

April 6, 2015

Planning and Sustainability Commission
1900 SW 4th Avenue
Portland, OR

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Subject: **Concerns on Pembina Pipeline Portland Propane Terminal**

As a retired chemical engineer and registered professional engineer with 35 years' experience in the natural gas processing business, I offer these comments on the proposed Pembina Pipeline Portland Propane Terminal.

One part of my career was as a process engineer at the Williams Company Lybrook Plant at 7,200 feet elevation in northwest New Mexico at a location 50 miles from the nearest town that produced propane for delivery to highway tankers. We produced over 600,000 BPY of both Commercial Grade HD-5 Propane and Refrigerant Grade Propane and loaded over 3,000 trucks annually safely in all kinds of weather conditions serving most of New Mexico that does not have natural gas service. The Portland Pembina Pipeline Propane Terminal will receive 13,505,000 BPY of propane by rail in 18,980 rail cars annually for storage and delivery in a very populated urban area to 24 marine tankers to world markets.

Although the Pembina Propane Terminal is enormously larger in volume, one of the greatest dangers is in the transfer hose connections (Unsafe Acts and Unsafe Conditions) where the Portland project is only three times larger in the Barrels per Hose Connection.

Economic Concerns

The Pembina Pipeline Company is a Canadian based company that has found that the regulations for a proposed Propane Terminal and Marine Export Facility in Canada are a greater obstacle than the US Regulations and the naïve Oregon and Portland requirements.

The Port of Portland expects Construction Revenue of \$18.8 Million Dollars and Annual Operating Revenue of \$8.8 Million Dollars for the life of the project. In 20 years the Port of Portland will generate \$194.8 Million Dollars. The share the Port of Portland receives as a middleman operation is equal to \$0.0172 per gallon non-escalating over the 20 year project life and is an extremely low reward for the high risk.

Propane is currently marketed at \$0.5958 per gallon and a year ago was \$1.3698 per gallon.

The Port of Portland will receive less than 3 % of the product value as a middle man operation. There are a total of 40 middle man operations from the well head to the final burner tip (See Chart at End). Pembina Pipeline Company receives all product upgrade pricing to Pacific Rim Markets.

Pembina Pipeline Company business model has been upset in recent months with propane valued at a record low of \$0.20 per gallon in western Canada. At the same time with an oversupply of propane and rapidly expanding and capital intensive new fractionation projects with no place to go, Pembina is desperate to complete the export of propane to Pacific Rim Countries.

Rail System Concerns

A total of 37,960 full and empty DOT-112 Rail Cars yearly are impacting a 125 year old rail infrastructure in the 1,232 mile distance from the Fort McMurray Alberta Processing Facilities to the Portland Propane Terminal.

The 380 full and empty unit trains increase the wait time by 24 hours annually at grade crossings and delaying emergency response along the 1,232 mile distance from the Processing Facilities in Alberta to the Port of Portland Terminal in Oregon. The emergency response does not know or care if the rail cars are full or empty.

The American Association of Railroads indicates that 99.9977% Hazardous Material Shipments safely reach the final destination. The 0.0023 % that results in an incident is the concern. An estimated 18 unsafe incidents are predicted in a short 20 year period on the rail system and the results could be catastrophic.

The Danger Blast Zone for Crude Oil Rail Cars is one half mile on either side of the tracks. Incident command will impose mandatory evacuation orders within this area. I live within this half mile Evacuation Zone with the nearby BNSF Tracks in rural Vancouver. The Evacuation Zone for Propane Rail Cars is three times larger or 1.5 miles either side of the tracks. The Danger Blast Zone for Propane Rail Cars is 3,696 Square Miles or 25 times greater than the total area of the City of Portland at 145 Square Miles. Ten major cities are located up track include Fort McMurray, Redwater, Edmonton, Calgary, Spokane, Pasco, Kennewick, (Washougal, Camas, or The Dalles, Gresham) and Vancouver and many smaller communities.

How many residences, schools, churches, businesses, hospitals, and fire stations are in this expanded safety zone?

PROPANE SAFETY ZONES							
Fort McMurray Alberta to Portland Oregon = 1,232 Miles							
EVACUATION ZONE - 1.5 miles minimum radius or 3.0 miles diameter from Ground Zero							
Gas Plant or Fractionator		5 Miles	From Ground Zero	78	Square Miles		
Rail Miles	1232 Miles	3 Miles	From Ground Zero	3,692	Square Miles		
Urban Areas	10 Cities	5 Miles	From Ground Zero	780	Square Miles		
Export Terminal		5 Miles	From Ground Zero	78	Square Miles		
Total Evacuation Zone				4,628	Square Miles		
PREPARE TO EVACUATE Zone - 3.0 miles minimum radius or 6.0 miles diameter from Ground Zero							
Gas Plant or Fractionator		10 Miles	From Ground Zero	314	Square Miles		
Rail Miles	1232 Miles	6 Miles	From Ground Zero	7,392	Square Miles		
Urban Areas	10 Cities	10 Miles	From Ground Zero	3,140	Square Miles		
Export Terminal		10 Miles	From Ground Zero	314	Square Miles		
Total Evacuation Zone				11,160	Square Miles		

The difference between the legacy DOT-111 Crude Oil Rail Cars at 7/16 inch Wall Thickness and the DOT-112 LPG Propane Rail Cars at 9/16 inch Wall Thickness is only 1/8 inch of steel. The 9/16 inch steel shell provides protection from puncture for rail operations below 12 miles per hour. The DOT-112 is not a 'Fail Safe' Rail Car but has considerably less use than the DOT-111 Crude Oil Rail Cars.

Facility Siting Concerns

The OSHA 1910.119 Process Safety Management Regulations provide a very structured methodology to protect the workers in a facility handling highly hazardous chemicals and to some extent the area around the facility. The Guidelines for Facility Siting and Layout (198 pages) ISBN # 978-0-8169-0899-8 \$216.95 through the American Institute of Chemical Engineers offers a long version of the Facility Siting issue. A shorter version is a ten page checklist that prompts a detailed review by asking specific questions. The Pembina Propane Terminal located in the heart of an urban metropolitan requires a response in 63 out of 133 items evaluated (if all items are weighted equally nearly half of the questions require a Response).

Facility and Stationary Source		Analysis by William Brake				
Siting Checklist		BS Chemical Engineering				
Revalidating Process Hazards Analysis		Registered Professional Engineer				
Walter L Frank and David K Whittle		April 6, 2015				
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#	Item	Yes Adequate	No Requires Response	Not Applicable	Total Total	Percent That Require Response
1	Spacing between Process Components	4	4	0	8	50%
2	Location of Large Inventories	5	2	1	8	25%
3	Locations of Motor Control Centers	5	1	0	6	17%
4	Location and Construction of Control Room	14	16	0	30	53%
5	Location of Shops, Substations, roads rails and Ignition Sources	1	3	0	4	75%
6	Location of Engineering , Labs , Administrative and other buildings	1	11	0	12	92%
7	Unit Layout	3	7	0	10	70%
8	Location of Unit Relative to On-Site and Off-Site Surroundings	1	12	0	13	92%
9	Location of Fire Mains and Back Up Diesel Pumps	2	2	0	4	50%
10	Location and Adequacy of Drains, Spill Basins, Dikes and Sewers	7	1	0	8	13%
11	Location of Emergency Stations (Showers , Respiratory Devices and PPE	3	1	0	4	25%
12	Electrical Classification	12	1	0	13	8%
13	Contingency Planning	11	2	0	13	15%
Total Evaluation		69	63	1	133	47%

My experience at over 100 Natural Gas Processing Plants is that only one was located in a city residential area and it was built in 1929 and the city grew up around it. All the others were a minimum of 5 miles from a town and typically 10 miles away from any urban areas. The Pembina Portland Propane Terminal is considered too close to the City of Portland, Port of Portland, City of Vancouver, the New Vancouver Waterfront Development, and the Port of Vancouver and is in the PDX International Flight Path.

Emergency Response Concerns

With a very short 30 month construction period, the Portland Municipal Fire Department needs to be ready now for this Pembina Propane Terminal. The lead time for new equipment, manpower, and training prohibits rapid growth. With over a 2 year lead time for purchase of new fire apparatus, there is no time to gear up. If the Port of Portland is not ready now, then this can be a deal breaker for the project. Mutual aid from Vancouver, Olympia, and Salem is in many cases over one hour away and these municipal fire departments also lack industrial advanced fire suppression techniques and training. Fighting a fire incident on the back side of a burning 120 foot tall refrigerated propane storage tank is not within the capabilities of any fire department. The last major fire in Metropolitan Portland in the past decade occurred on September 2, 2012 at the Thunderbird Motel near the Interstate 5 became a five- alarm fire and took one week to contain.

Project Concerns

Pembina Pipeline Company is a small company started in 1997 with 700 current employees. It has acquired through 'acquisitions' engineering and management talent and lacks the robust and detailed talent needed to design, build, operate and maintain a World Class Facility like the Portland Propane Terminal.

Pembina Pipeline Company is not proven in several engineering challenges.

The thermal change of 120 foot tall Propane Storage Tank from +100 F to -44 F is a change of close to 4 inches and puts enormous stress on weld and support structures. The tank cycles twice a month in relation to ship loading schedules or 480 times in the 20 year project life.

The unproven concrete cap technology has not been used in the US and is not a standard installation. Only a handful of tanks world-wide have this added safety feature as a limited terrorism protection.

The weight of the storage tank, concrete cap and over 450,000 barrels of propane is estimated at over 103,000,000 pounds. This is 51,500 tons (10 % of the estimated weight of a single World Trade Center building that collapsed on September 11, 2001) and is not a project for the uninformed on the banks of the Columbia and Willamette Rivers in a historic flood plain. Soil Strength, Earthquake Resistance, Thermal Stresses, Ground Freezing, and Water Tables are some key areas of concern.

The project requires multiple robust and redundant refrigeration systems to cool the product and reduce the pressure from 150# to a design 1-2 # pressure. Any failure in the refrigeration system results in boil off of the hydrocarbon and flaring of the product. API Standard 2000 and RP520 indicate a maximum 1.4 inches of water column pressure to be exerted on the roof of a 3/16 inch plate steel roof to prevent overpressure and failure of the roof at the shell to head seam.

A simple threaded coupling leak on the storage tank is a 'major project' to repair similar to the cold box technology of air, nitrogen and helium recovery units where workers dig and tunnel through frozen hydrocarbons and perlite insulation as much as 15 feet to reach the leaking fitting.

Marine Shipping Concern

The urgency to receive a marine vessel at the Columbia River Bar, go up river 105 river miles to Portland, then load over 500,000 bbls product and return the vessel downriver 105 miles to the Columbia River Bar all within a high tide cycle is unrealistic. This is too much to ask for a short 12 hour window of time. This is expected to occur for over 24 vessels a year or 480 vessels in the 20 year project life.

Summery

It is not "if" it will have a major incident, but "when" as there are a lot of unknowns in the project scope.

Is this the right project for the Port of Portland Terminal?

I urge the Portland Planning and Sustainability Commission to delay to review all the testimony in the 5 hour public hearing on April 7, 2015 or vote against this Pembina Pipeline Propane Export Terminal.

Thank you for inviting public comments on this project.

Sincerely,

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