March 27, 2015

Planning and Sustainability Commission
1900 SW 4th Avenue, Suite 7100
Portland, Oregon 97201

Dear Chair Baugh and PSC members,

I am writing to strongly recommend that the PSC reject the proposal to amend subsection 33.430.090.A of the Zoning Code to allow propane to be transported via pipe through the environmental conservation overlay zone at Terminal 6 of the Port of Portland. The amendment is being proposed exclusively to accommodate the proposal by Pembina Marine Terminals, Inc. to construct and operate a marine propane export terminal at Terminal 6.

There are many reasons why Pembina's proposal should be rejected. These same arguments undermine the need for, and lead to the rejection of, the proposed zoning amendment, since the only reason for the amendment is to accommodate the Pembina proposal. Below find some of the reasons I find compelling to reject Pembina's proposal, and on which I base my recommendation to the Commission.

1. Pembina's proposal is totally inconsistent with Portland's official policies, values and goals to dramatically reduce its carbon footprint, mitigate climate change, and provide a healthy, equitable, and resilient community for all.

The City of Portland is very explicit in its 2015 State Legislative Agenda report about its objective to "support policies that limit Oregon's carbon footprint, mitigate climate change and improve air quality," and its commitment as a City "to promoting a prosperous, low-carbon economy." [1] Similarly, Portland's Bureau of Planning and Sustainability is very explicit in its Mission Statement about creating a "plan for a resilient future," and "policy and actions to address climate change." [2]

Even more to the point, Portland and Multnomah County's 2009 Climate Action Plan strives "to achieve a 40 percent reduction in carbon emissions by 2030 and an 80 percent reduction by 2050 (compared to 1990 levels)."[3] It was exactly this Plan that led the White House to recently name Portland as one of 16 national "Climate Action Champions," and as "a regional leader for greenhouse gas reduction and climate change mitigation." [4]

Also to the point, as members of the PSC are aware, is the fact that "stewardship, development and maintenance" of the Portland's Climate Action Plan is one of three areas of responsibility specifically designated to the Commission. [5]

More and more research indicates that the vast majority (e.g., 80%) of the world's known fossil-fuel reserves must be left in the ground if global warming is to be held to less than two degrees Celsius, and the escalating adverse effects of climate change and extreme weather are to be slowed. [6]

Fossil fuel corporations, however, continue in their attempts to aggressively pursue business-as-usual. Continue, in other words, to pursue the maximization of short-term profits, regardless of the consequences for present and future generations and the planet. [7]

Because of outrage at the escalating adverse effects of climate change and the refusal of fossil fuel companies to change, growing numbers of educational and religious institutions, cities, foundations, investment funds, etc. have committed themselves to divest from the largest fossil fuel corporations. [8-10]

Mayor Charlie Hales embraced divestment in a major speech on World Environment Day, June 5th, 2013, when he stated that "while I'm proud that our City holds no direct fossil fuel assets in our financial investment portfolio, it's not enough. The City must urge the Oregon State Treasurer, the Local Government Investment Pool and the Oregon Investment Council to divest of all state holdings in fossil fuel." [11]

It's clear from all of the above that we urgently need to move away from fossil fuels, and toward livelihoods and jobs based upon clean forms of energy, energy efficiency, resource conservation and recovery, etc.—exactly as advocated in Portland's official policy, values and goals statements.

Pembina's proposal takes us in exactly the opposite direction. Pembina is a large, rapidly expanding, highly integrated Alberta based corporation providing services and/or facilities to clients and investors at almost every point along the fossil fuel "hydrocarbon value chain." [12] Pembina's proposal and corporate identity reflects and perpetuates exactly the types of fossil fuel dependence, industries, practices, and short term decision making from which we urgently need to transition.

2. Propane is a byproduct of fracked natural gas. Its production thus perpetuates and cannot be disentangled from the massive and well documented health, environmental, and other problems created by fracking.

Most propane*produced today is derived from natural gas extracted from shale formations by hydraulic fracturing and horizontal drilling. Study after study in both the United States and Canada documents the major threats, pollution, and dangers of such fracking. These include: the use of massive quantities of water and hazardous chemicals; the creation of vast quantities of polluted wastewater (the injection disposal of which sometimes causes earthquakes); the release of many hazardous pollutants into air, land, and water; multiple major human health impacts; multiple impacts to fish, wildlife, farm and domesticated animals, and agriculture; major problems and disruptions within communities. [13-15]

* Propane is one of several hydrocarbons that co-occurs in natural gas and crude oil when they are extracted. It and the other co-occurring hydrocarbons (e.g. ethane, butane) are removed from natural gas (which is primarily methane) and purified during natural gas processing and marketed separately. Pembina says the propane it proposes to export is extracted from deposits in northeast British

Columbia, and northwest and central Alberta within the Western Canadian Sedimentary Basin [16]. Pembina also acknowledges that the natural gas is extracted through fracking [17].

3. Fracking for natural gas has much higher methane leakage rates than previously reported. Methane is a much more potent greenhouse gas than carbon dioxide, and more potent than previously estimated. High methane leakage rates mean that the touted benefits of fracked natural gas as a "bridge fuel" are illusory.

Proponents tout fracked natural gas as a transition fuel, and as a bridge to a cleaner energy future. More and more research indicates, however, that fracking operations have much higher methane leakage rates than previously reported—rates that are often so high they eliminate any superiority of natural gas over coal, at least in terms of lower total emissions of global warming gases [18-20]

Methane, the chief component of natural gas, is a much more potent greenhouse gas than carbon dioxide. The ratio of a greenhouse gas's ability to trap heat relative to carbon dioxide is called its global warming potential (GWP). In September, 2013, the Intergovernmental Panel on Climate Change (IPCC) increased its estimates of the GWP of methane. The IPCC now estimates that methane is 34 times more potent than CO2 in trapping heat over a 100 year span (it previously estimated a GWP of 25), and 86 times more potent than CO2 in trapping heat over a 20 year span (its prior estimate was 72). [21-23]

The high methane leakage rates at many fracking sites, and the increased IPCC estimates of the GWP of methane—especially the GWP of 86 over a 20 year span—cancel out the lower CO2 benefits of natural gas as a transition or bridge fuel.

Greenpeace adds two additional revealing considerations to our understanding of our situation and our urgent need for action:

"Though the IPCC and countries around the world have updated their greenhouse gas inventories as scientists refine our understanding of methane's Global Warming Potential, the US Environmental Protection Agency continues to use outdated figures to judge methane's impact on the climate.

EPA currently uses a GWP of 25 over 100 years for calculating the impact of methane on climate change. The EPA calculates greenhouse gas emissions in an annual report called the U.S. Greenhouse Gas Emissions and Sinks, commonly referred to as the greenhouse gas inventory. The EPA's GWP is based on the IPCC's fourth Assessment Report, published in 2007, not the most recent, published in 2013.

By using a 100-year time scale, the EPA vastly under estimates the damage methane will cause to the climate in the next two critical decades. Scientists say that methane could push the climate over a "tipping point" in the next 18-25 years, causing runaway global warming, and making a 100-year timeline obsolete. By combining a falsely low GWP and a misleading 100-year time horizon, the EPA's

methane estimates falsely dilutes the impact of methane emissions, and undermines the urgency of taking the steps necessary to avoid climate catastrophe." [22]

4. Propane has benefits in comparison to other fossil fuels. It's still a fossil fuel, however, and its derivation is dependent upon and perpetuates all the environmental, health, and greenhouse gas emission problems created by fracked natural gas.

Pembina and supporters of propane note that propane as a fuel produces less CO2 when burned per BTU produced than gasoline or diesel, and that burning propane is cleaner than burning gasoline or diesel. [16] While both statements are true, propane is still a fossil fuel and a by-product of fracked and processed shale gas. Propane perpetuates our dependence on exactly the fuels and practices from which we urgently need to transition. While propane per se may produce less CO2 and burn cleaner than gasoline or diesel, the underlying practices for fracking and processing the shale gas from which it is derived are anything but clean in their environmental, health, and greenhouse gas consequences.

5. Evidence increasingly indicates that shale oil and gas production in the U.S. and Canada via advanced fracking technologies is a short-term bubble, that official projections are overly optimistic, and that production will peak this decade and fall considerably below projections in subsequent decades.

Evidence increasingly indicates that forecasts by the U.S. Department of Energy (DOE) and its Energy Information Administration (EIA) about the productivity, economic viability, and lifespan of major fracked shale oil and gas formations throughout the U.S. are much more optimistic than warranted, and sometimes dramatically so. [24]

In 2011, for instance, the EIA issued a report based upon analyses by an independent firm (Intek, Inc.) under contract to the agency, that California's vast Monterey Shale deposits contained 13.7 billion barrels of recoverable oil if extracted using the latest technologies "including acid treatments, horizontal drilling and fracking." [25] Projections followed that "the oil boom would bring as many as 2.8 million new jobs to California and boost tax revenue by $24.6 billion annually." [25] In mid 2014, however, the EIA slashed its projections dramatically, concluding that just 4% of the oil could be recovered using the technologies proposed, and that 96% of the oil in the deposits was nonrecoverable. [25] At the same time " the author of the original EIA estimate, Intec Inc., admitted that it had been derived from oil company presentations rather than hard data." [24]

Much of impetus for the EIA's dramatic revision was created by geoscientist J. David Hughes' analyses of real-world production data from wells in the Monterey Formation, as opposed to analyses based upon claims and assumptions. [26] Hughes worked for 32 years with the Geological Survey of Canada as a scientist and research manager on coal, oil, gas and unconventional gas assessments, issues and constraints. He is a Fellow at, and frequently publishes at, the Post Carbon Institute on issues related to energy and sustainability, and is also a board member of Physicians, Scientists, and Engineers for Healthy Energy and the Association for the Study of Peak Oil and Gas – Canada. [27]

In October of 2014 Hughes and the Post Carbon Institute released “Drilling Deeper: A Reality Check on U.S. Government Forecasts for a Lasting Tight * Oil & Shale Gas Boom.” [28] (*Tight oil is medium to light oil contained in low permeability shale and other formations, i.e., it's shale oil.)

The report provides an “exhaustive well-by-well survey of major tight oil and shale gas fields, [and] shows that the U.S. Department of Energy (DOE) has produced exaggerated forecasts that are misleading policymakers and the public about America’s long-term energy future. 'The Department of Energy’s forecasts—the ones everyone is relying on to guide our energy policy and planning—are overly optimistic based on what the actual well data are telling us,' [Hughes] said in a written statement.” [28]

“Drilling Deeper” provides a comprehensive ”analysis of the 12 major shale plays [i.e., shale fields or formations] in the U.S. (accounting for 89% of current tight oil and 88% of current shale gas production), [and] concludes that both oil and natural gas production will peak this decade and decline to a small fraction of current production by 2040.” [29] Researchers at several universities (e.g., the University of Texas, Louisiana State University) have recently reached conclusions similar to those of Hughes. [30]

Hughes has issued similar real-world production based analyses about the future of fracked shale gas in Canada. In 2011, for example, he noted that: “Canadian gas production peaked in 2001, and ... is now down 16% from that peak. All gas producing regions in Canada, with the exception of British Columbia, are past peak. The Western Canada Sedimentary Basin (WCSB), which is the source of 97% of Canada's gas production, is a very mature exploration area. The largest pools, with the greatest net energy payback (i.e., the amount of energy returned through gas production compared to the amount of energy expended in drilling and production), are typically found early in the exploration cycle.

The Law of Diminishing Returns inevitably takes over as basins mature, with ever greater expenditures of effort in terms of exploration and production for ever diminishing returns. [In] Western Canada ... in just 15 years, the number of operating gas wells has tripled while the amount of gas produced by each well has decreased by two-thirds.” [31]

It's important to note that the Western Canada Sedimentary Basin (WCSB), described by Hughes as past peak production and subject to the Law of Diminishing Returns, is exactly the natural gas formation from which Pembina [16] says the propane it proposes to export will be derived. Hughes' analyses thus raise major questions about the accuracy of Pembina's [16] claims that the supplies of propane it proposes to export will be abundant and available for export through 2040.

6. The fracked shale gas boom is economically unsustainable. Contributing to this non-sustainability are high costs and low earnings, Wall Street profit strategies, increased attention to "stranded assets," the growing divestment movement, and the growing transition to clean energy technologies and energy efficiency.

Below find brief descriptions of the contribution of each factor to the economic non-sustainability of the fracked shale gas boom. The same factors raise questions about the economic sustainability of propane, since it is a byproduct of processed fracked gas.

—High costs and low earnings: In comparison to conventionally drilled gas, gas extracted via fracking and horizontal drilling requires high capital expenditures, and results in production that depletes rapidly, and is of lower quality and yield. Shale formations are very uneven in yield, and large numbers of wells need to be drilled to find "sweet spots." Constant exploration and drilling for new wells is required to counter the rapid production decline of old wells, and to maintain or increase total production. All this is very expensive, and results in companies constantly borrowing, spending and drilling to generate enough production to pay debts and attract and retain investors. In the past this "drilling treadmill" resulted in so much short-term production relative to demand that gas prices and profits plummeted, which in turn led to more borrowing, spending, and drilling. [29, 32-35]

—Wall Street profit strategies: In February of 2013, Deborah Rogers, the Executive Director of the Energy Policy Forum, published "Shale and Wall Street: Was the Decline in Natural Gas Prices Orchestrated?" [36] The report provides a compelling analysis of the role of Wall Street investment banks in influencing the borrowing and drilling treadmills that occurred in the shale gas industry, the production gluts and price and profit depressions that resulted, and the benefits that accrued to banks from the mergers and acquisitions that resulted from these depressions. [37] Below find the abstract from the report:

"In 2011, shale mergers and acquisitions (M&A) accounted for $46.5B in deals and became one of the largest profit centers for some Wall Street investment banks. This anomaly bears scrutiny since shale wells were considerably underperforming in dollar terms during this time. Analysts and investment bankers, nevertheless, emerged as some of the most vocal proponents of shale exploitation. By ensuring that production continued at a frenzied pace, in spite of poor well performance (in dollar terms), a glut in the market for natural gas resulted and prices were driven to new lows. In 2011, U.S. demand for natural gas was exceeded by supply by a factor of four.

It is highly unlikely that market-savvy bankers did not recognize that by overproducing natural gas a glut would occur with a concomitant severe price decline. This price decline, however, opened the door for significant transactional deals worth billions of dollars and thereby secured further large fees for the investment banks involved. In fact, shales became one of the largest profit centers within these banks in their energy M&A portfolios since 2010. The recent natural gas market glut was largely effected through overproduction of natural gas in order to meet financial analyst's production targets and to provide cash flow to support operators' imprudent leverage positions." [36]

Rogers recently provided an update on the “Shale and Wall Street” report [38], and also recently described how Wall Street is benefiting from a similar strategy and practices in the shale oil industry [39].

—Increased attention to “stranded assets”: Scientists, analysts, and others increasingly maintain that the vast majority of the world's known fossil-fuel reserves must be left in the ground if global warming is to be held to less than two degrees Celsius, and the escalating effects of climate change and extreme weather are to be slowed. [6] Such reserves are currently carried on the books of companies as assets, but must be written off if they are unburnable, i.e., they're “stranded assets.”

The dangers of stranded assets and related issues, and the urgent need for the world to transition to a low carbon future have received extensive attention from non-profit organizations such as Ceres [40] and the Carbon Tracker Initiative [41]. Such organizations are playing a major role informing and mobilizing large institutional investors and businesses collectively worth trillions of dollars to move toward a low-carbon, sustainable future.

—Growing divestment movement: Because of outrage at the escalating calamitous effects of climate change and the refusal of fossil fuel companies to change their ways, growing numbers of educational and religious institutions, cities, foundations, investment and pension funds, etc. have committed themselves to divest from the largest fossil fuel corporations. [8-10] High profile calls for divestment are occurring with growing frequency, the most recent being from the UN Framework Convention on Climate Change [42], and from The Guardian newspaper in its “Keep It In The Ground” and “Fossil Fuel Divestment” campaigns [43].

—Growing transition to clean energy technologies and energy efficiency: The transition to solar, wind and clean, low-carbon energy in the U.S. [44,45] and other countries [46,47] is skyrocketing. Organizations such as Ceres [48] and Divest-Invest [49] are mobilizing businesses, investors, and policymakers to make the necessary investments and changes. More than 200 Oregon businesses, for instance, have signed and acted upon the Ceres' sponsored Oregon Business Climate Declaration [50]. Mark Jacobsen and his colleagues at Stanford and other institutions have provided analyses through the Solutions Project of how a 100% clean, renewable energy future could be achieved in all 50 states [51]. The U.S. Conference of Mayors has documented successful city initiatives for energy efficiency and conservation [52]. Organizations such as Architecture 2030 are providing real leadership in how built environments worldwide can be transformed to promote a low-carbon, resilient future [53].

7. The heart and deeper thrust of my testimony.

Portland is officially committed to dramatically reducing its carbon emissions, mitigating climate change, and providing a healthy, equitable, and resilient community for all. Science and emerging climate realities suggest only one viable path for achieving such goals: the rapid reduction in the use and development of fossil fuels (especially extreme fuels like fracked shale gas and oil, and tar sands

bitumen), and the rapid increase in the use and development of clean energy sources, distributed energy systems, energy efficiency, resource conservation, waste reduction, etc. The transition has already been embraced by many, and is spreading rapidly. The only real questions are: will it be fast enough, and how much will it be slowed by fossil fuel corporations' insistence on business-as-usual regardless of the catastrophic consequences?

It's true that propane has some benefits in comparison to other fossil fuels. It's still a fossil fuel, however, and its derivation is dependent upon and perpetuates all the environmental, health, and greenhouse gas emission problems created by fracked natural gas—problems which substantial evidence now reveals are much greater than previously acknowledged. Growing real-world evidence also reveals that despite optimistic official forecasts and industry projections, shale oil and gas production via fracking in the U.S. and Canada is a short-term bubble, and that production will peak this decade and decline considerably in subsequent decades. Equally damning is the inescapable conclusion, based upon multiple converging lines of evidence, that the boom in fracked oil and gas is economically unsustainable. Failure to acknowledge all of the preceding leads not only to bad decisions, but also to decisions that divert us from the planning and decisions we urgently need to make to transition to a clean, equitable and sustainable future.

Before closing, I'd like to narrow my focus considerably, and briefly note that accidents have occurred in which pressurized DOT 112 rail cars transporting propane ruptured and exploded [54-56]. One vulnerability for such cars is when they come uncoupled during a derailment, jackknife across a track, and are impacted by following cars [54]. The propane Pembina proposes to ship from Edmonton, Alberta to Portland will be transported in mile long trains of one hundred DOT 112 cars every second day. If an accident occurs, especially one involving uncoupled jackknifed cars, the explosions and possible BLEVEs that could occur would be massive—and possibly catastrophic if they occurred in a densely populated area [57].

I'd also like to note that BLEVEs have occurred as a result of mega-earthquakes.The following links will take you to an analysis [58] and video footage [59] of the BLEVE that occurred in the LPG tanks at the Cosmo Oil refinery in Ichihara City following the magnitude 9.0 Tohoku Earthquake in Japan on 3/11/11. The fires were finally extinguished 10 days later [60]. The likelihood of a Cascadia Subduction Zone mega-earthquake [61] in the near future in Oregon raises questions about the possibility of BLEVEs occurring at Pembina's proposed terminal. Such a possibility is amplified by the “concentration of fuel tank farms, pipelines, marine terminals, and transmission towers along the lower Willamette River on the northwest side of Portland. The ['Earthquake Risk Study for Oregon’s Critical Energy Infrastructure Hub'] predicts violent shaking, liquefaction and landslides from a magnitude 8 or 9 earthquake would cause pipe breaks, rupture fuel storage tanks, topple transmission towers and destroy berths.” [62]

None of the above rail or terminal related risks are necessary. Pembina's proposal is totally inconsistent with Portland's official policies, values and goals, and it flies in the face of the Commission's official charge to provide “stewardship, development and maintenance” for Portland's Climate Action Plan.

Thus, it is my strong recommendation to the Commission that you reject the environmental overlay zone code amendment that would accommodate and facilitate Pembina's proposal.

Sincerely,

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