THE BUREAU OF
PLANNING &
SUSTAINABILITY

DATE: November 10, 2021

TO: Planning and Sustainability Commission

FROM: Morgan Tracy, Project Manager

CC: Andrea Durbin, Director
Eric Engstrom, Principal Planner; Tom Armstrong, Supervising Planner

SUBJECT: Comprehensive Plan Background Data – Landslide Hazard Map and Slope Map

---

As part of the adoption of Part 2 of the Residential Infill Project, the landslide risk data contained as part of the 2035 Comprehensive Plan background reports is concurrently being updated to reflect more recent and accurate landslide risk data. This updated map includes several data layers that specifically contribute to the formulation of the Constrained Sites 'z' overlay zone (consistent with the data used with Part 1 of the Residential Infill Project). In addition to those layers, other landslide risk elements are being included in support of a factual basis for background and consideration with future legislative and quasi-judicial land use decisions. Changes to related maps are also proposed for consistency.

Background

The 2035 Comprehensive Plan, Buildable Lands Inventory (Ordinance No. 185657 and 187831) included three maps that illustrate landslide risk elements:

1) Flood, Slope, and Slide Hazards- HAZ-01-REV-1
    - FEMA Floodway (FEMA 2010)
    - FEMA 100-year Floodplain (FEMA 2010)
    - 25% or greater slope areas (BPS 2004-2009)
    - Landslide Deposits (DOGAMI 2014)
    - Historic Landslides (DOGAMI 2014)
2) Landslide Hazard Areas - HAZ-03-REV-1
    - Landslide Hazard Area
        - Landslide Hazard Zones (PSU/METRO 1997)
        - 15% or greater slopes (METRO 1998)
    - Historic Landslides (DOGAMI 2014)
3) Historic Landslide Deposits – HAZ-09
    - Landslide Deposits (DOGAMI 2014)

The existing Regulatory Potential Landslide Hazard Area Map (used in map HAZ-03) was created following the 1996 storm events to ensure that land divisions in areas of potential landslide hazard are designed based on detailed knowledge of the site conditions. The purpose of that regulation is to reduce the risk of private and public losses as a result of landslides. The 1997 map was based on the best available information at the time using a combination of sources to delineate potential landslide hazard areas. This data has subsequently been superseded by more accurate mapping published by the State Department of Geology and Mineral Industries (DOGAMI).

Experience by planners and engineers reviewing Landslide Hazard Studies submitted in support of land use applications for land divisions indicates that in some areas, particularly in Southwest Portland, the existing map is overly conservative. Consequently, for some land division applications, property owners and developers to be obligated to obtain a Landslide Hazard Study where a study has no benefit to the property owner or public. In limited areas, the existing regulatory map excludes properties which have a real landslide hazard. These areas include debris flow runout zones which, although not common, are a particularly high-risk type of landslide due to the speed of debris flows and their capacity for destruction. The hazard area delineated on the proposed regulatory map is significantly more accurate than the existing regulatory map. The difference in total area coverage between the existing and proposed regulatory overlays is a net reduction of 1,799 acres.

A secondary issue is that the inclusion of landslide hazard data on a second map (HAZ-01) and historic landslide deposit data on a third map (HAZ-09) is both duplicative and supplementary with map HAZ-03 which can create confusion as updates to this data are incorporated in the future.

Additionally, with the update to map (HAZ-01), new slope data is being incorporated. The previous slope information predates currently available LiDAR information which is much more precise. The resolution for the 2014 data is 1-foot, whereas the earlier 2004-2009 dataset is 3-feet.

City of Portland, Oregon | Bureau of Planning and Sustainability | www.portland.gov/bps
1900 SW 4th Avenue, Suite 7100, Portland Oregon, 97201 | phone: 503-823-7700 | tty: 503-823-6868

Proposed Mapping Changes

This project will repeal map HAZ-03-REV-1, as well as map HAZ-09 both adopted by Ordinance No. 185657 and 187831 and replace them with the single "Landslide Hazard Areas – HAZ-03-REV-2" map as further described below. In addition, the project will amend "Flood, Slope, and Slide Hazards- HAZ-01-REV-1" also adopted by Ordinance 185657 and 187831 by renaming the map "Flood and Slope Hazards – HAZ-01-REV-02" and deleting historic landslide and landslide deposit data. The flood data contained on that map remains unchanged with this update, however, the slope data is being updated from 2004-2009 data to 2014 LiDAR data.

New Landslide Map Data and Methodology used:

The proposed Landslide Hazard Areas map was constructed using the following data published by DOGAMI:

IMS-22, 2002 https://www.oregongeology.org/pubs/ims/p-ims-022.htm

GIS Overview Map of Potential Rapidly Moving Landslide Hazards in Western Oregon

All areas of potential rapidly moving landslide hazards were included. This data includes potential debris flow runout zones which are not included in the IMS-57 maps

IMS-57, 2018 https://www.oregongeology.org/pubs/ims/p-ims-057.htm

Plate 1 - Landslide Inventory Map of Central and Eastern Multnomah County

All areas of existing mapped landslide deposits were included

Plate 2- Shallow Landslide Susceptibility Map of Central and Western Multnomah County

Areas of high shallow landslide susceptibility were post processed and included. The shallow susceptibility mapping is based on Light Detection and Range (LiDAR) data. Due to the precision and accuracy of that data, the high hazard areas published by DOGAMI include very localized slopes such as retaining walls in otherwise gently sloping neighborhoods where landslides are highly improbable. In order to screen out these lower probability landslide areas, BPS overlaid the high shallow landslide hazard areas with a 100-foot square grid. Grid cells which included 20 percent or more hazard area within the grid cell were included, while cells with less than 20% area were excluded. The 20 percent cutoff was determined by running trials with varying percentages and determining through observation which percentage threshold most closely captured real hazard areas while excluding areas that would not warrant further study and evaluation.

City of Portland, Oregon | Bureau of Planning and Sustainability | www.portland.gov/bps
1900 SW 4th Avenue, Suite 7100, Portland Oregon, 97201 | phone: 503-823-7700 | tty: 503-823-6868

Plate 3 - Deep Landslide Susceptibility Map of Central and Western Multnomah County

All areas of moderate and high deep landslide susceptibility were included

Summary of proposed map changes:

Map #1

Repeal: Flood, Slope, and Slide Hazards- HAZ-01-REV-1 (see Attachment 1)

- FEMA Floodway (FEMA 2010)
- FEMA 100-year Floodplain (FEMA 2010)
- 25% or greater slope areas (BPS 2004-2009)
- Landslide Deposits (DOGAMI 2014)
- Historic Landslides (DOGAMI 2014)

Replace with: Flood and Slope Hazards- HAZ-01-REV-2 (see Attachment 2)

- FEMA Floodway (FEMA 2010)
- FEMA 100-year Floodplain (FEMA 2010)
- 25% or greater slope areas (BES 2014)

Map #2

Repeal: Landslide Hazard Areas - HAZ-03-REV-1 (see Attachment 3)

- Landslide Hazard Area
  - Landslide Hazard Zones (PSU/METRO 1997)
  - 15% or greater slopes (METRO 1998)
- Historic Landslides (DOGAMI 2014)

Replace with: Landslide Hazard Areas - HAZ-03-REV-2 (see Attachment 4)

- Potential Rapidly Moving Landslides (DOGAMI 2002)
- Landslide Deposits (DOGAMI 2018)
- Deep Landslide, moderate and high susceptibility (DOGAMI 2018)
- Shallow Landslide, high susceptibility (DOGAMI 2018 and BPS 2019)

Map #3

Repeal: Historic Landslide Deposits – HAZ-09 (see Attachment 5)

- Landslide Deposits (DOGAMI 2014)

Attachments:

1. Flood, Slope, and Slide Hazards- HAZ-01-REV-1
2. Flood and Slope Hazards- HAZ-01-REV-2
3. Landslide Hazard Areas - HAZ-03-REV-1
4. Landslide Hazard Areas - HAZ-03-REV-2
5. Historic Landslide Deposits – HAZ-09

City of Portland, Oregon | Bureau of Planning and Sustainability | www.portland.gov/bps
1900 SW 4th Avenue, Suite 7100, Portland Oregon, 97201 | phone: 503-823-7700 | tty: 503-823-6868

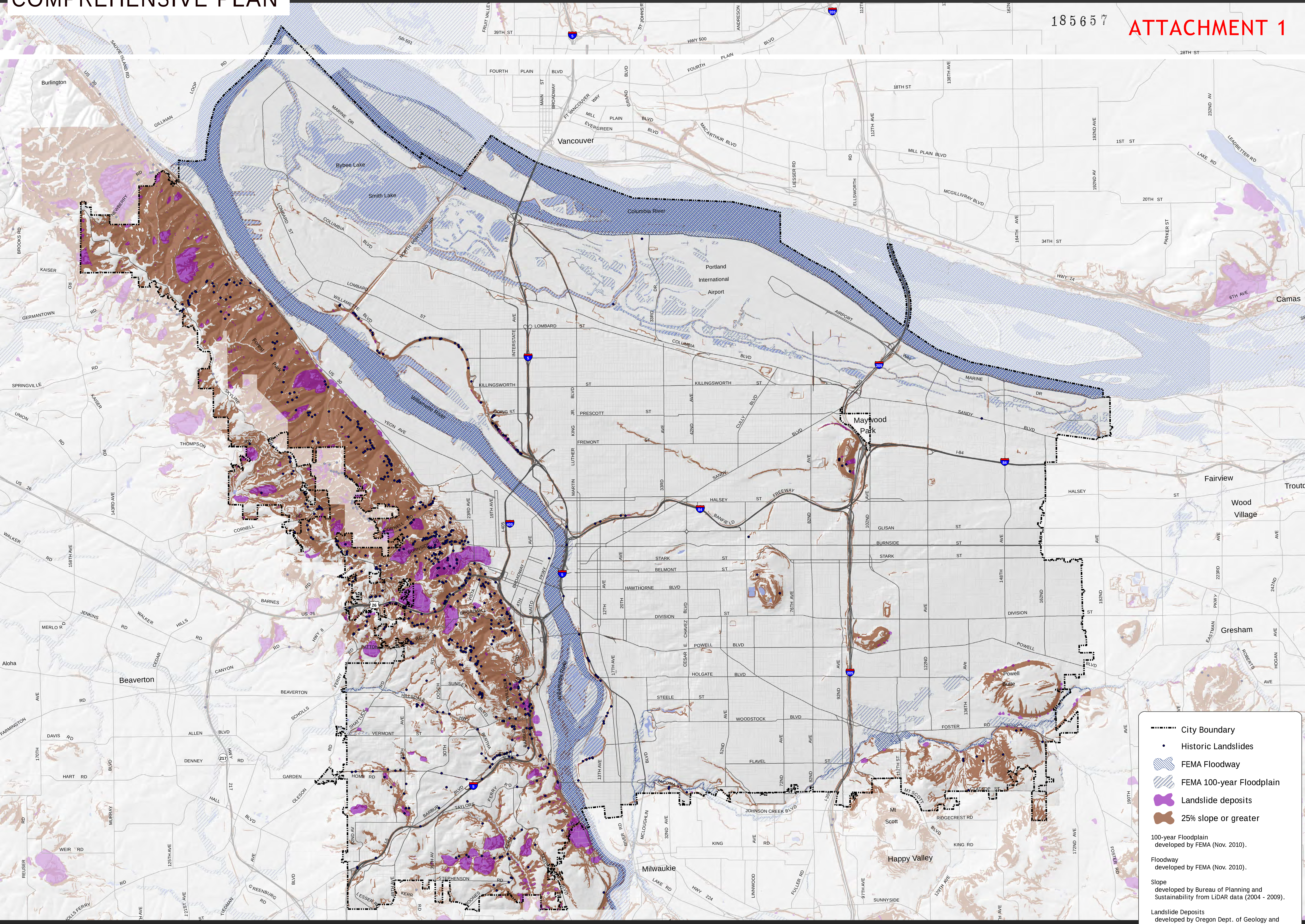
Flood, Slope, and Slide Hazards- HAZ-01-REV-1

COMPREHENSIVE PLAN

BUILDABLE LANDS

185657

ATTACHMENT 1


Vancouver
Columbia River
Portland
International
Airport
Bybee Lake
Smith Lake
Willamette River
Maywood
Park
Fairview
Troutdale
Wood
Village
Gresham
Camas
Burlington
Beaverton
Aloha
Milwaukie
Happy Valley
Mt
Scott
Powell
Butte
City Boundary
Historic Landslides
FEMA Floodway
FEMA 100-year Floodplain
Landslide deposits
25% slope or greater
100-year Floodplain
developed by FEMA (Nov. 2010).
Floodway
developed by FEMA (Nov. 2010).
Slope
developed by Bureau of Planning and Sustainability from LiDAR data (2004 - 2009).
Landslide Deposits
developed by Oregon Dept. of Geology and Mineral Industries (Dec. 2014).
Historic Landslides
developed by Oregon Dept. of Geology and Mineral Industries (Dec. 2014).
NORTH
0 0.25 0.5 1 1.5 Miles

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon
Charlie Hales, Mayor · Susan Anderson, Director

May 31, 2016 City of Portland | Bureau of Planning and Sustainability | Geographic Information System

This work was supported in part by a periodic review grant from the Oregon Department of Land Conservation and Development.

Flood and Slope Hazards - HAZ-01-REV-2

COMPREHENSIVE PLAN

BUILDABLE LANDS

ATTACHMENT 2

NORTH

0 0.25 0.5 1 1.5 Miles

THE BUREAU OF PLANNING & SUSTAINABILITY

November 4, 2021 City of Portland | Bureau of Planning and Sustainability | Geographic Information System

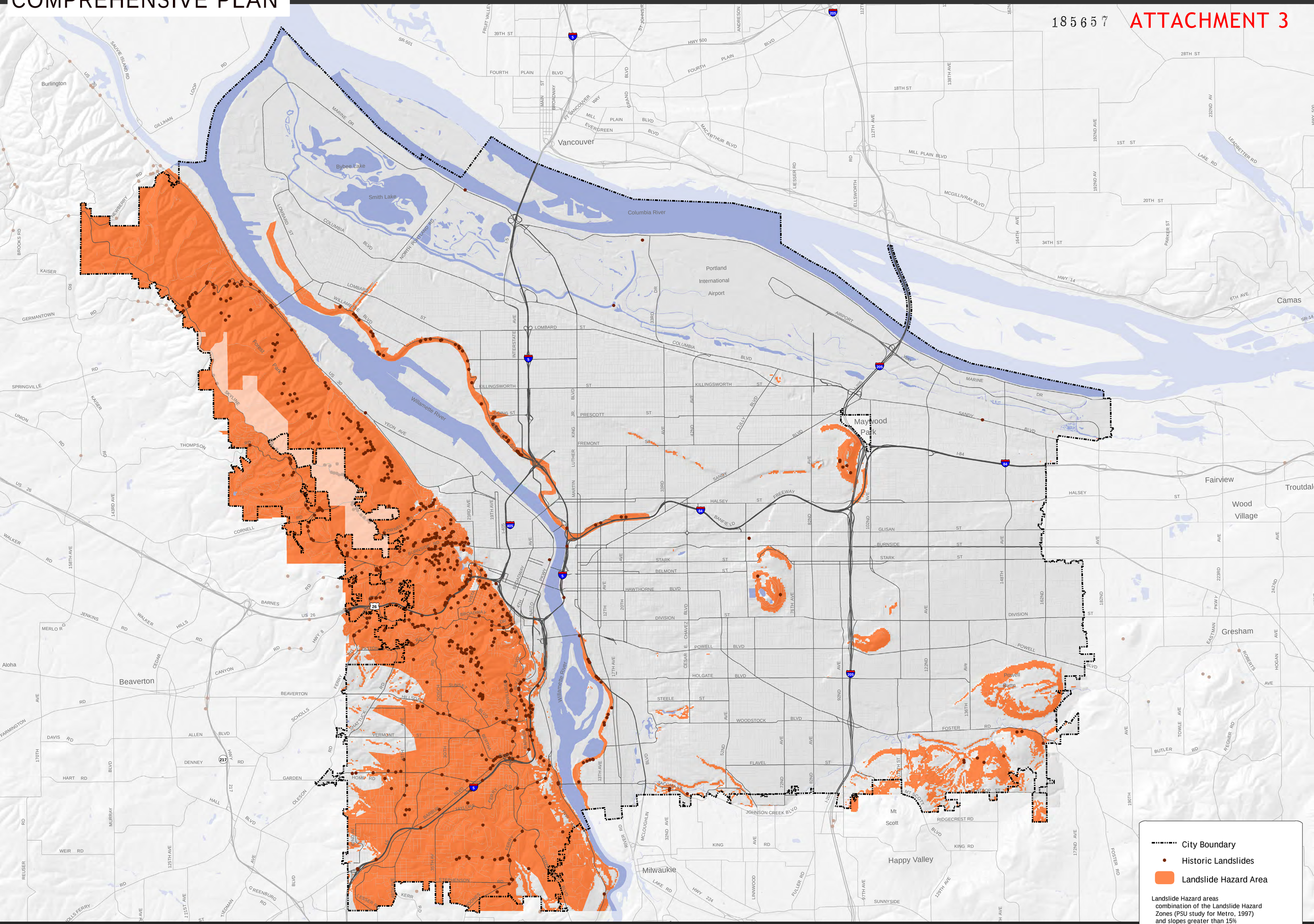
This work was supported in part by a periodic review grant from the Oregon Department of Land Conservation and Development.

Landslide Hazard Areas - HAZ-03-REV-1

COMPREHENSIVE PLAN

BUILDABLE LANDS

185657 ATTACHMENT 3



Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon
Charlie Hales, Mayor • Susan Anderson, Director

May 31, 2016 City of Portland | Bureau of Planning and Sustainability | Geographic Information System

This work was supported in part by a periodic review grant from the Oregon Department of Land Conservation and Development.

- City Boundary
- Historic Landslides
- Landslide Hazard Area

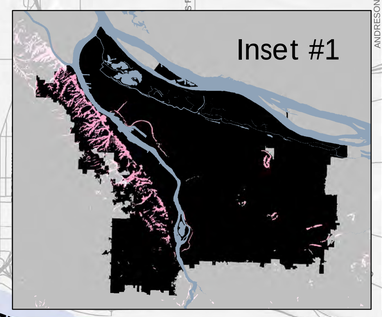
Landslide Hazard areas
combination of the Landslide Hazard Zones (PSU study for Metro, 1997) and slopes greater than 15% (Metro gridded slope data, 1998).

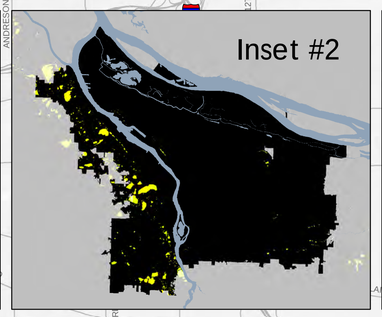
Historic Landslides
developed by Oregon Dept. of Geology and Mineral Industries (Dec. 2014).

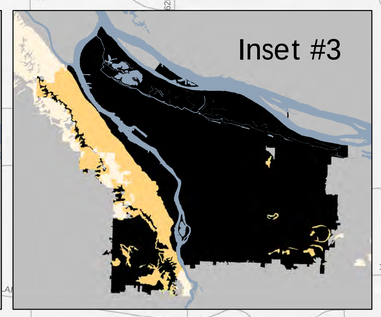
Landslide Hazard Areas - HAZ-03-REV-2

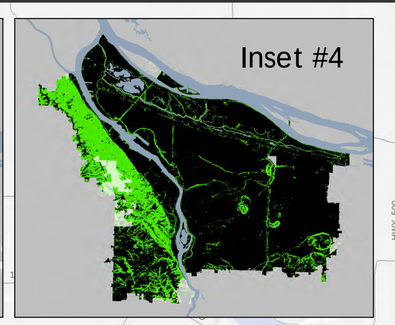
COMPREHENSIVE PLAN

BUILDABLE LANDS









ATTACHMENT 4

- City Boundary
- Potentially Rapid Moving Landslide Hazards (DOGAMI, IMS-22, Inset #1)
- Landslide Deposits (DOGAMI, IMS-57, Inset #2)
- Deep Landslide Susceptibility (DOGAMI, IMS-57, Inset #3)
- Shallow Landslide Susceptibility (DOGAMI, IMS-57, Inset #4)

Methodology
The proposed regulatory Potential Landslide Hazard Area Map was constructed using the following data published by DOGAMI.

IMS-22, 2002,
https://www.oregongeology.org/pubs/ims/p-ims-022.htm

GIS Overview Map of Potential Rapidly Moving Landslide Hazards in Western Oregon

All areas of potential rapidly moving landslide hazards were included. This map includes potential debris flow runout zones which are not included in the IMS-57 maps.

IMS-57, 2018,
https://www.oregongeology.org/pubs/ims/p-ims-057.htm
Landslide Inventory Map of Central and Eastern Multnomah County

All areas of existing mapped landslide deposits were included.

Deep Landslide Susceptibility Map of Central and Western Multnomah County

All areas of moderate and high deep landslide susceptibility were included.

Shallow Landslide Susceptibility Map of Central and Western Multnomah County

Areas of high shallow landslide susceptibility were post-processed and included.

The methodology by which the shallow landslide susceptibility areas were determined is described in detail in DOGAMI Special Paper 45, Protocol for Shallow Landslide Susceptibility Mapping https://www.oregongeology.org/pubs/sp/p-SP-45.htm.

Moderate shallow landslide hazard areas were not included due to the conservative methodology used to determine factors of safety against slope instability. Although useful for other screening purposes, the shallow moderate hazard overlay includes areas where the risk of losses due to landslide is low provided the proposed development is constructed in accordance with local and state building codes reviewed at the time of building permit. The shallow susceptibility mapping is based upon Light Detection and Range (LiDAR) data. Due to the precision and accuracy of the data, the high hazard areas published by DOGAMI include very localized slopes such as retaining walls in otherwise gently sloping neighborhoods where landslides are highly improbable. To reduce the number of properties which would be unnecessarily included, BPS overlaid the high landslide areas with a 100-foot square grid. Grid cells which included 20 percent or more hazard area within the cell were included in the map, while cells with localized sloping areas of less than 20 percent of the grid cell were excluded. The 20 percent cutoff was determined by running trials with varying percentages and determining by observation which percentage most closely captured real hazard areas while excluding areas that would not warrant a Landslide Hazard

NORTH

0 0.25 0.5 1 1.5 Miles

THE BUREAU OF PLANNING & SUSTAINABILITY

November 9, 2021 City of Portland | Bureau of Planning and Sustainability | Geographic Information System

This work was supported in part by a periodic review grant from the Oregon Department of Land Conservation and Development.

S:\gis\Projects\Comprehensive_Plan\Buildable_Lands\Maps\Atlas_Maps\BLI_HAZ_03_Potential_Landslide_Hazard.mxd

Historic Landslide Deposits- HAZ-09

COMPREHENSIVE PLAN

BUILDABLE LANDS

185657 ATTACHMENT 5

Burlington
Vancouver
Bybee Lake
Smith Lake
Columbia River
Portland International Airport
Willamette River
Beaverton
Aloha
Forest Park
Maywood Park
Camas
Fairview
Wood Village
Gresham
Troutdale
Powell Butte
Mt Scott
Happy Valley
Milwaukie
Sunnyside

City Boundary

Historic landslide deposits

Historic Landslides
developed by Oregon Dept. of Geology and Mineral Industries (Dec. 2014).

NORTH

0 0.25 0.5 1 1.5 Miles

Bureau of Planning and Sustainability
Innovation. Collaboration. Practical Solutions.
City of Portland, Oregon
Charlie Hales, Mayor • Susan Anderson, Director

May 31, 2016 City of Portland | Bureau of Planning and Sustainability | Geographic Information System

This work was supported in part by a periodic review grant from the Oregon Department of Land Conservation and Development.