Chapter 6
Cumulative Impacts

6.1 What are cumulative impacts?

Cumulative impacts are impacts that would result from the incremental addition of the proposed action to impacts from past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions that occur over time. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed action, including the proposed action's incremental contribution to cumulative impacts on the environment.

This chapter describes the approach to conducting the cumulative impacts analysis, including what past, present, and reasonably foreseeable future projects are considered, and identifies the resource areas that are addressed in the analysis. It then describes cumulative impacts that could result from construction and operation of the proposed action, including potential risks associated with the handling, storage, and transport of the proposed bulk liquids, including crude oil. Lastly, this chapter presents any measures identified to mitigate the cumulative impacts of the proposed action and identifies any unavoidable and significant adverse cumulative impacts.

6.2 What is the study area and what resources were considered for the cumulative impacts analysis?

As discussed in the preceding chapters of this Draft EIS, the potential for impacts related to the proposed action are considered in terms of the potential to affect resources in the study area, which generally includes the project site, Puget Sound & Pacific Railroad (PS&P) rail line, and Grays Harbor. The extended study area includes the area that could be affected by increased rail traffic from the source of the proposed bulk liquids to Centralia, Washington, and the areas that could be affected by increased vessel traffic from the mouth of Grays Harbor to the point of final delivery.

In general, the scope of the cumulative impacts analysis is limited to those resources where the proposed action could have an additive impact in combination with other past, present, and reasonably foreseeable and similar future actions. Based on the analyses in Chapter 3, *Affected Environment, Impacts, and Mitigation*, and Chapter 4, *Environmental Health and Safety*, the proposed action would affect the following resources in each study area and could contribute to cumulative impacts. The potential for cumulative impacts in the extended study area is addressed in Section 6.5.8, *Extended Study Area*.

- Section 6.5.1, *Air*
- Section 6.5.2, *Noise and Vibration*
- Section 6.5.3, *Tribal Resources*

- Section 6.5.4, *Rail Traffic*
- Section 6.5.5, *Vehicle Traffic and Safety*
- Section 6.5.6, *Vessel Traffic*
- Section 6.5.7, *Environmental Health and Safety* (related to incidents of oil spills, fires, and explosions)

6.3 What are the relevant regulations for the cumulative impacts analysis?

This cumulative impacts analysis is prepared in accordance with the Washington State Environmental Policy Act (SEPA) (Chapter 43.21C Revised Code of Washington [RCW]), the SEPA Rules (Chapter 197-11-060 Washington Administrative Code [WAC]), and the SEPA Handbook.

Additional guidance developed by the Council on Environmental Quality (CEQ) in the handbook entitled *Considering Cumulative Effects under the National Environmental Policy Act* (1997) was also considered where SEPA requirements are consistent with requirements of the National Environmental Policy Act (NEPA).

6.4 What methods were used to analyze cumulative impacts?

The resource-specific methods and assumptions described in the respective resource sections of Chapter 3, *Affected Environment, Impacts, and Mitigation*, Chapter 4*, Environmental Health and Safety,* and Chapter 5, *Extended Rail and Vessel Transport,* were used for the cumulative impacts analysis. The cumulative impact analysis took the following approach.

- Addressed the resources with the potential to be affected by the proposed action as discussed in Chapter 3, *Affected Environment, Impacts, and Mitigation*; Chapter 4, *Environmental Health and Safety*; and Chapter 5, *Extended Rail and Vessel Transport*.
- Considered other actions in relation to the geographic scope of the proposed action.
- Considered other actions in relation to the temporal period of the proposed action.
- Relied on the best available data at the time of the analysis.
- Reached conclusions based on known regulations at the time of the analysis.

The boundaries for the cumulative impacts analysis were based on the geographic location of the proposed action and are described for each resource area. The analysis considered regional influences and activities, and the projected lifespan of the proposed project activities. The geographic extent of the cumulative impacts analysis area is described for each resource in Section 6.5, *What cumulative impacts were identified?* The cumulative impacts analysis period is 2017 to 2037.

This analysis considers the impacts on the environment resulting from the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future

actions regardless of what agency (federal, state, local) or person (private citizen, nongovernment organization, corporation) undertakes the other actions. This analysis considers other actions that could affect the human or natural environment similar to the proposed action and that could add to the impacts of the proposed action.

6.4.1 Past and Present Actions

The following past and present actions have contributed to the existing condition of resources in at the project site, in Grays Harbor, and along the PS&P rail line.

- **Prior industrial development at the Port of Grays Harbor (Port) and ongoing terminal operations.** The Port owns four deepwater marine terminal facilities and provides services including pilotage, ship assistance, line handling and terminal stevedoring, and onsite cargo storage. The Port's terminals are supported by large, paved, secured cargo yards, the Port's own on-dock rail system, and more than 104,000 square feet of on-dock covered storage. The marine terminal rail system includes more than 50,000 feet of rail looping through the marina terminal complex (WorleyParsons 2014). A network of local roads with some collector and arterial roads provides access to the Port's terminal facilities.
- **Prior development of transportation infrastructure (roadways and rail lines) and ongoing maintenance of that infrastructure.** The terminal rail system connects to the PS&P main line, owned by Genesee and Wyoming, Inc. The PS&P short line, Class III railroad, connects to the BNSF Railway Company (BNSF) main line, a Class I railroad, in Centralia. The PS&P rail line can also connect to the Union Pacific main line in Centralia (WorleyParsons 2014). The PS&P rail line was constructed between 1889 and 1896. It currently moves products and materials for 30 industries.
- **Prior development of infrastructure for harbor navigation and ongoing maintenance of that infrastructure**. Grays Harbor is a tidal estuary with jetties at the entrance. The two jetties were originally constructed from 1889 to 1913 for harbor navigation. Other aids to navigation include a deepwater navigation channel (Grays Harbor Navigation Channel), turning basins, and anchorage areas for shallow and deep-draft vessels (WorleyParsons 2014). The navigation channel, anchorage areas, and turning basins are maintained by the U.S. Army Corps of Engineers (USACE) through periodic maintenance dredging.

6.4.2 Ongoing and Reasonably Foreseeable Future Actions

Requests for information on any planned infrastructure or construction projects scheduled to occur between 2017 and 2037 were sent to the Cities of Oakville, McLeary, Elma, Montesano, Hoquiam, and Aberdeen. In addition, Thurston County, Lewis County, Grays Harbor County, including the Grays Harbor Council of Governments, Cowlitz-Wahkiakum Council of Governments PS&P, the Port, the Quinault Indian Nation, and the Chehalis Tribe were also contacted. The following plans and elements were reviewed for this analysis.

- Cowlitz-Wahkiakum Council of Governments Metropolitan and Regional Transportation Improvement Programs 2015–2018 (August 2014)
- Grays Harbor Council of Governments 2013 Annual Report
- Cowlitz-Wahkiakum Council of Governments Fiscal Year 2013 Annual Report (July 1, 2012 to June 30, 2013); Southwest Washington Regional Transportation Planning Organization

- Washington State 2010–2013 Freight Rail Plan (December 2009)
- Cowlitz-Wahkiakum Council of Governments Metropolitan and Regional Transportation Plan 2009–2029 (November 2009)
- City of Hoquiam Comprehensive Land Use Plan (February 2009)
- Grays Harbor Council of Governments US 101 Regional Circulation Project – Final Report (January 2007)

Based on information gathered from the sources above, Table 6-1 lists future actions that could contribute to cumulative impacts on resources analyzed for the proposed action. The locations of these projects are show in Figure 6-1.

Figure 6-1. Cumulative Projects

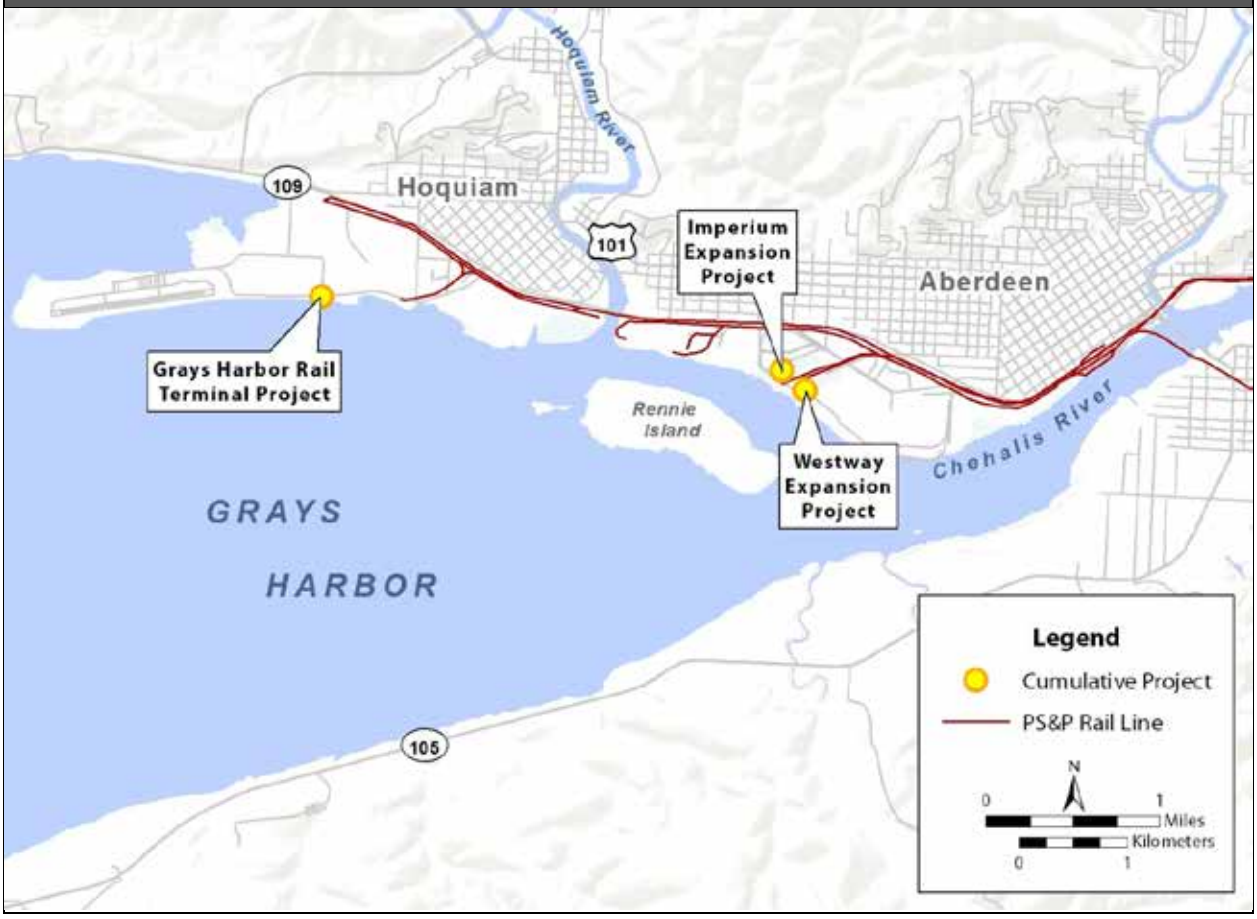

Table 6-1. Reasonably Foreseeable Future Actions Contributing to Cumulative Impacts

Project	Proponent	Location	Description	Contributing Activity	Schedule
Westway Expansion Project	Westway Terminal Company LLC	Port of Grays Harbor, Terminal 1	Westway Terminal Company LLC is proposing to expand the existing bulk liquids terminal to handle and store crude oil. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 458 (loaded and unloaded) trips per year and vessel traffic in Grays Harbor by approximately 238 vessel trips per year.	Construction is anticipated to start in 2016 if permits are issued.
Imperium Expansion Project	Imperium Terminal Services LLC	Port of Grays Harbor, Terminal 1	Imperium Terminal Services LLC is proposing to expand the existing bulk liquids terminal to handle and store crude oil, ethanol, naphtha, gasoline, vacuum gas oil, jet fuel, no. 2 fuel oil, no. 6 fuel oil, kerosene, renewable jet fuel, renewable diesel, used cooking oil, and animal fat, in addition to currently permitted liquids, including biodiesel, petroleum diesel, vegetable oil, and methanol. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 730 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 400 vessel trips per year.	Construction is anticipated to start in 2016 if permits are issued.
Grays Harbor Rail Terminal Project	USD Group LLC	Port of Grays Harbor, Terminal 3	USD Group LLC is proposing to construct a new bulk liquids terminal to handle and store crude oil. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 365 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 120 vessel trips per year.	Construction is anticipated to begin within the next 2 years if permits are issued.

Project	Proponent	Location	Description	Contributing Activity	Schedule
Grays Harbor Navigation Improve-ment Project[a]	U.S. Army Corps of Engineers	Grays Harbor Navigation Channel	The project would deepen the navigation channel to 38 feet mean lower low water between the South reach and Cows Point reach.	Upon completion of channel deepening, the limiting design depth for the transit of large commercial vessels between the Bar Reach and Port terminals would be 38 feet mean lower low water.	Dredging for channel deepening is currently proposed to occur between 2016 and 2017.

[a] The Navigation Improvement Project would also contribute to cumulative impacts on vessel traffic.

Operations related to the Grays Harbor Navigation Improvement Project were considered in the development of vessel traffic projections related to the baseline or no-action alternative evaluated in this Draft EIS. For these reasons, the analysis of cumulative impacts focuses on cumulative impacts associated with construction and operation of the three projects proposed for development at the Port: the proposed action, the Westway Terminal Company LLC Expansion Project (Westway project), and Grays Harbor Rail Terminal project. These three projects are referred to as the cumulative projects.

Tables 6-2 and 6-3 summarize the rail and vessel traffic associated with the reasonably foreseeable future actions contributing to cumulative impacts of the cumulative projects.

Table 6-2. Rail Traffic for Reasonably Foreseeable Future Actions

	Rail Trips		
Project	**Daily**	**Weekly**	**Annual**
Westway Project	1.25	8.75	458
Imperium Project	2	14	730
Grays Harbor Rail Terminal Project	1	7	365
Total Rail Trips	**4.25**	**29.75**	**1,553**

Table 6-3. Vessel Traffic for Reasonably Foreseeable Future Actions

	Vessel Calls			Vessel Trips		
Project	**Daily**	**Weekly**	**Annual**	**Daily**	**Weekly**	**Annual**
Westway Project	0.3	2.3	119	0.7	4.6	238
Imperium Project	0.5	3.8	200	1.1	7.7	400
Grays Harbor Rail Terminal Project	0.2	1.2	60	0.3	2.3	120
Total Vessel Trips	**1.0**	**7.3**	**379**	**2.1**	**14.6**	**758**

6.5 What cumulative impacts were identified?

This section addresses the cumulative impacts on air, noise and vibration, tribal resources, rail traffic, vehicle traffic and safety, vessel traffic, and environmental health and safety that could result from the cumulative projects. This section also addresses potential cumulative impacts in the extended study area.

6.5.1 Air

This section discusses potential cumulative impacts on air that would result from construction and operation of the cumulative projects.

6.5.1.1 Study Area

The cumulative impacts study area for air includes Grays Harbor County where emissions from onsite operations would occur and where the majority of emissions related to offsite rail transport on the PS&P rail line and vessel transport in Grays Harbor would occur. Possible greenhouse gas (GHG) emissions associated with operations, rail and vessel transport, and combustion are considered.

6.5.1.2 Cumulative Impacts

The following section describes the criteria pollutants, toxic air pollutants, and GHG emissions that could result from the construction and routine operation of the cumulative projects

Criteria Pollutants

As presented in Chapter 3, Section 3.2, *Air*, air pollutants resulting from the proposed action are not anticipated to approach levels defined by the National Ambient Air Quality Standards (NAAQS). Although increased nitrogen oxide (NO_X) emissions during onsite operations of the proposed action would not exceed the NAAQS, the emissions are analyzed under a scenario where all cumulative projects perform activities at the same time.

The maximum cumulative nitrogen dioxide (NO_2) concentrations would occur if the following actions occurred simultaneously.

- The applicant is loading a vessel at the terminal while operating the vapor combustion unit at maximum capacity.
- Westway Terminal Company LLC is unloading crude oil from a unit train.
- USD Group LLC is loading crude oil at Terminal 3 and unloading a unit train.

Under these circumstances, the highest concentration of 1-hour NO_2 could occur resulting in an increase of NO_2 concentration that would slightly exceed the 1-hour NO_2 standard.[1] The 1-hour

[1] The maximum 1-hour NO_2 modeled concentration from the combined total from all three facilities would be about 145 micrograms per cubic meter of air (µg/m^3) (81 µg/m^3 for the Westway project, 14 µg/m^3 for the Imperium project, and 50 µg/m^3 for the Grays Harbor Rail Terminal project). Adding the maximum ambient 1-

NO_2 standard is 188 micrograms per cubic meter of air (μg/m^3), and the total NO_2 concentration based on the above scenario is 190 μg/m^3 of air. A violation of the NO_2 standard would not likely occur for the following reasons.

- The standard requires that the 3-year average of NO_2 be exceeded.[2]
- The analysis conservatively assumed a high percentage of NO_2 converted.[3]
- All of the mobile source activity as previously described would have to occur simultaneously during meteorological conditions that have the poorest dispersion conditions (i.e., very low wind speeds and a strong temperature inversion).
- The maximum 1-hour background concentration would need to occur simultaneously.

Additionally, incorporation of the mitigation described in in Section 6.5.1.3, *Mitigation Measures*, would further reduce the risks of exceeding applicable air quality standards.

Toxic Air Pollutants

Air dispersion modeling of diesel particulate matter (DPM) was conducted using the U.S. Environmental Protection Agency (EPA) AERMOD dispersion model[4] for rail activities between Poynor Yard and the three project sites.

Figures 6-2and 6-3 show the average increased inhalation cancer risk from DPM in 2017 and 2037[5] under cumulative conditions by illustrating the 100-per-million and 10-per-million risk levels. The air quality sensitive receptors[6] within these risk levels are also shown.

Under WAC 173-460, Controls of New Sources of Toxic Air Pollutants, Washington State Department of Ecology (Ecology) may recommend approval for a stationary source project that is likely to cause an exceedance of acceptable source impact levels for one or more toxic air pollutants if it is demonstrated that the increase in emissions of toxic air pollutants (such as DPM) would not likely result in an increased cancer risk of more than 10 in 1 million. However, this regulation only applies to stationary sources, not mobile sources such as rail locomotives. There are no local or state regulations for DPM emissions from mobile sources. For this reason, the 10-per-1-million risk level is not a threshold to determine significance of the impact. However, to provide context of the average increased inhalation cancer risk from DPM, the 10-per-million risk level is shown in Figures 6-2 and 6-3. For project-level impacts, EPA would

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hour NO_2 background concentrations of 45 μg/m^3, the total concentration would be 190 μg/m^3. The 1-hour NO_2 standard under NAAQS is 188 μg/m^3.

[2] The standard requires that the 3-year average of the 98th percentile of the daily 1-hour maximum not be exceeded.

[3] The modeling conservatively assumed that 80% of the emitted NO_x is converted to NO_2. It is unlikely that this high percentage of emitted NO_x is converted to NO_2 over the short travel distances where the maximum concentration is predicted to occur.

[4] AERMOD is a dispersion model recommended by EPA for estimating the impact of industrial sources of emissions on ambient air quality.

[5] Years 2017 and 2037 were modeled to assess the risk from DPM emissions over time because locomotives that emit less DPM than in 2017 will be in operation by 2037. The analysis assumes maximum throughput capacity in 2017 and 2037.

[6] A facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses.

typically urge action to mitigate the increased risk of exposure at the 100-per-million risk level. Therefore, the 100-per-million risk level is also shown in Figures 6-2 and 6-3.

The analysis indicates if all cumulative projects are operating at maximum throughput, the 100-per-million-and-above risk level from rail operations would be limited to the project sites and the Westway project site in 2017 and 2037.

In 2017, the 10-per-million risk level from rail operations would extend from east of Poynor Yard to west of the Imperium project site. As shown in Figure 6-2, some residential land uses are within the 10-per-million risk level west and north of the PS&P rail line. Three sensitive receptors (West End Playfield, 28th Street Landing, and Viewing Tower) (Chapter 3, Section 3.2, *Air*), are also located within the 10-per-million risk level.

By 2037, the 10-per-million risk level is smaller and limited to the industrial area around the Westway and Imperium project sites, and around Poynor Yard (Figure 6-3). A portion of residential area and the 28th Street Landing and Viewing Tower could fall within the 10-per-million risk level north of the PS&P rail line. The risks are less compared to 2017 because the analysis considers that more efficient locomotives would be used by this time. As discussed in Section 3.2, *Air*, implementation of applicant mitigation measures would help to reduce these risks (Section 6.5.13, *Mitigation Measures*).

Figure 6-2. Average Cumulative Diesel Particulate Matter Inhalation Cancer Risk (2017)

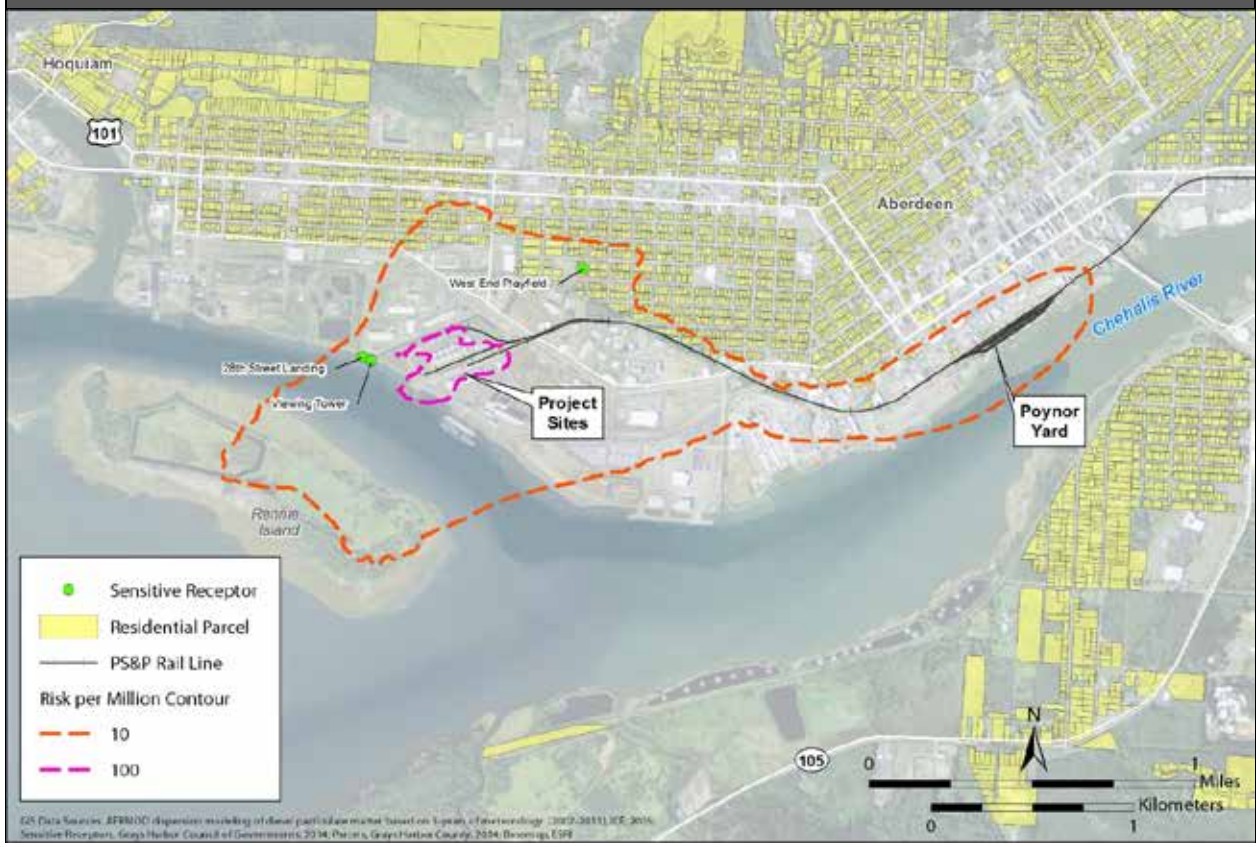
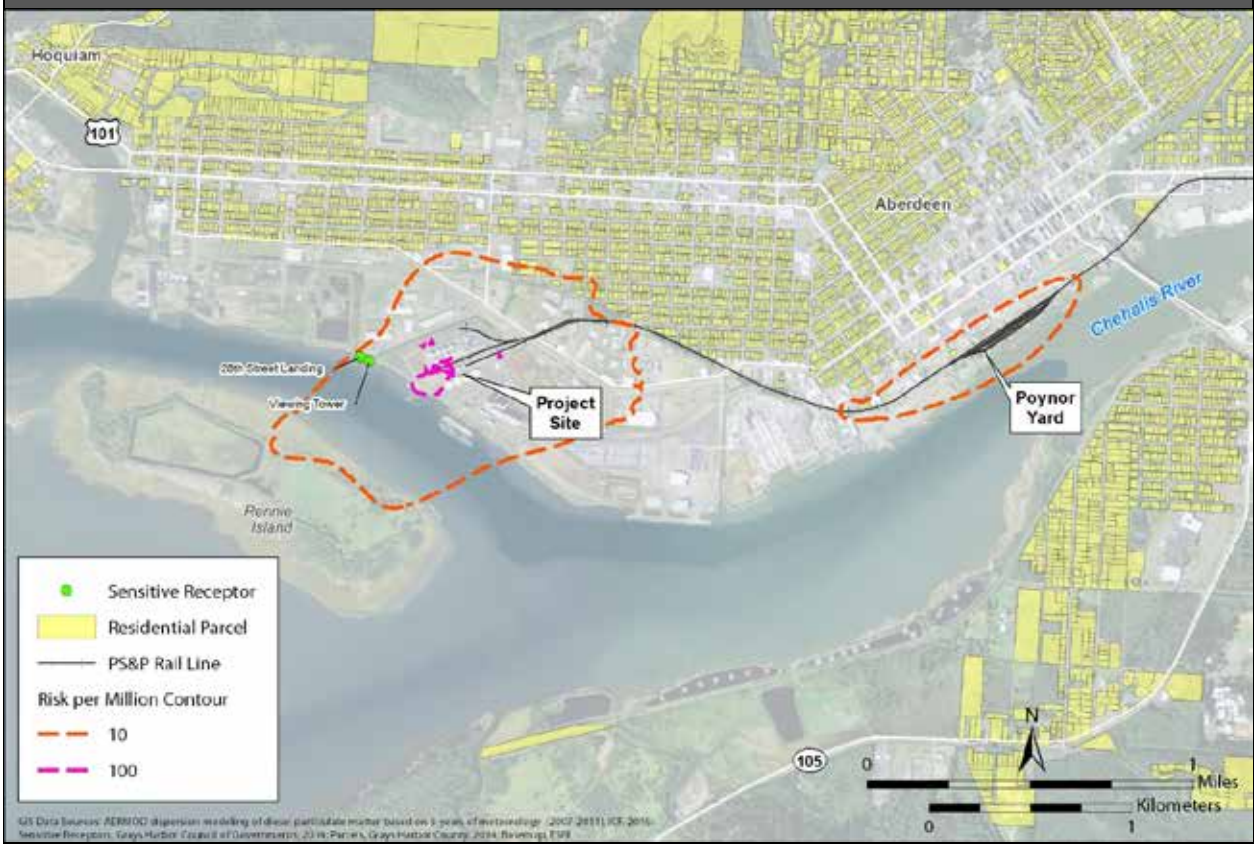


Figure 6-3. Average Cumulative Diesel Particulate Matter Inhalation Cancer Risk (2037)



Greenhouse Gas Emissions

The cumulative GHG emissions from transportation of crude oil and other products to and from the cumulative project sites, as well as operation of the facilities themselves, are presented in Table 6-4. Table 6-4 shows the additional annual GHG emissions associated with operations of the cumulative projects, including the GHG emissions from transport of the bulk liquids through the state. The largest contribution of GHG emissions would result from rail transport and represents an increase of approximately 7.8% in the statewide rail emissions of GHGs. Overall GHG emissions related to operation of the proposed action represent about a 0.11% increase in statewide GHG emissions. The statewide GHG emissions include sources of GHG emissions in Washington State.

Table 6-4. Annual Average GHG Emissions Compared to Statewide 2011 GHG Emissions ($MTCO_2e$/year)

Source Type	Washington State[a]	Westway Project	Imperium Project	Grays Harbor Rail Terminal Project	Total	Increase (%)
Rail	1,000,000	25,532[b]	35,709[b]	16,646[b]	77,887	7.79
Marine vessels	3,300,000	783[c]	1,417[c]	2,394[c]	4,594	0.14
Industrial sources (project site)	3,700,000	4,052[d,e]	6,634[d,f]	10,586[d,g]	21,272	0.57
Total	**91,700,000**	**30,367**	**43,760**	**29,645**	**103,753**	**0.11**

[a] Washington State Department of Ecology 2014a
[b] Rail transport throughout the state; includes on-site rail emissions.
[c] Includes emissions from vessels hoteling at the Terminal 1 dock (i.e., on-site vessel emissions).
[d] On-site stationary sources
[e] Trinity Consultants 2015a
[f] Trinity Consultants 2015b
[g] HDR Engineering, Inc. 2014
$MTCO_2e$ = metric tons of carbon dioxide equivalent

World Resources Institute maintains an online database of global GHG emissions that is developed using a consistent method to estimate emissions for the key GHGs. It is based on inventory data provided by EPA, the U.S. Department of Energy, the Food, and Agriculture Organization of the United Nations, and the International Energy Agency. In 2011, global emissions were estimated to be 43,372.71 million metric tons of carbon dioxide equivalent emissions (CO_2e)[7] and U.S. emissions were estimated to be 6,550.10 million metric tons of CO_2e (World Resources Institute 2014). In 2011, Ecology reported that Washington State contributed 91.7 million metric tons of CO_2e, a decrease from the peak of 101.6 million metric tons in 2007 (Washington State Department of Ecology 2014a).

GHG emissions from the cumulative projects would represent approximately 0.1% of total Washington State emissions. Revised Code of Washington (RCW) 70.235.020, sets the following GHG statutory reduction levels.

- By 2020, reductions to 1990 emission levels.
- By 2035, reductions to 25% below 1990 levels.
- By 2050, reductions to 50% below 1990 levels or 70% below the state's expected emissions that year.

[7] Carbon dioxide equivalent (CO_2e) is a metric used to compare the emissions of the different greenhouse gases based on their global warming potential. It represents the amount of carbon dioxide emission that would cause the same integrated radiative forcing, over a given time horizon, as an emitted amount of a greenhouse gas or a mixture of greenhouse gases. The equivalent carbon dioxide emission is obtained by multiplying the emission of a greenhouse gas by its global warming potential for the given time horizon (Intergovernmental Panel on Climate Change 2013).

In order to meet these reductions, Washington State must reduce emissions to 88.4 million metric tons per year by 2020, 66.3 million metric tons by 2035, and approximately 44.2 million metric tons by 2050.[8] The GHG emissions from the cumulative projects would be approximately 0.23% of Washington State's statutory reductions of 44.2 million metric tons of CO_2e per year (half of the 1990 level) by 2050.

In November 2014, the United States entered into a nonbinding agreement with China to reduce emissions 26 to 28% below 2005 levels (White House 2014). This national goal translates to annual emissions between 4,628 and 4, 756 million metric tons by 2025. The GHG emissions from the cumulative projects would represent approximately 0.002% of these national targets.

According to the International Panel on Climate Change, cumulative GHG emissions should be limited to 1 trillion metric tons (total) by 2050 or the planet will exceed the 2°C warming threshold. Currently, the amount of GHGs that have been emitted worldwide since the Industrial Age is estimated to be 592 billion metric tons (Oxford E-Research Center 2015). Cumulative worldwide emissions must be limited to 408 billion metric tons to meet the 2050 target. Emissions from the cumulative projects would constitute 0.00003% of this limit.

The end use of the products handled by the facilities would also result in CO_2 emissions. Different products produce different amounts of $C0_2$. Table 6-5 illustrates the different CO_2 emission factors associated with the combustion of the products that could be shipped through the facilities. The analysis used EPA's average heat content of crude oil of 5.80 million British thermal units (Btu) per barrel (U.S. Environmental Protection Agency 2013) and the highest emissions factor[9] for the product likely to be handled by the facilities[10] listed in Table 6-5. This determined the maximum amount of CO_2 emissions from end use of products shipped through the proposed facilities in a given year is 26,494,153 metric tons of CO_2 per year (Westway project is 6,272,352 metric tons of CO_2 per year, Imperium project is 13,067,400 metric tons of CO_2 per year, and Grays Harbor Rail Terminal project is 7,154,401 metric tons CO_2 per year).

[8] Total emissions needed to reach the Washington State statutory reductions were calculated based on the required reduction from the most recently available statewide inventory of 91.7 $MMTCO_2e$ in 2011. (Washington State Department of Ecology 2014).

[9] The emissions factor represents the number of kg of CO_2 that would be emitted for each million Btu of a given product.

[10] Kerosene has the highest emission factor but crude oil is expected to be the main product handled by all three facilities.

Table 6-5. Estimated CO_2 Emissions Factors for Oil Combustion

State or Condition	Products	CO_2 Emissions Factors (kg CO_2 per mmBtu)
Refined	Gasoline	70.22
	Kerosene	75.20
	Naptha	68.02
	Jet fuels	72.22
	No. 2 fuel oil (diesel oil)	73.96
	No.6 fuel oil (bunker c oil)	75.10
	Vacuum gas oil	73.00 (Estimate)
Unrefined	Bakken crude oil[a]	73.96
	Diluted bitumen[b]	75.10
Non-Petroleum Fuels		
Pure (unblended)	Ethanol	68.44
Can be composed of 20–80% of plant-based fuel	Renewable jet fuel	72.22 (Estimate)
Can be composed of 20–80% of plant-based fuel	Renewable diesel	73.84
Variable composition	Used cooking oil/animal fat	71.06

Source: U.S. Environmental Protection Agency 2013
[a] Emissions factor for no. 2 fuel oil was used for Bakken crude oil.
[b] Emissions factor for no. 6 residual fuel oil was used for diluted bitumen.
kg CO_2 per mmBtu = kilograms of carbon dioxide per million British thermal units.

Whether the cumulative projects result in an increase in GHG emissions relative to the no-action alternative depends on speculative factors. For example, the relative contribution of the cumulative projects to the net change in CO_2 emissions would depend on whether the cumulative projects result in increased demand for crude oil or displace other crude oil consumed by end users (which depends, in part, on the source and final destination of the oil), what type of crude oil is being transported (i.e., which emissions factors are used), and what the end use is (e.g., combustion, development of other products).

The analysis made the following assumptions to calculate the maximum potential amount of GHG emissions related to combustion.

- The entire amount of crude oil to be handled by the cumulative projects facilities would be additive (would not be substituting for other sources of crude oil).
- The oil would be diluted bitumen (highest emission factor).
- The end use for the entire amount would be combustion.

However, it anticipated that the majority of crude oil to be handled and stored at the proposed facilities would come from domestic sources (e.g., Bakken crude oil). This crude oil can only be transported to U.S. refineries, which are limited in capacity by law. Therefore, this oil would replace oil currently used in U.S. refineries and there would be no net increase in overall emissions. Although diluted bitumen was used for the analysis. Bakken oil would most likely be the main product handled by the facility. Because it has a lower emissions factor, it would generate fewer emissions. While most of the crude oil is likely to be refined into products used

for combustion, some final products, such as asphalt would not be combusted so the emissions would be less.

As noted above, it is expected that much of the crude oil transported to the facilities would replace crude oil that was previously transported by tank vessel, mostly from Alaska. In the Marine & Rail Oil Transportation Study, Ecology stated the following.

> …historically, 90% of crude oil bound for Washington's refineries was delivered here by tank ship from Alaska or from other international sources of oil. Today pipeline and rail delivery of crude oil make up more than 30% of our imports, while vessel delivery is reduced to less than 70%. Crude oil transportation is rapidly shifting to delivery by rail and pipeline (Washington State Department of Ecology 2014b).

Also, based on market demand, crude oil may be refined into multiple products that may or may not have significant GHG emissions (e.g., asphalt is not combusted and is a crude oil product). This analysis assumes that all of the oil would be refined into fuel and combusted, which likely overstates total GHG emissions from the cumulative projects. Even if the proposed facilities are not built, additional GHG emissions from end use may still occur over the analysis period because the product could be transported to another facility for domestic use or export.

Because of these factors, the GHG emissions related to combustion represent the maximum potential increase in GHG emissions. This increase is dependent on the specific market conditions, end use of the product, and properties of the oil. The net GHG emissions could be considerably lower.

Regardless of the end-use emissions scenario, the cumulative projects would not have an impact on the crude oil market in the United States. In 2013, 7.45 million barrels of crude oil were produced in the United States, and 7.72 million barrels of crude oil were imported every day. Together, this equals 15.17 million barrels of crude oil supplied to the United States every day (U.S. Energy Information Administration 2015). The total amount of oil transported by the cumulative projects would be 176,110 barrels per day (Table 6-6) or 1.2% of the U.S. daily crude oil supply. Because of this small volume, the cumulative projects would not likely affect the crude oil market.

Table 6-6. Proposed Daily Throughput Compared to National Average—Cumulative Projects

Proposed Project	Daily throughput (barrels per day)	Daily US Crude Oil Supply (percent [%] of 15.17 million barrels per day)
Westway Project	48,918	0.3%
Imperium Project (for all tanks)	82,192	0.5%
Grays Harbor Rail Terminal Project	45,000	0.3%
Total	**176,110**	**1.2%**

Climate Change

GHG emissions from the cumulative projects would contribute to global GHG emissions, which contribute to climate change. This section describes the projected impacts of climate change in the Pacific Northwest.

Earth's climate is primarily controlled by the balance of incoming energy from the sun and reflected energy from the Earth's surface. Heat and light from the sun is either reflected or absorbed by the Earth's surface and its atmosphere. GHGs (carbon dioxide, methane, nitrous oxide, water vapor, ozone, and hydrofluorocarbons) can trap outbound radiation in the Earth's atmosphere. GHGs are released through natural sources, such as CO_2 emitted from aerobic respiration or organic decomposition. GHGs are also released as a result of human activities, such as the combustion of fossil fuels, industrial processes, land use change, deforestation, agricultural production, solvent use, and waste management.

The *Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report* states the warming of the global climate system is unequivocal, and each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. Additionally, from 1880 to 2012, the globally averaged, combined land and ocean surface temperature data show a warming of 0.85°C, or 1.5°F (Intergovernmental Panel on Climate Change 2013). This warming has coincided with increased concentrations of GHGs in the Earth's atmosphere.

The Intergovernmental Panel on Climate Change, the National Research Council, and the U.S. Global Change Research Program have concluded that it is extremely likely (a 95 to 100% chance) that global increases in atmospheric GHG concentrations and global temperatures are caused by human activities. Washington State's Climate Impacts Group has researched the potential impacts of climate change in the Pacific Northwest and concluded that there will be substantial impacts by the middle of the 21st century (Climate Impacts Group 2015). Changes to temperature, precipitation, and sea level are predicted (Mote et al. 2014). Observed and projected increases in temperatures, shifts in precipitation, and changes in flood patterns reflect regional patterns across Idaho, Oregon, and Washington. Changes in sea-level rise are localized to the Oregon and Washington coasts.

An increase in the overall temperature of the Earth causes large-scale changes throughout the Earth's climate system, including higher sea levels, changes in precipitation, and altered weather patterns (e.g., an increase in more extreme weather events). These changes affect the natural and built environment and humans.

Ocean acidification is also a result of increasing levels of CO_2. The Earth's oceans absorb excess CO_2 from the atmosphere, making seawater more acidic. More acidic waters threaten Washington State's shellfish industry and tribal resources and could affect the marine foodweb. Ocean acidity is increasing at a faster rate than predicted, and this increase may reduce the ability of oysters and other species to form shells (Washington State Blue Ribbon Panel on Ocean Acidification 2012).

Temperatures across the region increased by 1.3°F during the 1895 to 2011 period (Kunkel et al. 2013 in Mote et al. 2014). Temperatures are projected to continue increasing with average annual temperatures increasing 3.3 to 9.7°F[11] by the end of the century compared to the 1970 to 1999 period (Mote et al. 2014).

From 1895 to 2011, there has not been a statistically significant change in annual precipitation across the Northwest. However, the variability of annual precipitation has increased since 1976

[11] The range reflects changes projected under the lower (B1) and higher (A2) emissions scenarios, as defined by the Intergovernmental Panel on Climate Change *Special Report on Emissions Scenarios (SRES)*.

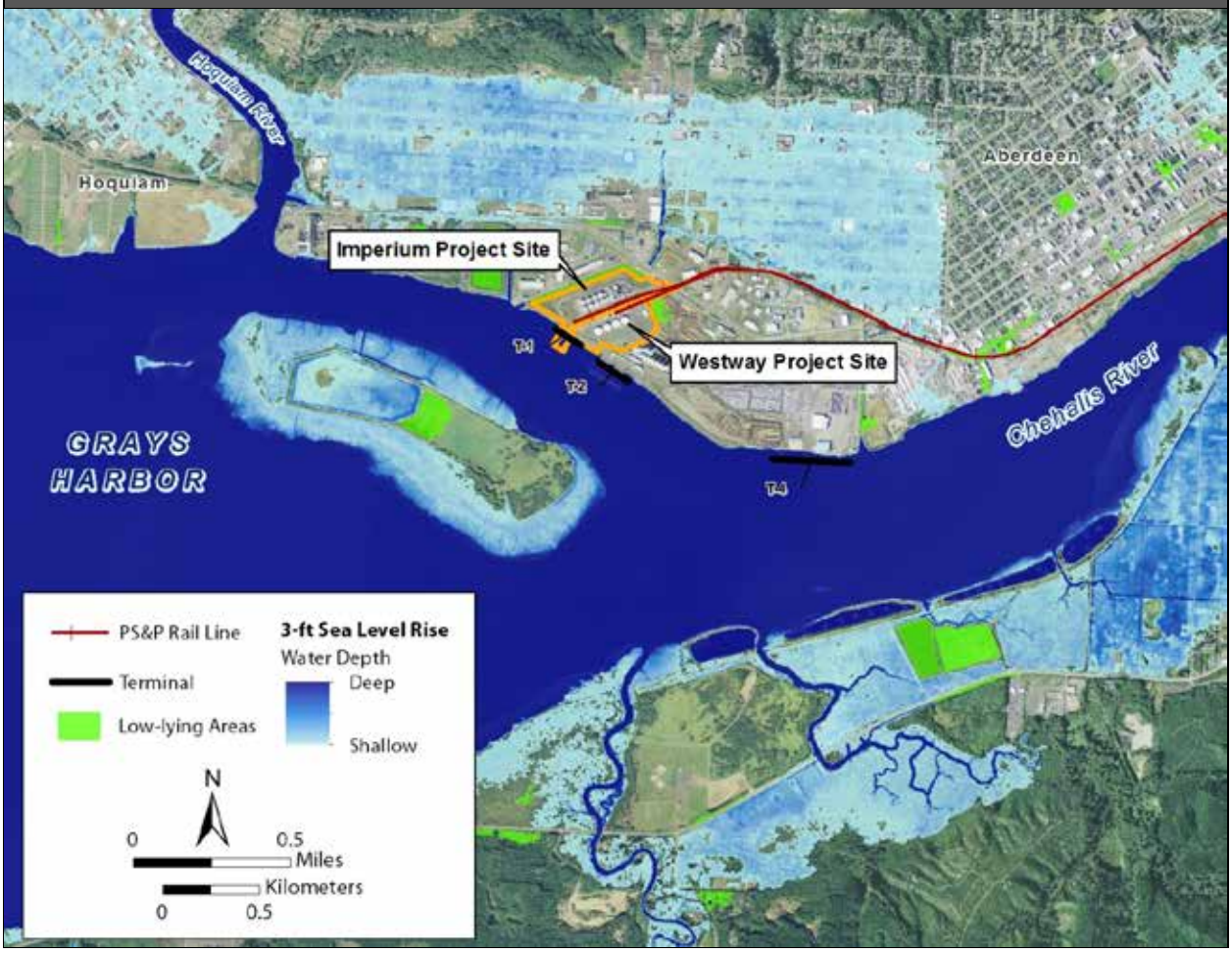
compared to the previous 75 years (Kunkel et al. 2013). Similarly, projected changes in precipitation are less certain with climate and various emissions futures resulting in a range of wetter and drier future conditions. Plausible futures range from an 11% decrease to a 12% increase in annual average precipitation by mid-century (Mote et al. 2014).[12] Seasonal shifts, such as a wetter spring and dryer summer, could be obscured by annual averages. An increase in heavy downpours may result in an increase in flood risk in rain-snow and rain-dominant basins (Mote et al. 2014), which could lead to greater flooding from the Chehalis, Humptulips, Wynoochee, and Wishkah Rivers because they originate in primarily rain-dominant basins.

As global temperatures rise, the oceans warm and expand, and ice caps and glaciers melt. This causes sea levels to rise. Global sea level has risen about 7 inches during the 20th century and is projected to rise at a higher rate in the future (National Research Council 2012).

The analysis period for the cumulative projects is 2017 to 2037. Sea level rise along the Washington, Oregon, and California coasts is projected to increase 24 inches by the end of the 21st century with projections ranging up to 9 inches (0.75 feet) of sea level rise by 2030 (National Research Council 2012).[13] Intensifying coastal storms could increase the likelihood of more severe coastal flooding and erosion (Dalton et al. 2013); however, as shown in Figure 6-4, even with a conservative estimate of 3 feet of sea-level rise, floods are not expected to affect the proposed facilities.

[12] Increase is relative to the 1970 to 1999 average and based on an ensemble of projections from 21 climate models and the low (B1) and high (A2) emissions scenarios.
[13] The National Research Council 2012 report provides a projection (a single estimate) and a range (high and low estimate) of projections for 2030, 2050, and 2100.

Figure 6-4. Sea-Level Rise and Coast Flooding Impacts in the Study Area



Source: National Ocean and Atmospheric Administration 2015

6.5.1.3 Mitigation Measures

The incremental increase in air emissions related to the cumulative projects could result in a slight exceedance of NAAQS threshold for NO_X, increases in DPM, and increased GHG emissions. Implementation of the applicant mitigation measures identified in Section 3.2, *Air*, and repeated below, would also help to offset cumulative impacts.

- The applicant will ensure that all engine-powered equipment and vehicles used in construction, operation, and maintenance at the facility are subject to a regular inspection and maintenance schedule in order to minimize air pollutant emissions, GHG emissions, and fuel consumption. Preventive maintenance activities will include but not be limited to the following actions.
  - Replacing oil and oil filters as recommended by manufacturer instructions.
  - Maintaining proper tire pressure in on-road vehicles.
  - Replacing of worn or end-of-life parts.
  - Scheduling routine equipment service checks.

- The applicant will develop and implement an anti-idling policy for both construction and operation and ensure that equipment operators receive training on best practices for reducing fuel consumption in order to reduce project-related GHG emissions. The anti-idling policy will include required warmup periods for equipment and prohibit idling beyond these periods. The policy will define any exemptions where idling is permitted for safety or operational reasons, such as when ambient temperatures are below levels required for reliable operation. In addition, the use of technologies such as idle management systems or automatic shutdown features will be considered part of the policy.
- To identify NO_X emissions if the Westway, Imperium, and Grays Harbor Rail Terminal Projects are approved, the applicant will ensure air monitoring stations are installed to monitor the NO_2 emissions at or near the facility prior to the third proposed facility beginning operations. Air monitoring reports will be submitted to Olympic Region Clean Air Agency annually. If levels are observed to be approaching the NAAQS then additional measures could be required in the agency's air permit.
- To monitor DPM emissions associated with rail operations at and near the project site, the applicant will ensure a DPM monitoring station is installed prior to beginning operations. The applicant will ensure the DPM emission report is submitted to the City of Hoquiam annually. The City of Hoquiam will coordinate with the City of Aberdeen, Ecology, and the Olympic Region Clean Air Agency as applicable, to review the emission report. If DPM emissions are observed to approach levels of concern for sensitive receptors, then the City of Hoquiam will require the applicant to modify operations to reduce DPM emissions. These actions could include the following.
  - Modifying or reducing switching operations between Poynor Yard and the project site to reduce DPM emissions during switching operations.
  - Installing a commercial idle control retrofit device on switching locomotives to reduce DPM emissions from idling.
  - Using Tier 3 or Tier 4 compliant[14] switching engines at Poynor Yard.
- To reduce GHG emissions, DPM, and other air pollutants from the locomotives, idling will be minimized to the maximum extent practicable. Shutting down locomotive engines as soon as practicable when not in use and delaying restart until necessary for car switching or departure from the facility would reduce these pollutants.
- To minimize idling from trains and vessels and resulting emissions, the applicant will coordinate with the Port and PS&P to manage waiting times for rail and vessel arrivals or departures.

6.5.1.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in increased air emissions, most notably of NO_2 and DPM. Compliance with the applicable regulations along with implementation of the mitigation measures described above would reduce cumulative impacts on air quality. There would be no unavoidable and significant adverse cumulative impacts.

[14] These refer to standards for implementing EPA's program to improve locomotive efficiency to reduce emission of particulate matter and nitrous oxides.

6.5.2 Noise and Vibration

This section discusses potential cumulative impacts on noise that would result from construction and operation of the cumulative projects.

Based on the analysis in Chapter 3, Section 3.7, *Noise and Vibration*, the proposed action would have negligible onsite noise and vibration impacts from construction or routine operations at the project site and during vessel transport. The noise and vibration would be similar to levels generated by other industrial activities in the Port. For this reason, only the potential cumulative impacts on noise from rail operations are discussed in this section.

6.5.2.1 Study Area

The cumulative impacts study area for noise includes areas that could be affected by increased noise related to rail transport on the PS&P rail line.

6.5.2.2 Cumulative Impacts

The following section describes the noise impacts that could result from the routine operation of the cumulative projects.

The cumulative projects would increase train traffic on the PS&P rail line by 4.25 trips per day. As described in Chapter 3, Section 3.7, *Noise and Vibration*, Federal Railroad Agency/Federal Transit Administration guidance manual (FRA/FTA Manual) methods use the day-night sound level (L_{dn}) to evaluate potential noise impacts with rail projects.[15] Because L_{dn} measures the average sound level over a 24-hour period, the addition of an average of 4.25 trips operating daily on the PS&P rail line would increase the average noise level along the PS&P rail line. This means that more people along the PS&P rail line would experience rail noise more frequently because more trains would be operating on the rail line and the average noise level would increase. In addition, the distance from the PS&P rail line within which sensitive receptors would be exposed to noise increases that meet FRA/FTA criteria for noise impacts[16] would also increase.

Table 6-7 presents the number and general location of noise-sensitive receptors that would be exposed to increased rail traffic noise from the cumulative projects on the PS&P rail line. Based on the analysis, cumulative rail traffic would increase wayside noise. Approximately 78 receptors would be exposed to noise increases that meet the FRA/FTA criteria for moderate impacts,[17] primarily in the Elma-Satsop and west of Montesano/east of Aberdeen areas. Approximately 10 receptors would be exposed to higher noise increases that meet the FRA/FTA criteria for severe impacts,[18] all at PS&P rail line grade crossings[19] in Elma (North 11th Street, North 13th Street, and North 17th Street).

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[15] This is a 24-hour average noise level (in A-weighted decibels [dBA]) with a 10-decibel upward adjustment of noise levels occurring at night. This adjustment is made to account for most individuals' increased sensitivity to noise at night.

[16] See Chapter 3, Section 3.7, *Noise and Vibration*, for the FRA/FTA criteria.

[17] The change in the noise level would be noticeable to most people but may not be enough to cause strong adverse community reactions. For more information, see Section 3.7, *Noise and Vibration*.

[18] A significant percentage of people would be highly annoyed by the noise. For more information, see Section 3.7, *Noise and Vibration*.

[19] Throughout this chapter, *grade crossings* refer to at-grade crossings on the PS&P rail line.

Table 6-7. Estimated Counts of Sensitive Receptors Exposed to Increased Noise on the PS&P Rail Line—Cumulative Projects

Analysis Segment	Location	Grade Crossings[a]	Number of Grade Crossings	General Land Use Characteristics	Horn		Wayside	
					Moderate Impact[b]	Severe Impact[b]	Moderate Impact[b]	Severe Impact[b]
A	Centralia	1–8	8	Higher-density single family residential and commercial	143	0	0	0
B	Unincorporated Centralia, Rochester (south of US 12)	9–20	12	Single-family residential and commercial	47	15	1	0
C	Rochester (between US 12 and Littlerock Road SW)	21–24	4	Single-family residential and commercial	18	4	3	0
D	Rochester (west of Littlerock Road SW)	25–30	6	Single-family residential and commercial	23	5	0	0
E	Oakville	31–42	12	Lower-density single-family residential and commercial	41	3	0	0
F	Malone-Porter	43–54	12	Lower-density single-family residential	81	26	8	0
G	Elma-Satsop	55–72	18	Medium-density single-family residential	268	148	32	10
H	Montesano	73–84	12	Medium-density single-family residential	44	16	0	0
I	West of Montesano/east of Aberdeen	85–92	8	Medium-density single-family residential	45	27	34	0
J	Aberdeen	93–103	11	Single-family residential and commercial	46	9	0	0
Total					**756**	**253**	**78**	**10**

Notes:
[a] See Chapter 3, Figure 3.7-2, for the location of grade crossings.
[b] As defined by FRA/FTA criteria. For more information, see Chapter 3, Section 3.7, *Noise and Vibration*.

The most substantial potential for increased noise would occur from locomotive train horns sounding at grade crossings for public safety. Based on the analysis, noise exposure would occur near grade crossings along the PS&P rail line with the highest increases in the Elma-Satsop area. In total, approximately 756 receptors along the PS&P rail line would be exposed to increased noise from locomotive train horns that would meet the FRA/FTA criteria for moderate impacts at 83 grade crossings. This includes the eight grade crossings in Centralia that have high levels of existing surface transportation noise exposure. Rail traffic noise from the cumulative projects would add to the existing high levels of noise exposure.

Approximately 253 additional receptors would be exposed to increased noise that would meet the FRA/FTA criteria for severe impacts. These receptors are near 51 grade crossings along the rail line, with a majority (approximately 148 receptors) in the Elma-Satsop area.

Table 6-8 illustrates the grade crossings exposed to the highest noise increases from train horn noise. For information on noise increases at all grade crossings, see Appendix G, *Noise Data*.

Table 6-8. Grade Crossings with the Most Sensitive Receptors Exposed to the Highest Noise Levels from Train Horns[a]

Grade Crossing[a]	Grade Crossing Description	Location	Number of Receptors
55	North 2nd Streets	Elma	32
61	North 11th Street	Elma	24
62	North 13th Street	Elma	20
91	Private Crossing	Central Park	14
58	North 6th Street	Elma	14
85	Country Farm Road	Montesano	12
63	North 17th Street	Elma	10
65	Hurd Road	Satsop	10
60	North 10th Street	Elma	8
73	Old Monte Brady Road	Brady	6
45	Private Crossing	Malone-Porter	6
59	North 9th Street	Elma	6
57	North 5th Street	Elma	6

[a] Between 1 and 4 sensitive receptors would be exposed to the highest increase in train horn noise at 38 other grade crossings.
[b] See Chapter 3, Figure 3.7-2, for the location of grade crossings.

As described in Chapter 3, Section 3.7, *Noise and Vibration*, the relative impacts from exposure to increased noise would depend on the existing noise level. As the existing level of noise exposure increases, the additional noise exposure needed to cause a higher-magnitude impact decrease. On average, potentially affected receptors would generally experience an average increase in noise exposure over the course of any given day. However, it is not possible to predict when trains would be traveling along the PS&P rail line. All trains would travel at the same speed as existing trains, and would continue to sound horns consistent with existing operational practices. Sensitive receptors would experience train horns sounding more frequently because an additional 4.25 trips would operate on the PS&P rail line.

6.5.2.3 Mitigation Measures

Rail traffic from the cumulative projects would substantially increase noise along the PS&P rail line. As described Section Chapter 3, Section 3.7, *Noise and Vibration*, railroad noise is exempt from Washington State and local noise limits; however, implementation of the measures identified in Section 3.7, *Noise and Vibration*, and repeated below, would also reduce cumulative impacts.

- To reduce construction noise at nearby sensitive receptors, the applicant will maintain construction and maintenance equipment in good working order with properly functioning mufflers to control noise.
- To address increased noise from rail traffic, the applicant will coordinate with PS&P and interested communities along the PS&P rail line on the creation of quiet zones, if requested. Elimination of locomotive horn sounding at the affected grade crossings would eliminate and not just reduce increased horn noise. Quiet zones can only be established by public agencies using a procedure established in FRA regulations. This may include installation of enhanced safety measures at grade crossings such that sounding train horns would not be required. Implementation of a quiet zone is subject to FRA approval. Quiet zones include measures to maintain the level of safety while reducing noise.

6.5.2.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in increased rail traffic that could cause substantial increases in noise along the PS&P rail line, depending on the specific location. This could result in noise increases that meet the FRA/FTA criteria for severe impacts on sensitive receptors. These increases represent approximately 263 total receptors and up to approximately 32 receptors affected at any one grade crossing. These severe noise impacts would be from train horn noise for public safety at approximately 253 receptors, and from train wayside noise at approximately 10 receptors. In Centralia, the cumulative projects would add noise to an existing noisy environment and cause moderate impacts per FRA/FTA criteria. Mitigation described above would reduce cumulative noise impacts. However, as long as train horns continue to sound for safety at the grade crossings, the potential for exposure to significant adverse noise impacts would remain.

6.5.3 Tribal Resources

This section discusses potential cumulative impacts on tribal resources that would result from construction and operation of the cumulative projects.

6.5.3.1 Study Area

The cumulative impacts study area for tribal resources consists of tribal resources near the project sites that could be affected by construction and routine operations of the cumulative projects. The cumulative study area also includes tribal resources that could be affected during routine rail transport along the PS&P rail line and routine vessel transport through the Grays Harbor Navigation Channel.

6.5.3.2 Cumulative Impacts

The following section describes the potential impacts on tribal resources that could result from the construction and routine operation of the cumulative projects. The potential for increased risks of

larger spills and related environmental consequences are addressed in Chapter 4, *Environmental Health and Safety*.

Construction

As noted in Section Chapter 3, Section 3.12, *Tribal Resources*, the proposed action would be required to comply with water and air quality standards consistent with the permits described in Section 3.12. Therefore, construction of the proposed action would not likely result in the cumulatively substantial degradation of tribal resources.

Onsite Operations

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources if operations were to degrade or limit access to resources used by the tribes, including the plants and fisheries described in Section 3.12. As described in Chapter 3, Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals*, leaks and spills of petrochemicals from routine rail operations and associated maintenance already pose risks at the existing site. The risks would increase under the proposed action because of increased rail trips and facility operations. However, the potential increase of small spills would be slightly greater than under the no-action alternative, and is not expected to have any measurable impact on tribal resources, including water quality, aquatic habitat, or animals. Cumulative risks of incidents[20] are addressed Section 6.5.7, *Environmental Health and Safety*.

As further noted in Section 3.12, *Tribal Resources*, onsite routine operations would involve vessel-loading activities that would increase the occupancy of the Terminal 1 berth, which is a usual and accustomed fishing area of the Quinault Indian Nation fishers. Currently, tribal fishers deploy gillnets and drift with the tide, taking turns sweeping through segments of Grays Harbor that typically extend as far as Cosmopolis to the Crossover Channel Reach of the navigation channel (Chapter 3, Figure 3.12-1). This area includes the portion of the navigation channel in front of the Terminal 1 berth. Depending on its size, a docked vessel would occupy approximately 20 to 25% of the width of the channel.[21] While a vessel is at berth, fishers cannot extend fishing nets as far and cannot access the areas nearest the dock structure where fish are reported to concentrate (Quinault Indian Nation 2015: Exhibit E). When a vessel is docked, fishers must either shorten the duration of their drift to stop as they near the vessel or move farther out into the navigation channel to avoid the vessel. Lighting impacts from nighttime transfer operations may also affect fish behavior and harvest.

The most intensive fishing at the dock area is during the fall salmon management period from September to mid-November, when several fishing vessels may deploy drift gillnets near the Terminal 1 berth. Quinault Indian Nation fishers may also fish the area during other times of the year, deploying gillnets for winter steelhead and white sturgeon in spring and summer.

[20] *Incidents* refer to oil spills, explosions, or fires.

[21] The typical 550-class tank barge is approximately 600 feet long and a maximum of 78 feet wide and is assisted by a tug that is approximately 127 feet long and a maximum of 42 feet wide. A Panamax-class tanker has a maximum overall length of 950 feet and a maximum width of approximately 106 feet.

Cumulative vessel calls to Terminal 1 at maximum throughput would occupy the berth a maximum of 363 days per year[22] (Section 6.5.6, *Vessel Traffic*). During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery may be open 2 to 4 days per week. Assuming a 24-hour maximum berth occupancy and vessels evenly dispersed over the allowed harvest times, it is likely a vessel would be at the dock during a substantial portion of the fishery season. However, the potential of these vessels to affect treaty catch is dependent on how fish are distributed across the navigation channel relative to the remaining channel area available to treaty fishers.

Salmon concentrate next to the dock along Terminal 4 (Quinault Indian Nation 2015: Exhibit E); however, the navigation channel is narrower at Terminal 1 and salmon may be distributed differently at this location compared to the wider channel and adjacent shallow areas leading to the south channel at Terminal 4. Migration patterns of salmon in estuaries and rivers are complex. Hinch and Rand (2000) found evidence to suggest sockeye salmon were efficient at finding small reverse-flow vortices to increase swimming efficiencies during upstream migration. Generally, upstream-migrating salmon avoid fast water by swimming near the shore and near the bottom (Quinn 2005:80). Hughes (2004) hypothesized that Chinook salmon migrate further from the bank than sockeye to avoid wave drag caused by swimming close to the surface in shallow waters. However, all species may distribute similarly in the dredged and tidally influenced navigation channel.

Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open tribal fishing season, distribution of the fish, number of fishers on any given day), it is difficult to predict whether increased occupancy at Terminal 1 would substantially affect the tribe's usual ability to fish. While vessels could occupy the berth up to 100% of the time during the fall fishery, Quinault Indian Nation fishers would not have the option to fish along the dock. Fishers could have access to fish at other locations in Grays Harbor (such as other portions of the navigation channel, farther away from the shoreline or farther upstream), although opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers.

Docked vessels at other times of the year would likely have less impact because fewer fishers are participating in fish harvest. Fishers would, therefore, likely have more options to adjust their fishing efforts to other areas in Grays Harbor and the Chehalis River.

Rail

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources along the PS&P rail line if rail operations were to degrade or limit access to resources used by the tribes, including the plants and fisheries described in Section 3.12. Because operation of the proposed action would be required to comply with water and air quality standards consistent with the permits described in Chapter 3, routine rail operations related to the proposed action would not likely result in the cumulatively substantial degradation of tribal resources. Cumulative risks of incidents are addressed in Section 6.5.7, *Environmental Health and Safety*. Additionally, as discussed in Section 3.12, access to tribal resources along the PS&P rail line would not be affected by rail operations related to the proposed action.

[22] Assumes all vessels are tank barges with a maximum 24-hour berth occupancy.

Vessel

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources in Grays Harbor if vessel operations were to degrade or limit access to resources used by the tribes, including the plants and fisheries described in Section 3.12. Because operation of the proposed action would be required to comply with water and air quality standards consistent with the permits described in Chapter 3, routine vessel operations related to the proposed action would not likely result in the cumulatively substantial degradation of tribal resources. Cumulative risks of incidents are addressed in Section 6.5.7, *Environmental Health and Safety*.

As further noted in Section 3.12, vessel operations could disrupt access to usual and accustomed fishing areas if there are fishers in the navigation channel when a vessel is traveling to and from the project site. If the cumulative projects are approved, the number of vessels traveling in the navigation channel through usual and accustomed fishing areas would increase further compared to the existing conditions.[23]

Operation of the cumulative projects at maximum throughput would result in a maximum additional 758 tank vessel trips[24] per year through the navigation channel. These vessel trips would be added to an average[25] of 373 annual trips by tank and cargo vessels[26] associated with ongoing operations at the Port terminals (Section 6.5.6, *Vessel Traffic*). The total maximum vessel trips would be 1,180 when considering both the existing and the cumulative projects.

Because cumulative vessel traffic would be limited to the navigation channel (Chapter 3, Section 3.17, *Vessel Traffic*), impacts on tribal resources in Grays Harbor but outside the navigation channel are not expected. The cumulative projects would use Terminals 1 and 3, and would not affect drift and set-net gillnet fishers operating east of Terminal 1 and the turning basin, in the south channel near Markham, and in Area 2C (Chapter 3, Figure 3.17-5). Crab fishing grounds in Grays Harbor are outside of the navigation channel and access to those areas would not be affected by the increase in vessel traffic. Resources important to the Chehalis would also not be affected, because all tribal fishing occurs within the Chehalis Reservation.

Cumulative vessel trips would be most likely to conflict with tribal fishing during the fall salmon management period, when more fishers typically deploy drift gillnets in the navigation channel from the Crossover Channel Reach to the turning basin. During peak periods of the fall fishery, up to nine boats may be actively fishing this area and two to four fishers with nets deployed at one time (Quinault Indian Nation 2015:10). Increased vessel traffic would increase the chance that a vessel travelling through this area would disrupt tribal fishing.

As described in Section 3.17, *Vessel Traffic*, it takes approximately 2 hours for vessels to transit the navigation channel between the entrance buoy and Terminal 1. Favorable transit times for vessels related to the proposed action are close to high tide. Quinault Indian Nation fishers currently choose

[23] As noted in Chapter 3, Section 3.16, *Vessel Traffic*, the analysis in this Draft EIS considers the potential growth in vessel traffic unrelated to the proposed action over the 20-year analysis period (2017 to 2037). Projected traffic increases were based on growth rates used in the Grays Harbor Channel Deepening Project.
[24] A trip represents one-way travel.
[25] Annual average estimate over the 20-year analysis period.
[26] Tank vessels carry bulk liquids and consist of self-propelled tankers and tank barges. Cargo vessels carry grain, wood, and other dry projects. They consist of self-propelled cargo ships, cargo barges that require an escort tug, and RoRo vessels (roll-on/roll-off) that carry wheeled vehicles.

the high slack tide period for salmon drift gillnetting. Assuming the vessel is between the Crossover Channel Reach of the navigation channel and Terminal 1 for approximately half of the 2-hour transit time, including docking and undocking maneuvers, a vessel trip could disrupt fishing for a 1-hour period.

Transiting vessels related to the cumulative projects would affect (limit) the timing, duration, and physical area that could be fished. Depending on the specific circumstances of the interaction, this could affect the volume of a day's catch. Fishers may be able to compensate for lost fishing time by retrieving their net and motoring back to the start of the drift area; however, depending on factors such as the time of day and number of other fishers, it may not be practical to do so and the disruption could equate to lost fishing opportunities.

Cumulative vessel trips by large commercial vessels[27] are forecast to average 3.2 vessel trips per day over 20-year analysis period (Section 6.5.6, *Vessel Traffic*) compared to 1.1 trips per day without the cumulative projects. As described in Chapter 3, Section 3.17, *Vessel Traffic*, a vessel trip could disrupt fishing for a 1-hour period.[28] When a vessel is traveling through the area, tribal fishers would either avoid the area entirely (fish elsewhere) or cut their drifts short (pull the nets in sooner) to avoid conflicts with vessels. Fishers would continue to need to monitor radio communications for inbound and outbound vessel traffic and be prepared to retrieve fishing gear when a vessel is transiting the area. Under cumulative conditions, the potential for a 1-hour disruption could occur up to two more times on average per day.

Depending on the specific circumstances of the interaction, cumulative vessel trips could affect (limit) the timing, duration, and physical area that could be fished, which has the potential to affect the volume of a day's catch. Fishers may be able to compensate for lost fishing time by retrieving their net and motoring back to the start of the drift area; however, depending on factors such as the time of day and number of other fishers, it may not be practical to do so and the disruption could equate to lost fishing opportunities. Although it is difficult to predict whether the increased vessel traffic would result in an overall inability to meet the tribe's seasonal quota, increased traffic would limit access to usual and accustomed fishing areas with a greater potential to do so under cumulative conditions.

Increased vessel trips could also reduce access to the Quinault Indian Nation's ocean crab and marine fisheries by limiting the times when tribal fishers can cross the bar at the mouth of Grays Harbor and limiting access to the navigation channel, which tribal fishers prefer to use when transporting catch into the harbor. Although laden tank vessels are anticipated to transit out of the harbor during high tide, inbound vessels in ballast could transit the navigation channel at any time. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides. It is likely this disruption would not be substantial because smaller Quinault Indian Nation fishing vessels would be able to maneuver around and avoid the transiting tanker vessels.

Quinault Indian Nation fishers participating in the Dungeness crab fishery inside Grays Harbor would not be affected by cumulative vessel trips because they operate outside the navigation channel and monitor marine communications to avoid larger vessels when transiting to fishing grounds.

[27] The term *large commercial vessels* refers collectively to tank and cargo vessels.

[28] The following navigation rules (Inland Navigation Rules, Rules 9, 13, and 18) apply to the navigation channel.

6.5.3.3 Mitigation Measures

Implementation of the applicant mitigation measures identified in Section 3.12, *Tribal Resources*, and repeated below, would reduce cumulative impacts.

- To mitigate potential impacts on tribal fishing, the applicant will coordinate with the Quinault Indian Nation and Washington Department of Fish and Wildlife, as requested, to support review and possible adjustments of docking schedules to minimize conflict with fishing schedules negotiated preseason by the state and tribe. Consultation will account for operations, including anticipated vessel movements related to the proposed action.
- While tribal fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project related vessel traffic arrivals and departures over a designated very high frequency (VHF) marine radio channel.
- To mitigate impacts on access to tribal treaty fishing areas, the applicant will initiate a process between stakeholders and Quinault Indian Nation tribal officials to discuss and identify additional mitigation measures such as, the adjusting the timing of vessel calls during peak fishing seasons. Initiation of the process between the parties will occur before the proposed vessel operations begin.

6.5.3.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would affect tribal resources. Implementation of the mitigation measures described above would reduce but may not eliminate impacts on tribal resources. More specifically, vessels related to the proposed action would travel through usual and accustomed fishing areas in Grays Harbor. Under current and future conditions, increased vessel traffic could restrict access to tribal fishing areas in the navigation channel or at Terminal 1. This conflict is most likely to occur for fishing related to harvest of salmon, steelhead, and sturgeon. Because other factors besides vessel operations affect fishing opportunities, such as the number of fishers, fish distribution, timing, and duration of fish windows, the extent to which vessel operations related to the proposed action would affect tribal fishing is difficult to quantify. No mitigation measures would completely eliminate the possibility of impacts to fishing resources as a result of vessel operations related to the proposed action.

6.5.4 Rail Traffic

This section discusses potential cumulative impacts on rail traffic that would result from construction and operation of the cumulative projects.

6.5.4.1 Study Area

The cumulative impacts study area for rail traffic consists of the PS&P rail line between Centralia and the project sites, including the PS&P junction with the BNSF main line in Centralia that could be affected during rail transport.

6.5.4.2 Cumulative Impacts

The following section describes the rail traffic, capacity, and grade-crossing occupancy impacts that could result from the routine operation of the cumulative projects. Cumulative impacts are not anticipated for construction of the cumulative projects.

Rail Traffic

Cumulative rail traffic from the cumulative projects, including baseline rail traffic, would equal approximately 7.35 trips[29] per day and 2,788 trips annually on the PS&P rail line. Table 6-9 summarizes the anticipated trips for the cumulative projects.

Table 6-9. Average Unit Train[a] Trips—Cumulative Projects

Project	Daily	Weekly	Annual
Westway Project	1.25	8.75	458
Imperium Project	2	14	730
Grays Harbor Rail Terminal Project	1	7	365
Existing traffic	3.1	23.8	1,235
Total	**7.35**	**53.5**	**2,788**

[a] Assumes 120-car unit trains (1.25 miles in length).

Capacity for Additional Trains

Based on simulation modeling (Chapter 3, Section 3.15, *Rail Traffic*), the PS&P rail line currently has the capacity to handle up to 12 trips per day, although, as with the existing traffic, delays along the rail line may occur. Current rail traffic along the PS&P rail line is approximately 3 trips per day. The addition of approximately 4.25 trips per day between Centralia and the project site can be accommodated without any improvements to the existing rail line.

Grade-Crossing Occupancy Times

Increased rail traffic along the PS&P rail line related to the cumulative projects would increase how often trains delay traffic at grade crossings (grade-crossing occupancy times).

The far-right column of Table 6-10 lists the average daily grade-crossing occupancy time at selected grade crossings between Centralia and east Aberdeen for all rail traffic (existing trains and trains from the cumulative projects) compared to the no-action alternative. These grade crossings are among those with the highest average daily traffic in the rail corridor (the other grade crossings are in Aberdeen).

[29] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Table 6-10. Average Daily Occupancy Time [a] at Selected Grade Crossings between Centralia and East Aberdeen—Cumulative Projects

Grade Crossing	Milepost	Location	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	26 minutes	1 hour 8 minutes
Pearl Street (SR 507)	0.89	Centralia	26 minutes	1 hour 8 minutes
West Reynolds Street	2.14	Centralia	17 minutes	53 minutes
Old Highway 99 SW	6.07	Unincorporated Thurston County	8 minutes	30 minutes
Monte Elma Road	51.98	Satsop	7 minutes	23minutes

[a] Occupancy times rounded to the nearest minute.

As described in Section 3.15, *Rail Traffic*, train occupancy times are most severe in Aberdeen due to switching operations related to Poynor Yard. Table 6-11 illustrates the maximum daily occupancy times for all trains (existing trains from the cumulative projects) compared to the no-action alternative at selected grade crossings in Aberdeen.

Table 6-11. Maximum Daily Occupancy Time[a] at Selected Grade Crossings in Aberdeen—Cumulative Projects

Grade Crossing	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Fleet Street	37 minutes	45 minutes
East Heron Street	44 minutes	52 minutes
Port Industrial Road	9 minutes	58 minutes
West 1st Street	7 minutes	1 hour 7 minutes
Industrial Road	13 minutes	1 hour 17 minutes

[a] Occupancy times rounded to the nearest minute.

Unit train trips would increase the maximum train occupancy times at all grade crossings in Aberdeen. For example, the maximum train occupancy time at West 1st Street would increase by 1 hour. The increase in occupancy times at the grade crossings east of Poynor Yard would be from switching operations to build up departing trains at and east of the Poynor Yard. The increase in train occupancy times at the grade crossings west of Poynor Yard would be from arriving trains and switching operations to break down trains at the west of Poynor Yard.

Unit train trips for the cumulative projects would also increase the frequency of trains occupying grade crossings in Aberdeen. Table 6-12 illustrates the average daily train occupancy time at selected grade crossing for all trains (existing trains and trains from the cumulative projects). Appendix L, *Vehicle Traffic Analysis*, provides the daily occupancy time at all grade crossings.

Table 6-12. Average Daily Train Occupancy Time[a] at Selected Grade Crossings

Grade Crossing	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Fleet Street	49 minutes	2 hours 38 minutes
East Heron Street	1 hour 10 minutes	3 hours 16 minutes
Port Industrial Road	14 minutes	1 hour 58 minutes
West 1st Street	17 minutes	2 hours 19 minutes
Industrial Road	43 minutes	3 hours 23 minutes

[a] Occupancy times rounded to the nearest minute.

The additional trains from the cumulative projects would substantially increase the average daily occupancy at grade crossings in Aberdeen. For example, the average daily train occupancy time at the East Heron Street grade crossing is currently 1 hour and 10 minutes from grain, auto, and mixed carload freight trains. With existing trains and additional trains from the cumulative projects, the average daily train occupancy time at East Heron Street would increase to 3 hours and 16 minutes.

6.5.4.3 Mitigation Measures

Impacts on rail traffic resulting from the cumulative projects are considered low and would not necessitate mitigation beyond the minimum requirements specified by applicable laws and regulations. Section 3.16, *Vehicle Traffic and Safety*, addresses mitigation measures for vehicle delay impacts at grade crossings. Chapter 4, *Environmental Health and Safety*, addresses rail safety mitigation measures.

6.5.4.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in an increase in blocked grade crossings; however, there would be sufficient capacity to accommodate this increase in rail traffic. There would be no unavoidable and significant adverse impacts. Mitigation to address vehicle traffic and safety impacts from increased rail traffic is addressed in Section 3.16, *Vehicle Traffic and Safety*.

6.5.5 Vehicle Traffic and Safety

This section discusses potential cumulative impacts on vehicle traffic and safety that would result from construction and operation of the cumulative projects.

6.5.5.1 Study Area

The cumulative impacts study area for vehicle traffic and safety consists of the roadways and intersections near the project sites that could be affected by increased vehicle traffic from construction and operation of the cumulative projects. The study area also includes grade crossings between Hoquiam and Centralia that could be affected by increased rail traffic.

6.5.5.2 Cumulative Impacts

The following section describes the vehicle traffic and safety impacts that could result from the construction and routine operation of the cumulative projects.

Onsite Construction and Operations

Construction and operation of the cumulative projects would generate traffic to and from each project site during construction. The estimated daily construction vehicle trips generated for the Westway project and Imperium project are presented in Table 6-13. The Grays Harbor Rail Terminal project operations would also generate vehicle trips on area roadways. However, the project site is located at Terminal 3 approximately 3 miles to the west of the Imperium and Westway project sites. Any Grays Harbor Rail Terminal project construction traffic in the Terminal 1 area including Industrial Road would have negligible impacts on vehicle delay.

Table 6-13. Estimated Daily Construction Vehicle Trips—Westway and Imperium Projects

Project	Estimated Number of Employees	Approximate Number of Vehicle Trips per Day
Westway Project		
Phase 1	86	172
Phase 2	49	98
Imperium Project		
Phase 1	76	152
Phase 2	110	220

Up to approximately 196 construction workers could access the project sites (Phase 1 of Westway project and Phase 2 of Imperium project). This would generate approximately 392 construction vehicle trips each day, or approximately 7% of the average daily traffic on Industrial Road. This increase in traffic would be temporary and limited to the construction period. Construction vehicles would park at or near the projects sites in the Port area and would not affect vehicle delay on Industrial Road.

After construction, approximately 160 trips would be generated daily at the project sites (approximately 100 trips with Westway project and 60 trips with Imperium project, assuming two trips per day per employee). This increase in employee vehicle trips would result in approximately 3% increase in average daily traffic on Industrial Road near the project sites. This increase is minimal compared to existing traffic conditions and would not result in a decrease to the level of service (LOS) designation on Industrial Road.

Rail

The following section describes vehicle traffic and safety impacts that could occur as a result of additional rail traffic from the cumulative projects.

Vehicle Delay

Rail traffic from the cumulative projects, including baseline train traffic, would equal approximately 25 trips per day, which would increase the number of train trips on the PS&P rail line by an average of approximately 4.25 trips per day. Motorists, including emergency vehicle operators, would experience delays and an increase in vehicle delay at grade crossings.

Average Vehicle Delay

Increased rail traffic along the PS&P rail line related to the cumulative projects would increase average vehicle delay. However, for the majority of the PS&P rail line grade crossings, the increase in blockage time would not result in a decline in the LOS because the average daily traffic for a majority of grade crossings is low. Sixty of the 81 public grade crossings have average daily traffic of fewer than 900 vehicles.

The approximate total vehicle delay in 2017 in a 24-hour period for grade crossings between west of Centralia and east of Aberdeen would vary from approximately 19 to 56 minutes daily, depending on the grade crossing, compared to 7 to 17 minutes under the no-action alternative. Therefore, the total blockage time at grade crossings due to the cumulative project trains would increase by approximately 12 to 39 minutes in a 24-hour period. Even though there would be an increase in total daily vehicle delay, an increase in train trips on the PS&P rail line would not substantially increase the average vehicle delay at most PS&P rail line grade crossings compared to the no-action alternative. This is because vehicle traffic along most of the PS&P rail line is relatively low and the chance of a substantial number of vehicles encountering a train would remain relatively low. In other words, most individual drivers would not likely notice a substantial change in delay at grade crossings.

However, the total blockage time would be greater in Centralia and Aberdeen. As shown in Table 6-10 in Section 6.5.4, *Rail Traffic*, the Tower Street and Pearl Street grade crossings in Centralia would be blocked for approximately 1 hour and 8 minutes each day compared to 26 minutes under the no-action alternative. Aberdeen would also experience increases in delay as shown in Table 6-11. For example, the Port Industrial Road grade crossing would be blocked for 1 hour and 58 minutes compared to 14 minutes under the no-action alternative.

Table 6-14 summarizes the average vehicle delay in 2017 at the grade crossings with the highest average daily traffic.[30] Appendix L, *Vehicle Traffic Analysis*, provides the average vehicle delay at all grade crossings in 2017. Because these grade crossings have the highest average daily traffic, vehicles at these crossings have the highest probability to experience vehicle delay.

[30] See Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, for the methods used to determine average vehicle delay and corresponding LOS.

Table 6-14. Level of Service (Average Vehicle Delay) at Selected Grade Crossings (2017)

Grade Crossing	Milepost	Location	Approximate 2017 Average Daily Traffic	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	8,025	A	B
Pearl Street (SR 507)	0.89	Centralia	13,755	A	B
West Reynolds Street	2.14	Centralia	6,380	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	10,160	A	A
Monte Elma Road	51.98	Satsop	4,770	A	A
Tyler Street	68.23	Aberdeen	4,050	B	F
South Chehalis Street	68.36	Aberdeen	4,905	C	F
Port Industrial Road	70.06	Aberdeen	17,845	A	D
West 1st Street	70.41	Aberdeen	4,625	A	E
Industrial Road	71.04	Aberdeen	5,795	B	F

As shown in Table 6-14, grade crossings in Aberdeen (Olympic Gateway Plaza area and the Port of Grays Harbor area) would experience the most substantial increase in average vehicle delay with the addition of cumulative project trains on the PS&P rail line. All grade crossings that would operate at or below LOS D in 2017 are in Aberdeen. These grade crossings are in two general areas.

- **Olympic Gateway Plaza area.** As illustrated in Figure 6-5, average vehicle delay would worsen at the Olympic Gateway Plaza compared to the no-action alternative. As described in Section 3.15, *Rail Traffic*, existing train-building activities at the Poynor Yard require eastbound trains to extend across the Wishkah River bridge and block grade crossings in the Olympic Gateway Plaza area. The additional trains from the cumulative projects would lengthen the average vehicle delay at these grade crossings. LOS at the East Heron Street and Newell Street grade crossings, the western-most grade crossings in the Olympic Gateway Plaza area, would degrade from LOS D to LOS F. The grade crossings east of Newell Street at the Olympic Gateway Plaza area would degrade from LOS B or C to LOS E or F.
- **Port of Grays Harbor area.** As illustrated in Figure 6-6, the West 1st Street, North Maple Street, and Industrial Road grade crossings would operate at LOS E or F. These grade crossings would operate at LOS A or B under the no-action alternative. The Port Industrial Road and West 1st Street grade crossings would operate at LOS D.

Figure 6-5. 2017 Cumulative Vehicle Delay at Selected Grade Crossings East of Poynor Yard

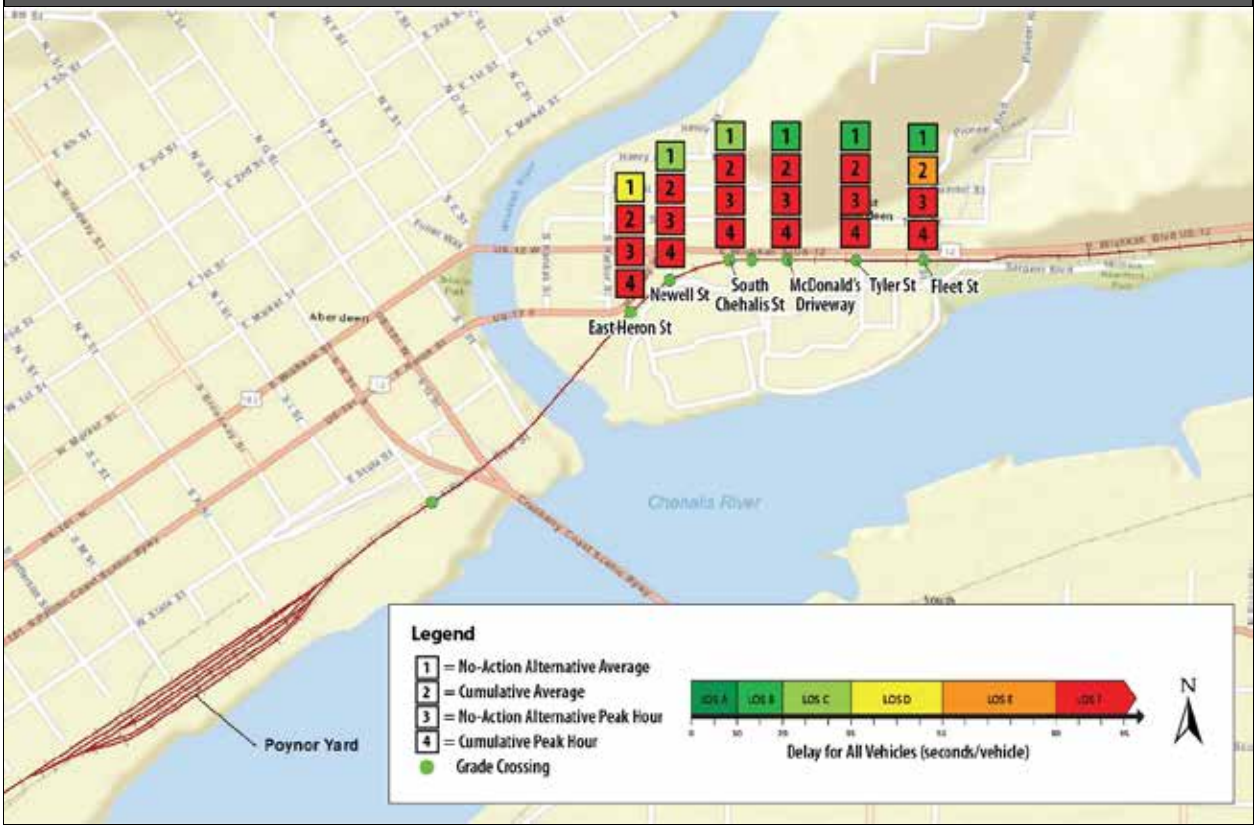
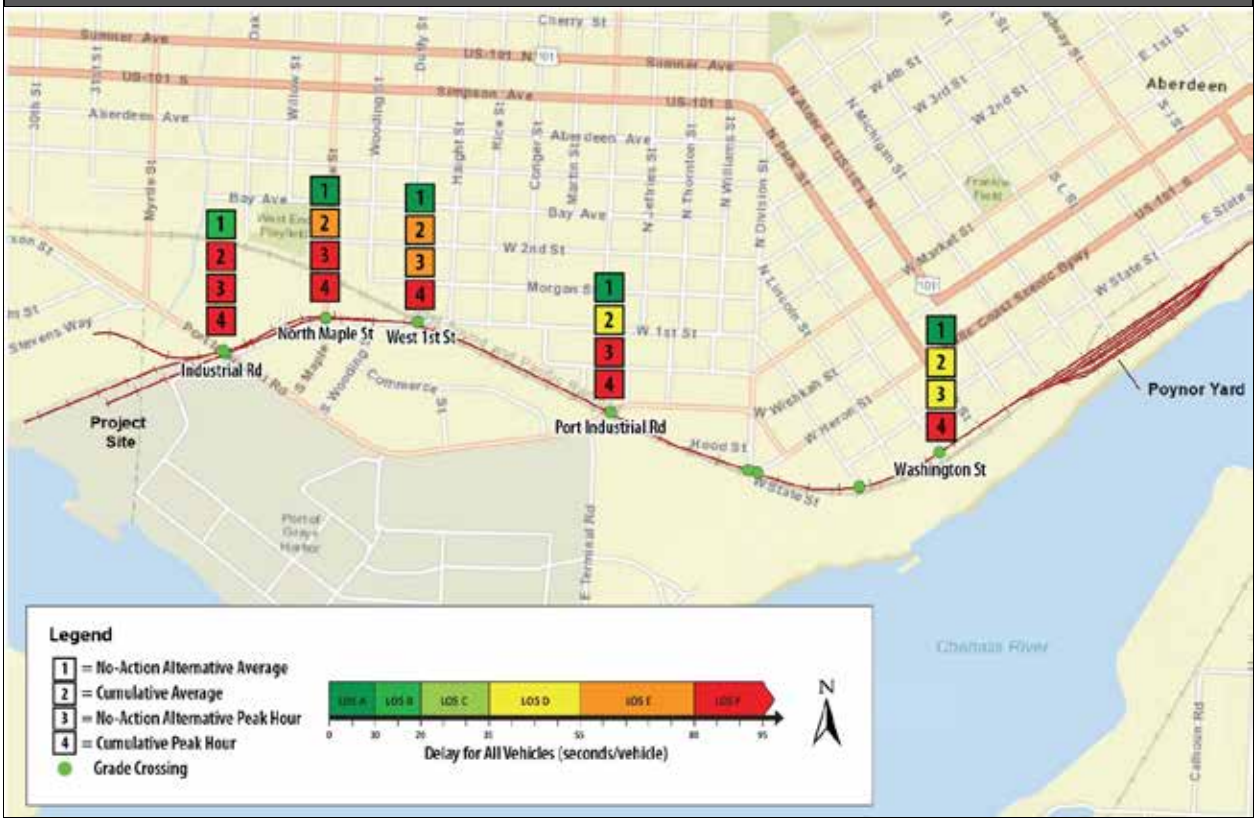


Figure 6-6. 2017 Cumulative Vehicle Delay at Selected PS&P Line Crossings West of Poynor Yard



As noted in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, this analysis represents a conservative analysis for the average vehicle in 2017 because the analysis is based on the following assumptions.

- **Maximum throughput.** The cumulative projects would begin full throughput operations of an average of 4.25 trips (maximum throughput) per day in 2017.
- **No trip diversion**. The vehicle delay analysis did not consider trip diversion (alternative routes for automobile traffic). Including trip diversion in the analysis would likely indicate shorter average vehicle delays at the Port area grade crossings because at some locations other routes would avoid crossing the PS&P rail line.
- **No planned rail infrastructure.** New infrastructure implemented in 2017 that could provide for increased train speeds (Chapter 3, Section 3.15, *Rail Traffic*) could reduce vehicle delay at grade crossings. Infrastructure improvements were not included in the analysis.
- **Most impactful switching operations for Imperium Project**. Switching operations for the Imperium projects assumes that PS&P would deliver rail cars to the project site in the most cost- and time-efficient manner. This method would increase the time that Imperium project trains would block the grade crossing between Poynor Yard and the Imperium project site.

Because the population is forecasted to grow, vehicle traffic volumes at the grade crossings will increase over time. Table 6-15 summarizes the predicted average vehicle delay at the grade crossings with the highest average daily traffic in 2037. Appendix L, *Vehicle Traffic Analysis*, provides the average vehicle delay at all grade crossings in 2037. Because these grade crossings have the

highest average daily traffic, vehicles at these grade crossings have the highest probability to experience vehicle delay at grade crossings.

Table 6-15. Level of Service (Average Vehicle Delay) at Selected Grade Crossings (2037)

Grade Crossing	Mile-post	Location	Approximate 2037 Average Daily Traffic	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	10,375	A	B
Pearl Street (SR 507)	0.89	Centralia	17,790	A	B
West Reynolds Street	2.14	Centralia	8,250	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	13,135	A	A
Monte Elma Road	51.98	Satsop	6,170	A	A
Tyler Street	68.23	Aberdeen	5,235	A	D
South Chehalis Street	68.36	Aberdeen	6,345	B	D
Port Industrial Road	70.06	Aberdeen	23,075	A	E
West 1st Street	70.41	Aberdeen	5,980	A	E
Industrial Road	71.04	Aberdeen	7,495	B	F

Similar to 2017 conditions, all grade crossings that would operate below LOS D in 2037 along at grade crossings are in Aberdeen.

- **Olympic Gateway Plaza area.** As described in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, the average vehicle delay would decrease over the 20-year analysis period in east Aberdeen (Olympic Gateway Plaza area) because of infrastructure improvements to the Wishkah River bridge that would allow speeds to increase from 10 to 20 miles per hour. Trains would move through grade crossings faster, thereby reducing vehicle delay at east Aberdeen grade crossings. LOS would improve at all the grade crossings between South Chehalis Street and Fleet Street grade crossings with the increase in speeds. In addition, future roadway improvements could further improve congestion and improve LOS in the Port and surrounding area. For example, possible options to alleviate congestion along US Route 12 (US 12) in Aberdeen related to the East Aberdeen Mobility Project are under consideration, including the creation of grade-separated crossings; however, because a preferred alternative has not yet been determined and funding has not been identified, this project was not considered in transportation modeling.
- **Port of Grays Harbor area.** All grade crossings between Port Industrial Road and the Imperium and Westway project sites would operate at LOS E or F indicating substantial delay for the average vehicle. Port Industrial Road would degrade from LOS D to E between 2017 and 2037 due to the forecasted traffic growth over the 20-year period.

Peak Hour Vehicle Delay

To describe the greatest impacts that could occur under cumulative conditions, an analysis of vehicle delay during the peak traffic hour was completed. The peak traffic hour is the hour of the day when the highest number of vehicles travel study area roads. The peak hour vehicle delay assumes the longest train under cumulative conditions would operate during the peak hour. Because unit trains related to the cumulative projects would have the same number of rail cars and would be longer than existing trains, the cumulative vehicle delay would be the same as the proposed action, as presented in Section 3.16, *Vehicle Traffic and Safety*. Table 6-16 summarizes peak hour vehicle delay at the grade crossings with the highest average daily traffic.

Table 6-16. Level of Service (Peak Hour Vehicle Delay) at Selected Grade Crossings (2017)

Grade Crossing	Milepost	Location	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	F	F
Pearl Street (SR 507)	0.89	Centralia	F	F
West Reynolds Street	2.14	Centralia	C	D
Old Highway 99 SW	6.07	Unincorporated Thurston County	C	D
Monte Elma Road	51.98	Satsop	A	B
Tyler Street	68.23	Aberdeen	F	F
South Chehalis Street	68.36	Aberdeen	F	F
Port Industrial Road	70.06	Aberdeen	F	F
West 1st Street	70.41	Aberdeen	E	F
Industrial Road	71.04	Aberdeen	F	F

The peak hour vehicle delay would be most substantial in Centralia and Aberdeen. In Aberdeen, rail operations on the PS&P rail line are heavily influenced by activities related to Poynor Yard, as described in Section 6.5.4, *Rail Traffic*. Peak hour vehicle delay can be summarized as follows.

- Centralia: Similar to the no-action alternative, the Tower Street and Pearl Street grade crossings would operate at LOS F. The H Street grade crossing would operate at LOS E.
- Olympic Gateway Plaza area: Similar to the no-action alternative, all grade crossings would operate at LOS F (Figure 6-5).
- Port of Grays Harbor area: All grade crossings would operate at LOS F (Figure 6-6).

Therefore, in Aberdeen, the peak hour analysis concluded substantial vehicle delay, with all grade crossings operating at LOS F, from the eastern end of the Olympic Gateway Plaza (Fleet Street) to the Port of Grays Harbor area.

Queueing

Increases to existing traffic delays would occur with an average of 4.25 new rail trips on the PS&P rail line with the cumulative projects. Increased vehicle delay from trains blocking grade crossings would have secondary impacts on nearby intersections. As vehicles begin to queue while waiting for the grade crossing to open, increased roadway congestion can affect upstream intersections. Table 6-17 illustrates the grade crossings that would have queues exceeding available storage length in 2017, as well as the increase in the queue length in number of cars compared to the no-action alternative.

Table 6-17. Average Queue Lengths Exceeding Available Storage Capacity at Grade Crossings—Cumulative Projects (2017)

Grade Crossing	Queue Direction	Queue Location	Increase in Average Queue Length (Number of Cars)[a]
Centralia			
Tower Street (SR 507)	Northbound	SR 507 northbound couplet in central Centralia. Upstream affected intersection is 4th Street.	8
Pearl Street (SR 507)	Southbound	SR 507 southbound in central Centralia. Upstream affected intersection is 6th Street.	23
East Aberdeen/Olympic Gateway Plaza Area[b]			
Fleet Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	8
Tyler Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	9
Chehalis Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	14
Newell Street[c]	Northbound	Exit from Olympic Gateway Plaza at US 12.	1
East Heron Street	Eastbound Right-Turn Lane	Right-turn from US Route 12 eastbound to Olympic Gateway Plaza. Upstream affected intersection is South F Street.	15
Port of Grays Harbor Area[b]			
Port Industrial Road[c]	Eastbound and Westbound	Adjacent to applicant's project site. Upstream affected intersection is South and Myrtle Street (Eastbound) and Maple Street (westbound).	25 (eastbound) 33 (westbound)
West 1st Street[c]	Eastbound and Westbound	East of the project site and Port Industrial Road. Upstream affected intersection is Maple Street (eastbound) and Haight Street (westbound).	13 (eastbound) 17 (westbound)
Industrial Road [c]	Eastbound and Westbound	Adjacent to applicant's project site in Port of Grays Harbor area.	35 (eastbound) 37 (westbound)

[a] Increase in average queue length compared to the no-action alternative. Assumes 20 feet per car. For example, the cumulative average queue length at Fleet Street would be 160 feet longer than the no-action alternative.
[b] Grade crossing location shown on Figures 6-5 and 6-6.
[c] Would not exceed available storage length under the no-action alternative. All other grade crossings exceed available storage length under the no-action alternative.

Table 6-17 illustrates that, for average queue lengths at the Tower Street and Pearl Street grade crossings in central Centralia, five of the seven Olympic Gateway Plaza area grade crossings and three of the Port area grade crossings would be longer for cumulative conditions than for the no-action alternative. Three intersections would not exceed available storage length under the no-action alternative.

The queue lengths would be substantial at most intersections shown in Table 6-17. In the Port area, the queue lengths would result from switching operations between Poynor Yard and the Imperium and Westway project sites, which would increase both the frequency and duration of blocked grade crossings. Table 6-12 in Section 6.5.4, *Rail Traffic,* illustrates the average daily train occupancy time at selected grade crossings under cumulative conditions. This increase in the average daily train occupancy time would increase vehicle queue lengths.

In the Olympic Gateway Plaza area, queues at the grade crossings at the Olympic Gateway Plaza would extend into the plaza parking area, except at East Heron Street, where queues would extend onto US 12 eastbound. The grade crossing at East Heron Street conflicts with Olympic Gateway Plaza traffic traveling eastbound on US 12, and serves as a bottleneck. During an eastbound train event, the queue would extend past F Street (upstream intersection) on the west side of the Wishkah River. Similar to the vehicle delay analysis, the queuing analysis did not consider trip diversion. Including trip diversion in the analysis would likely indicate shorter average queue lengths at the Port area because there are other routes to avoid the grade crossings.

Average queue lengths in 2037 would increase compared to 2017 queue lengths due to the increase in traffic over the 20-year period. Average queue lengths would also increase compared to no-action alternative conditions because of the blockage time associated with the cumulative project trains along the PS&P rail line. The grade crossings that would exceed the available storage length in 2037 would be the same as 2017 (Table 6-17). Appendix L, *Vehicle Traffic Analysis*, illustrates queue lengths at all study intersections. The following summarizes 2037 queue lengths.

- **Centralia.** Queue lengths at Pearl Street and Tower Street grade crossings in Centralia and the Port would grow by approximately 30% between 2017 and 2037.
- **Olympic Gateway Plaza area.** Queue lengths at grade crossings in the Olympic Gateway Plaza area in east Aberdeen would increase by approximately 10% between 2017 and 2037. The analysis assumed rail infrastructure improvements would improve train speeds in this area and reduce the amount of time trains occupy grade crossings in east Aberdeen by 2037.
- **Port of Grays Harbor area.** Queue lengths at the Port Industrial Road, West 1st Street, and Industrial Road grade crossings would increase by approximately 30% between 2017 and 2037.

Solutions being evaluated by ongoing regional planning efforts (such as the East Aberdeen Mobility Project) would alleviate some of the vehicle delay impacts related to the cumulative projects if such improvements are funded and implemented by 2037. Further regional efforts to evaluate the potential for additional storage capacity would also help to mitigate increased delay at those locations.

Vehicle Safety

Increased rail traffic related to the cumulative projects could increase the frequency of accidents along the PS&P rail line compared to the no-action alternative. The magnitude of the increase would be determined by the volume of train traffic and average daily traffic. The impacts on grade-crossing

safety specific to each grade crossing for accidents involving trains and vehicles are summarized in Appendix L, *Vehicle Traffic Analysis.* This appendix provides the total predicted accident rate, predicted intervals between accidents, and the decrease in years between the predicted intervals in the analysis year (2017 or 2037) for all grade crossings along the PS&P rail line.

In 2017, the grade crossings that would have the shortest predicted intervals between accidents would be in Aberdeen because rail operations east of the Poynor Yard (Olympic Gateway Plaza area) and west of the Poynor Yard (the Port and surrounding area) would increase the frequency of train passbys at these grade crossings. As with vehicle delay, accident frequencies could improve by 2037 for some grade crossings if improvements such as grade-crossing protections are implemented. Additionally, although infrastructure improvements considered for the East Aberdeen Mobility Project were not included in the safety analysis, any improvements would likely lessen delay and improve safety at grade crossings in the Olympic Gateway Plaza area.

The *Railroad-Highway Grade Crossing Handbook–Revised Second Edition* (Federal Railroad Administration 2007) indicates that active devices with automatic gates should be considered when certain criteria are met. One criterion is if the expected accident frequency, as calculated by the U.S. Department of Transportation Accident Prediction formula, exceeds 0.075. As shown in Appendix L, *Vehicle Traffic Analysis*, no grade crossings would exceed this frequency using this formula.

Emergency Access

As described in the vehicle delay analysis, average vehicle and peak hour delay would increase with the additional trains resulting from the cumulative projects. Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings. The following sections describe the impacts on emergency vehicle access, focused on the PS&P rail line between Centralia and Aberdeen, in Centralia, and in Aberdeen (Olympic Gateway Plaza and Port of Grays Harbor areas).

Between Centralia and Aberdeen

For the grade crossings between west Centralia and east Aberdeen, the average vehicle delay from rail traffic from the cumulative projects would increase compared to the no-action alternative. The cumulative projects would add an average of 4.25 unit train trips per day. The projected 2017 cumulative daily grade-crossing delay for all trains between west of Centralia and east of Aberdeen would be between approximately 19 and 56 minutes daily compared to between 7 and 17 minutes under the no-action alternative. (Appendix L, *Vehicle Traffic Analysis*, provides daily grade crossing blockage times for all grade crossings.) Therefore, the average delay at the grade crossings would increase 12 to 39 minutes in a 24-hour period from the additional trains from the cumulative projects.

These trains would affect emergency response times if an emergency vehicle were blocked at a grade crossing occupied by a train for one of the cumulative projects. The potential for the cumulative projects to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the PS&P rail line and the availability of alternative routes if a train were to occupy the grade crossing at the time of the call. Because the frequency of train traffic on the PS&P rail line would increase, the probability of an increase in emergency response time at these grade crossings would also increase. This impact would occur when an emergency vehicle experienced a delay related to a train for the cumulative projects.

Olympic Gateway Plaza Area (Aberdeen)

All grade crossings in the Olympic Gateway Plaza area (from East Heron Street to Fleet Street) are occupied for more than 35 minutes on average 3.9 times per week from eastbound grain and auto trains under the no-action alternative. Adding eastbound trains from the cumulative projects, these grade crossings would be occupied for more than 35 minutes on average 15.4 times per week.

Vehicle delays in the Olympic Gateway Plaza area are currently substantial because the seven grade crossings at the plaza provide the only vehicular emergency access to and from the plaza and Morrison Riverfront Park, immediately east of the plaza. With all cumulative projects, emergency response vehicles would experience more frequent and longer delays to access the Olympic Gateway Plaza area because there is no alternate roadway access to the plaza. Section 3.16*, Vehicle Traffic and Safety*, identifies applicant mitigation for emergency vehicle access to reduce the impact of a proposed action train on emergency response to this area.

Port of Grays Harbor Area (Aberdeen)

Vehicular access west of Poynor Yard and south of the PS&P rail line would be completely blocked on the existing roadways during train transits for the cumulative projects. Emergency vehicle access blockage would be affected in two areas, described as follows.

- **Between Poynor Yard and East of Port Industrial Road.** West of Poynor Yard and east of Port Industrial Road are the Washington Street, Monroe Street, Heron Street, and Division Street grade crossings. These grade crossings would be blocked for approximately 24 minutes when a Westway project train arrives (average of 0.6 times per day), and 51 minutes when an Imperium project train arrives (average of 1.0 time per day), compared to between 4 and 8 minutes, depending on train type, under the no-action alternative.
- **Between Port Industrial Road and the project sites.** All land uses south of the PS&P rail line between the Port Industrial Road grade crossing and the project site, including Home Depot and the Port, would be blocked from lands north of the PS&P rail line for between approximately 10 minutes and 33 minutes when a Westway project train and arrives (average of 0.6 times a day), and between 58 minutes and 1 hour 17 minutes when an Imperium project train arrives (average of 1.0 time a day). The Port Industrial Road grade crossing would be the first grade crossing that would open to provide vehicular access to this area. The Industrial Road grade crossing would the last grade crossing that would open to provide vehicular access to this area. This blockage of all grade crossings and the isolation of these land uses would substantially affect emergency response in this area.

6.5.5.3 Mitigation Measures

Rail traffic from the cumulative projects would substantially affect vehicle delays at grade crossings, emergency vehicle access, and accident frequency. Implementation of the applicant mitigation measures identified in Section 3.16, *Vehicle Traffic and Safety*, and repeated below, would reduce cumulative impacts.

- To mitigate vehicle traffic impacts associated with rail operations of the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, the Port, Grays Harbor Council of Governments, and PS&P to address vehicle delay and/or inform motorists of potential blockages at PS&P crossings between the project site and Poynor Yard. The Washington State Department of Transportation, City of Hoquiam, City of Aberdeen, and Port will approve

proposed measures for the areas where they are responsible for vehicle safety. The applicant will ensure measures are in place prior to beginning the proposed operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations.

- To mitigate vehicle traffic impacts associated with rail operations related to the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, the Port, Grays Harbor Council of Governments, and PS&P to address vehicle delays and/or inform motorists of potential blockages at PS&P grade crossings into and out of the Olympic Gateway Plaza. The Washington State Department of Transportation, City of Hoquiam, City of Aberdeen, and Port will approve proposed measures for the areas where they are responsible for vehicle safety. The applicant will ensure acceptable measures are in place prior to beginning the proposed project operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations.
- To reduce the potential for increased delay of emergency vehicles at PS&P grade crossings during project operations, the applicant will work with local emergency service providers to provide advance notification of incoming trains.
- To ensure that local emergency service providers have access to areas south of the PS&P rail line in Aberdeen, the applicant will ensure an automobile with an 8-foot clearance and a combination truck (pumper and ambulance) are available for staging south of the PS&P rail line in the Olympic Gateway Plaza for use by local emergency service providers. The applicant will also ensure an ambulance is available for staging south of PS&P rail line in the Port of Grays Harbor area between the project site and Port Industrial Road for use by emergency service providers. These measures will be in place prior to beginning crude oil operations.
- To address the potential for emergency access conflicts to areas along the PS&P rail line during unplanned unit train stoppages, the applicant will work with PS&P and local emergency service providers along the PS&P rail line to develop and implement a notification protocol to inform local emergency service providers and other interested parties of the duration and magnitude of the unplanned stoppages. The notification protocol will be in place prior to the beginning of operations involving transport of crude oil.
- To address potential vehicle safety impacts, each of the public at-grade crossings on the rail line, the applicant will work with PS&P to provide permanent signs that prominently display both a toll-free telephone number and a unique grade-crossing identification number in compliance with Federal Highway Administration regulations (23 Code of Federal Regulations 655). The toll-free number would enable drivers to report promptly any accidents, malfunctioning warning devices, stalled vehicles, or other dangerous conditions. The signs will be in place prior to the beginning of operations involving transport of crude oil.
- To address potential vehicle safety impacts, the applicant will coordinate with PS&P to make Operation Lifesaver educational programs available to communities, schools, and other organizations located along the rail line. Operation Lifesaver is a nationwide, nonprofit organization that provides public education programs to help prevent collisions, injuries, and fatalities at highway/rail grade crossings.

6.5.5.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would have unavoidable and significant adverse impacts on vehicle delay in Aberdeen. The mitigation measures would reduce but not completely eliminate these impacts on vehicle traffic and safety. The vehicle delays would be most severe if a train were to pass by during the peak vehicle traffic hour. However, unavoidable and significant adverse impacts would also result during train transits at grade crossings in the Olympic Gateway Plaza area and between Poynor Yard and the project sites.

Addressing vehicle delay at the grade crossings at the Olympic Gateway Plaza area and between Poynor Yard and the project site would require the participation of a broad group of stakeholders in coordination with ongoing regional transportation planning efforts. Measures to reduce vehicle delay could include modifying PS&P operations to limit switching activities during peak traffic hours, adding new PS&P rail line infrastructure to reduce grade-crossing blockage time, or adding new queue-storage capacity at grade crossings that exceed available storage length. Ongoing regional solutions such as the East Aberdeen Mobility Project could reduce vehicle delay impacts and improve safety conditions at the Olympic Gateway Plaza area. In addition, further regional efforts to evaluate the potential improvements to reduce vehicle delay (such as grade separation, early warning system, grade-crossing protections), would also help to reduce vehicle delay.

6.5.6 Vessel Traffic

This section discusses potential cumulative impacts on vessel traffic that would result from construction and operation of the cumulative projects.

6.5.6.1 Study Area

The cumulative impacts study area for vessel traffic consists of the Terminal 1 berth and the entirety of Grays Harbor, including the navigation channel into and out of the harbor and travel corridors in state waters out to 3 nautical miles.

As described in Chapter 5, *Extended Rail and Vessel Transport,* the cumulative projects would not have a substantial impact on vessel traffic in the extended study area off the Washington coast. The impact of cumulative vessel traffic on environmental health from increased risk of incidents during vessel transport (e.g., vessel grounding or collision), and related consequences (e.g., oil spills from vessel tank ruptures) is described in Section 6.5.7, *Environmental Health and Safety*.

6.5.6.2 Cumulative Impacts

The following section describes the vessel traffic in Grays Harbor that could result from the construction and routine operation of the cumulative projects.

Construction

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, construction of the proposed action is not anticipated to affect vessel operations because construction would be entirely contained on land and no in water. This is also true of the cumulative projects. Therefore, the cumulative projects would not result in any cumulative impacts on vessel traffic.

Navigation Channel Capacity

Baseline cargo and tank vessel trips in Grays Harbor are projected to increase from 324 to 422 between 2017 and 2037 due to increased trade of commodities. The cumulative projects would add an additional 758 tank vessel trips carrying crude oil per year to baseline traffic, resulting in a forecast of 1,082 total cumulative trips in 2017 and 1,180 total cumulative trips in 2037 (Table 6-18) for all vessel types.[31]

Table 6-18. Vessel Trips per Year—Cumulative Projects

	2017			2037		
Vessel Trips[a]	**Daily**	**Weekly**	**Annual**	**Daily**	**Weekly**	**Annual**
Baseline Conditions						
Cargo vessel	0.6	4.2	220	0.8	5.3	276
Cargo barge	0.2	1.4	72	0.3	1.8	92
Tank vessel[b]	0.1	0.6	32	0.1	1.0	54
Total Large Commercial Vessels	0.9	6.2	324	1.2	8.1	422
Cumulative Projects						
Westway Project			238	0.7	4.6	238
Imperium Project	1.1	7.7	400	1.1	7.7	400
Grays Harbor Rail Terminal Project	0.3	2.3	120	0.3	2.3	120
Cumulative Vessel Trips	2.1	14.6	758	2.1	14.6	758
Total Vessel Trips	**3.0**	**20.8**	**1,082**	**3.2**	**22.7**	**1,180**

[a] Vessel trips represent one-way trips.
[b] Numbers do not reflect Imperium no-action vessels, because proposed action number is total for facility.

The capacity analysis considered the number of navigable 2-hour windows available for vessels with different drafts and tidal elevations at the 2017 project depth of 38 feet mean lower low water (Table 6-1).

Cargo barges transiting to the mouth of the Chehalis River or further inland are forecast to account for 72 trips per year (approximately 7% of total commercial vessel trips) at the Port in 2017 and 92 trips per year (8% of large commercial vessel trips) in 2037. These vessels are not considered deep-draft. They have drafts between 0 and 17 feet, consistent with vessel data reported between 2008 and 2012 (Chapter 3, Section 3.17, *Vessel Traffic*).

The remaining trips under cumulative conditions would consist of tank and cargo vessels. It is anticipated that approximately half of the remaining vessel trips (either inbound or outbound trips) would be made by vessels in ballast. Vessels transiting in ballast would have a shallower draft (less than 27 feet) than when they are laden with cargo (U.S. Army Corps of Engineers 2014).

Based on these assumptions, approximately 53% of the total vessel trips (cumulative projects plus baseline) (577 in 2017 and 636 in 2037) would be made by vessels not considered to be deep draft, or vessels that draft less than 27 feet.[32] At the 2017 project depth of 38 feet mean lower low water,

[31] As noted in Section 3.16, *Vessel Traffic*, projected traffic increases unrelated to the proposed action were based on growth rates used in the Grays Harbor Channel Deepening Project.
[32] This percentage is slightly greater than 50% because cargo vessels have a shallower draft even when in ballast.

these vessels would be unconstrained by tidal elevations. The remaining 47% of all vessel trips (505 in 2017 and 544 in 2037) would be made by vessels with drafts between 27 and 39 feet.

Tank barges are most likely to call at Terminal 1 to load bulk liquids for the Westway and Imperium projects. The quantitative analysis in Chapter 3, Section 3.17, *Vessel Traffic*, assumes that the Crowley 550-Class articulated tug-barge or similar tank barges would be used. By assuming all tank barges, the analysis considers the highest possible number of vessel trips. If larger-capacity tankers are used, the number of vessel trips would be reduced. For the Grays Harbor Rail Terminal project, tankers are likely to call at Terminal 3 to load bulk liquids.

At the 2017 project depth of 38 feet mean lower low water, deep-draft vessels with drafts of 37 feet or less would have 1,627 navigable windows available each year, those with drafts of 38 feet would have 1,274 navigable windows and those with drafts of 39 feet or greater would have 904 navigable windows. Because the number of navigable windows available for transit of deep-draft vessels exceeds the total number of forecast laden vessel trips in 2017 or 2037 (505 in 2017 and 544 in 2037), the channel capacity would not be exceeded with the cumulative projects.

As described in Chapter 3, Section 3.17, *Vessel Traffic*, actual channel depths may vary considerably from project depths between maintenance dredging because sand and silt will accumulate in the channel. If the controlling depth of the navigation channel is reduced, the number of navigable windows at each tidal elevation threshold would be the same, but the maximum vessel draft possible at each tidal elevation would be reduced. Similar to current conditions, vessels with the greatest draft restriction would be given priority for transiting at the highest tidal elevations. Vessel operators may reduce the amount of cargo that is loaded to reduce the draft of the laden vessel and increase the transit opportunities. Given the flexibility of transiting at higher tidal elevations and/or reducing the cargo and draft of laden vessels, it is anticipated that vessel operators would be able to find navigable windows for the forecasted cumulative deep-draft vessel trips, even if the project depth of 38 feet mean lower low water is not maintained between dredging.

Berth Capacity at Terminal 1

As described in Chapter 3, Section 3.17, *Vessel Traffic*, assuming berth availability of 90%, the Terminal 1 berth would be available to receive vessels 328 days per year. Vessels are estimated to occupy the berth from 24 hours (tank barges) to 48 hours (tankers). The analysis assumed 100% tank barges for the cumulative projects, which results in a conservative estimate of the most days of berth occupancy. Vessel calls associated with the Grays Harbor Rail Terminal project would call at Terminal 3 and would not affect the capacity of the Terminal 1 berth.

The cumulative tank barge calls would be 319 (119 for the Westway project and 200 for the Imperium project) and each would occupy the berth for 24 hours each, resulting in 319 days of berth occupancy. The baseline forecast[33] consists of 17 tankers, which would occupy the berth 34 days and 10 tank barges would occupy the berth for 10 days, for a total baseline forecast of 44 days without the cumulative projects. The total berth occupancy—baseline plus cumulative—would be 363 days per year. This would exceed berth availability by 35 days.

[33] Includes existing and projected vessels for the Westway project only. No Imperium vessels are counted, because the Imperium project represents the total for the Imperium facility.

If tankers replaced tank barges under the cumulative projects, berth occupancy could be as low as 318 days per year and there would be sufficient capacity.

Other Capacity Constraints—Pilots and Escorts

State-Licensed Pilots

Grays Harbor is subject to compulsory Washington State pilotage for foreign vessels and U.S. vessels under enrollment and registered in foreign trade. All large commercial vessels engaged in foreign commerce would require Washington State pilots with Grays Harbor experience and knowledge (a requirement of their license and training). Domestic vessels on a coastwise voyage may enter and depart Grays Harbor under the control of a U.S. Coast Guard (federally) licensed captain.[34] However, many U.S. vessels calling at Washington State ports seek the assistance of a state-licensed pilot on a voluntary basis, or as a matter of company policy, even though it is not required by regulation.

The cumulative number of trips by large commercial vessels (cargo and tank vessels) is forecast to reach 1,082 trips in 2017 and 1,180 trips in 2037. The Port currently employs three state-licensed pilots, with two pilots to be on duty at any given time. If all cargo and tank vessels hired a state-licensed pilot to navigate to and from the Port, this would result in a maximum of 1,180 annual assignments, or approximately 393 annual assignments for each of the three state-licensed pilots currently employed by the Port.

Trips taken by state-licensed pilots in Grays Harbor are comparatively short (on average, 2 hours outbound or 2 hours inbound) and are limited to the navigation channel.[35] This would make it feasible for a pilot to take one vessel outbound and bring another inbound during a single high tide window if the volume of vessel traffic warranted this approach. Moreover, because Grays Harbor has a semidiurnal tidal cycle (with two high tides per day), there is more than one navigable window each day to pilot a vessel to or from the Port.

If needed to handle forecast growth, additional pilots could be trained. It takes approximately 9 months for a new pilot to obtain his/her first state license to handle smaller vessels and approximately 2.5 years to become fully qualified.

In accordance with WAC 363-116-065, Number of Pilots, the Puget Sound Board of Pilotage Commissioners regularly considers the number of pilots needed to optimize the operation of a safe, fully regulated, efficient, and competent pilotage service in the Grays Harbor pilotage district. The Port will continue to work with the Puget Sound Board of Pilotage Commissioners to forecast the number of vessels that would require a state-licensed pilot well in advance of anticipated increases, to allow for training and onboarding of additional pilots. If necessary, the Puget Sound Board of Pilotage Commissioners could support the Port by temporarily reassigning a qualified state-licensed pilot from Puget Sound to Grays Harbor (Larson pers. comm.).

[34] Table 15.812(e)(2) in Title 46 Code of Federal Regulations requires (among other things) that the Master or Mate of a U.S. Inspected Tank Barge of 10,000 gross tons or less have 12 trips over the route to control the vessel in designated pilotage waters.

[35] In comparison, the Puget Sound pilots may spend up to 6 to 8 hours on one vessel and must debark in a completely different geographic area than where they started, adding travel time home to the assignment.

Escort Tugs

Brusco Tug & Barge has three harbor tugs stationed in Grays Harbor exclusively available for commercial vessel assistance in the harbor. During normal operations, two tugs (one at the bow and one at the stern) assist large commercial vessels (cargo and tank vessels) with docking and undocking at the Port berths. A third tug may be used when conditions warrant, such as during high winds (D'Angelo pers. comm.).

Cumulative one-way inbound or outbound trips by large commercial vessels are forecast to reach 1,082 in 2017 and 1,180 in 2037, or approximately 3.0 vessel trips a day in 2017 and 3.2 vessel trips a day in 2037. Both inbound and outbound vessels would use tug assists during docking (inbound vessels) or undocking (outbound vessels). Escort tugs can be readily moved between the Port terminals to assist with docking and undocking and, if needed, one or more tugs could be added to the fleet. It is not anticipated that availability of tugs would limit vessel operations at the Port for the cumulative vessel traffic.

Escort tugs are not currently required for tank vessels in Grays Harbor. Oil tankers carrying product to or from the Imperium project site do use escort tugs as part of their Washington State approved facility operations plan. The Harbor Safety Plan for Grays Harbor has a *standard of care* (similar to a best management practice) that recommends tug escorts for all laden tank vessels carrying oil. The standards recommend:

- At least one escort tug should meet an arriving laden tank vessel carrying oil at the Grays Harbor entrance and escort it to the Hoquiam River where two tugs (escort and assist) assist the vessel during mooring procedures.
- At least one escort tug will accompany a departing laden tank vessel carrying oil from the terminal to the entrance of Grays Harbor.

Cumulative tank vessel calls would reach 395 in 2017 and 406 in 2037. A single vessel call includes an inbound and an outbound vessel transit, and it is assumed that the vessel is laden (and therefore, requires an escort) in only one direction. Under this scenario, approximately 1.1 tank vessel calls per day, on average, would require an escort tug, which would not exceed the capacity of tugs to escort laden tank vessels. Escort tugs reduce the potential for a vessel incident such as loss of steering or propulsion that could affect vessel traffic and pose a safety risk.

Commercial (Nontreaty) Fishing

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, the proposed action could result in increased disruption to commercial fishing in the navigation channel when a vessel is traveling to and from the project site or is docked at Terminal 1. This potential for disruption would increase with the cumulative projects, with vessel traffic in the navigation channel increasing from 1.1 trips per day to 3.2 trips per day and vessel occupancy at Terminal 1 increasing up to 363 days per year. During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery may be open 2 to 4 days per week. Approximately 15 to 25 boats participate each year up to 5 days per week during the open season (Scharpf pers. comm.).

As noted in Section 3.17, *Vessel Traffic*, assuming the vessel is traveling between the Crossover Channel Reach of the navigation channel and Terminal 1 for approximately half of the 2-hour transit time, including docking and undocking maneuvers, an individual vessel trip could disrupt fishing for a 1-hour period. When a vessel is traveling through the area, commercial fishers can either avoid the

area entirely (fish elsewhere) or cut their drifts short (pull the nets in sooner) to avoid conflicts with vessels. Fishers would need to monitor radio communications for inbound and outbound vessel traffic and be prepared to retrieve fishing gear when a vessel is transiting the area.

On average, vessels related to the cumulative projects would also be at the dock more frequently, approximately 7 days per week compared to an average of 1 day per week under the no-action alternative. Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open fishing window, distribution of the fish, number of fishers on any given day), it is difficult to predict whether increased occupancy at Terminal 1 would substantially affect any single fisher's ability to reach their limit. If a vessel is at berth during the fall fishery, fishers would have the option to fish longer (complete more drifts) or may choose to fish other preferred locations in Grays Harbor (such as other portions of the navigation channel, farther away from the shoreline or father upstream), although opportunities to relocate during intense fishing periods may limited if the other areas are occupied by fishers.

As noted in Chapter 3, Section 3.17.4.3, *Fishing and Recreational Vessels,* ocean-fishing vessels may use the navigation channel to transport their catch to the harbor. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides, whereas large commercial vessels tend to navigate through the channel when tidal elevations are more than 5 feet. As noted previously, commercial fishers can navigate around larger vessels limited to the navigation channel to avoid potential impacts.

6.5.6.3 Mitigation Measures

Although the cumulative projects would increase large commercial vessel traffic in Grays Harbor, neither the navigation channel nor Terminal 1 berth capacity would be exceeded. However, increased vessel traffic would increase the potential for safety risks and conflicts with commercial fishers. Implementation of the applicant mitigation measures, described in Section 3.17, *Vessel Traffic*, and repeated below, would reduce cumulative impacts.

- Due to sensitivity of the local environment, tribal resources, and the potential presence of special-status species, to reduce potential risk of incident due to loss of propulsion, loss of steering, grounding, or severe weather, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels have escort tugs through Grays Harbor as described below. This requirement will remain in place until rules are implemented pursuant to ESHB 1449, Section 12, at which time the rules will apply to the project. At least one escort tug must accompany a laden tanker or tank barge carrying oil between the Hoquiam River and Grays Harbor entrance, and two tugs (one escort tug and one assist tug) must assist the vessel during mooring procedures.
    - For laden tankers, the escort tug must be appropriately tethered while transiting Grays Harbor.
    - Escort tugs must have an aggregate shaft horsepower equivalent to at least 5% of the deadweight tons of the escorted oil tanker or tank barge.
    - Escort tugs must have sufficient mechanical capabilities to provide for safe escort.
- To ensure adequate safety for tug operations and thereby reduce the risk of an incident, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels supply

Grays Harbor pilots and tug companies with bollard pull capacities of the vessels prior to entering Grays Harbor.

- To reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will work with U.S. Coast Guard, Ecology, Port, and Grays Harbor Safety Committee to propose, develop, and implement a formal vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The vessel management system will be active prior to the applicant beginning the proposed operations.
- To reduce potential risk of incident of vessel collision while in Grays Harbor, the vessel management system will take the following actions.
  - Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel.
  - Prohibit the transit of any other deep-draft vessels within the south channel (just off Westport) to Terminal 1 in both directions whenever a laden tank vessel is transiting within the same channel.
  - Include real-time automatic identification system tracking and monitoring.
- To reduce the risk of an incident, the applicant will coordinate with the Port and, as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these must include the following elements.
  - Escort configurations and maneuvering characteristics of escorted tankers and tank barges.
  - Specific emergency connection and tethering procedures for connection of escort tugs to tankers and tank barges.
  - Specific maneuvers necessary for the escort tugs to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering or in bad weather.
  - Appropriate safe speed of transit in Grays Harbor when escort tugs are tethered.
  - Guidelines for tanker or tank barge bridge team to rapidly recognize and respond to a loss of power or steering. By improving recognition and reaction time, the escort tugs can more effectively steer the vessel through the navigation channel upon incident.
  - Requirement for a pretransit conference.
  - Requirements for refueling of the vessel.
- While commercial fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project related vessel traffic arrivals and departures over a designated VHF marine radio channel.

6.5.6.4 Unavoidable and Significant Adverse Environmental Impacts

Under existing fishing conditions, increased vessel traffic would cause a disruption when commercial fishers are in the navigation channel. This conflict is most likely to occur related to harvest of salmon, steelhead, and sturgeon during the fall fishery. Although vessel operations related to the cumulative projects are reasonably certain, it is not possible to determine how the proposed action could affect a commercial fisher's daily catch because of other unpredictable factors (number of fishers, fish distribution, timing, and duration of fishing window on any given day of any given week). However, it is anticipated that because there are alternate fishing areas and because there would be additional days/windows to fish uninterrupted, impacts would not be significant.

6.5.7 Environmental Health and Safety

This section discusses potential cumulative impacts on environmental health and safety that would result from construction and operation of the cumulative projects.

6.5.7.1 Study Area

The cumulative impacts study area for environmental health and safety includes Grays Harbor, the 59 miles of PS&P rail line to the junction with the BNSF main line in Centralia, and the cumulative project sites. Within this area, the operations of interest include the storage and transfer (loading and unloading) of products for the cumulative projects and the associated rail and vessel movements, particularly for crude oil and bulk liquids.

6.5.7.2 Cumulative Impacts

This section describes the cumulative increases in risk that could result from the cumulative projects.

Risk management involves the systematic identification, evaluation, and control of impacts that may arise from uncertain future events such as oil spills, fires, explosions, toxic releases, or natural disasters. Assessing a risk to a particular resource requires identifying possible hazards, evaluating the frequency of adverse events and the magnitude of their consequences, and determining appropriate measures for prevention or mitigation. By anticipating the level of risk and the potential impacts, preventive and mitigation measures can be implemented to reduce the frequency of an event, the impacts, or both.

Because it is not possible to predict the timing or magnitude of an oil spill, this analysis focuses on spill scenarios. Scenarios were developed for a range of potential incidents involving the terminal, trains and vessels. These scenarios considered spills and fires/explosions involving existing conditions (no-action alternative), typical daily operations of the cumulative projects or during offsite rail and vessel transport, and worst-case spills. Risk assessments were done using these scenarios to identify the likelihood a spill could happen. Scenarios included the following conditions.

- Incidents involving onsite handling and storage of crude oil and bulk materials at the cumulative project sites.
- Incidents involving trains transporting crude oil and bulk materials along the PS&P rail line.
- Incidents involving vessels transporting crude oil and bulk materials in Grays Harbor.

The scenarios considered various sizes of potential spills based on the activity (such as transport or transferring oil) and size of tank, rail cars, and vessels. To simplify descriptions, spill scenarios are identified using the amount of material spilled.

Table 6-19. Oil Spill Scenarios by Size

Size	Typical Scenario
Small	· 2,100 gallons (50 barrels) spilled when transferring oil from rail cars or to vessels at the project site · 1,000 gallons (24 barrels) spilled during a derailment along the PS&P rail line
Medium	· 50,400 gallons (1,200 barrels) spilled from pipeline or storage tank on site · 10,000 gallons (238 barrels) spilled when transferring oil from the facility to a vessel at the project site · 30,000 gallons (714 barrels or the contents of one full tank car) spilled during a derailment along the PS&P rail line
Large	· 3.36 million gallons (80,000 barrels or the contents of one full storage tank) spilled on site · 90,000 gallons (2,140 barrels or the contents of three full tank cars) spilled during a derailment along the PS&P rail line · 150,000 gallons (3,570 barrels or the contents of five full tank cars) spilled during a derailment along the PS&P rail line · 900,000 gallons (21,400 barrels or the contents of 30 full tank cars) spilled during a derailment along the PS&P rail line · 105,000 gallons (2,500 barrels) spilled into Grays Harbor from a vessel collision · 15.1 million gallons (360,000 barrels or the entire contents of a full tanker, including fuel) spilled into Grays Harbor during a vessel allision at harbor entrance

Using this information, the analysis first determined the likelihood that a spill would occur using the following methods. In general, the larger the spill, the less likely that the spill would occur.

- For spills at the terminals, operational information, such as the number of rail car unloadings, vessel loadings, and storage tanks in use, was combined with historical information on spills associated with these activities to determine the likelihood of spills.
- For spills along the PS&P rail line, the number of rail trips carrying crude oil was combined with historical information from the Federal Rail Administration on incidents on the PS&P rail line and across the country to determine the likelihood of spills.
- For spills during vessel transport, the number of vessel trips carrying crude oil was combined with historical information on vessel accidents to determine the likelihood of spills.

The risk assessment considered the type of operations, transportation routes for trains and vessels, and historic incident data to determine the likelihood of an incident happening. The analysis looked at a 20-year period from 2017 to 2037 for the proposed action.

The analysis first quantified the *chance* of each spill scenario occurring in any given year in the 20-year analysis period. It then qualitatively assessed the *likelihood* based on the likelihood of an incident occurring. The quantitative analysis is included in Appendix M, *Risk Assessment Technical Report*.

The *likelihood of an incident* is defined as follows.

- **Likely to happen.** Involves regular transportation and facility operations or conditions that would be expected *to frequently happen*.
- **Unlikely to happen.** Involves unusual operations or conditions that would be expected *to rarely happen*.

Oil Spills

Onsite Risks

The cumulative projects would result in the potential for more frequent spills of bulk liquids relative to the no-action alternative and to the proposed action alone, although the orders of magnitude are very similar. The likelihood of very large releases from storage tank failures would remain low. The relative risks are shown graphically in Figure 6-7 and summarized below.

Figure 6-7. Cumulative Environmental Health Risks from Potential Spills at the Terminal (Onsite)

- During rail unloading operations, a release of up to 4.8 barrels (200 gallons) could occur once every 3 years. This amount is less than the unloading area containment that would be at least 30,000 gallons so the spill is expected to be contained on the facility.
- During vessel transfer operations, a release of 238 barrels (10,000 gallons) could occur every 43 years. A small amount of the oil would be contained on the facility or vessel but the remaining oil could spill to water. This amount is less than the containment area so the spill is expected to be contained on the facility.

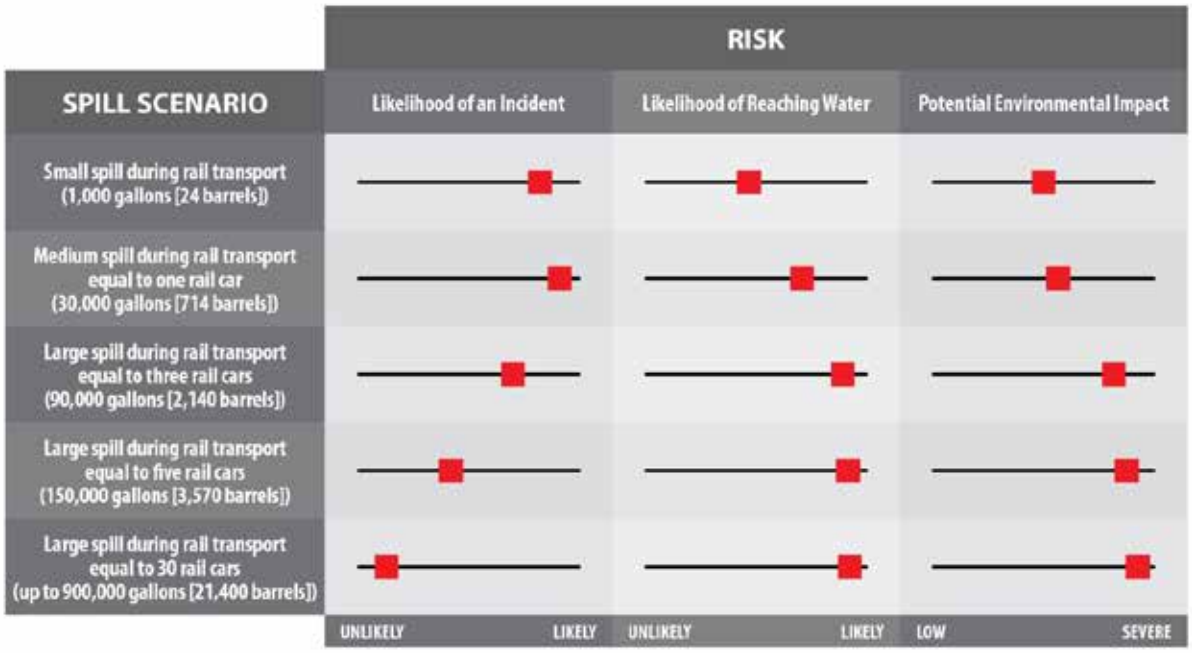
- An extreme failure of a storage tank could occur every 9,000 years. This could be caused by a construction or material failure, containment failure, or seismic or tsunami event. Some of the oil would be caught in the containment area, but the remaining oil could spill to land or water. Releases of 1,200 barrels (50,400 gallons) from the tanks or piping in the containment areas could occur every 455 years. This amount is less than the containment area so the spill is expected to be contained on the facility.

Each proposed facility would operate independently, so cumulative impacts from facility operations alone are not likely. The amount of oil and bulk liquids stored and moved by the facilities is higher cumulatively and could result in increased potential for spills from the facilities. Spills could be from operations, during transfers, from catastrophic failure of tanks, or from piping.

Rail Risks

Because of the increased number of rail trips related to the cumulative projects, there would be a greater potential for more frequent spills of bulk liquids relative to the no-action alternative or to the proposed action alone, although the orders of magnitude are very similar. The likelihood of very large releases would remain low. The relative risks are shown graphically in Figure 6-8 and the likelihoods are summarized below.

Figure 6-8. Cumulative Environmental Health Risks from Potential Spills during Rail Transport



- The chance of a minor collision or derailment resulting in a minor spill from one rail car is predicted to be once in 29 years, with a slight reduction to once in 31 years for 2037.
- The chance of a collision or derailment resulting in a loss equivalent to one rail car is predicted to be once in 11 years, dropping to once in 13 years for 2037.

- The chance of a collision or derailment resulting in the loss equivalent to three rail cars is predicted to be lower, at once in 73 years for 2017 and once in 110 years for 2037.
- The chance of a collision or derailment resulting in a loss equivalent to the content of five rail cars is predicted to be lower, at once in 1,400 years for 2017 and once in 3,300 years for 2037.
- The chance of an extreme event involving a release from a large number of rail cars is predicted to be once in 22,000 years for 2017 and once in 44,000 years for 2037.

The cumulative impact of 7.5 trains per day could result in an increased potential for derailments or incidental releases of oil and hazardous substances, pollutants, and contaminants during transport or incidents. The risk of an oil spill from train operations typically relates to the risk of derailment. However, a derailment does not mean a spill will happen; a train can derail with no spill resulting. A leak could occur during transit of the rail car but the spill quantity at a single point along the rail would be expected to be small.

The cumulative projects considered in the cumulative impacts analysis involve rail transport of oil. Operation of the cumulative projects would result in increased rail traffic along the PS&P rail line. The Pipeline and Hazardous Materials Safety Administration analysis concludes that the projected continued growth of domestic crude oil production and the growing number of train incidents involving crude oil have increased substantially the potential for future severe train incidents involving crude oil in high-hazard flammable trains. This increase in rail traffic would generally increase the risk of more frequent releases of bulk liquids, although the risk of very large releases remains relatively low.

Vessel Risks

Because of the increased number of vessel trips related to the cumulative projects, there would be a greater potential for more frequent spills of bulk liquids relative to the no-action alternative and the proposed action alone, although the orders of magnitude are very similar. The likelihood of very large releases would remain low. The relative risks are shown graphically in Figure 6-9 and the likelihoods are summarized below.

Figure 6-9. Cumulative Environmental Health Risks from Potential Spills during Vessel Transport

- A collision with another vessel during transport causing a spill of 2,500 barrels (105,000 gallons) could occur every 45 years.
- An extreme spill from a vessel (loss of the entire contents[36]) due to an allision with a fixed object (e.g., the entrance jetty) could occur every 116 years.
- An extreme grounding resulting in the loss of the entire contents[37] of vessel could occur every 128 years.

Fires or Explosions

This section describes the likelihood of fires or explosions for the different release scenarios identified previously.

Onsite Risks

A spill could cause a fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite. The incident could cause sparking, which could ignite the spill. Many of the materials to be handled under the cumulative projects are flammable but they are generally in a liquid and not gaseous form. Typically, terminal activities resulting in a spill would have limited potential to result in ignition because terminals are designed to reduce ignition potential. Liquid materials would pool on the ground with only limited vapor generation—particularly compared to other common materials like propane. The risks of fires or explosions at the terminal are presented graphically below in Figure 6-10. Additional information regarding the risks of fire and explosions during rail transport is provided in Chapter 4, *Environmental Health and Safety*, and Appendix M, *Risk Assessment Technical Report*.

[36] These risks assume use of tank barges, which could carry up to 185,000 barrels. As noted previously, larger Panamex-class vessels carrying up to 360,000 barrels could be used. Use of larger vessels would reduce the number of trips needed and, would generally result in a lower likelihood of a similar accident (i.e., collision or allision) occurring.

[37] These risks assume the use of tank barges, which could carry up to 185,000 barrels. As noted previously, larger Panamax-class vessels carrying up to 360,000 barrels could be used. Although the decrease in number of trips associated with using larger vessels would generally result in a lower chance of an accident, this reduction would be offset, in part, by the increased potential for grounding associated with a deeper-draft vessel. Therefore, the risks of a 185,000-barrel spill versus a 360,000-barrel spill are likely to be similar.

Figure 6-10. Cumulative Environmental Health Risks from Potential Fires/Explosions at the Terminal (Onsite)

Rail Risks

Explosions are most likely when a spill is ignited and the resulting fire impinges on another tank or rail car. As the material in these adjacent tanks or rail cars heat up, the pressure builds and may eventually burst the container. The extent of the damage depends on the exact configuration of the release and fire compared to the location of the other tanks or rail cars, any fire suppression capabilities, and the timing and nature of response actions. It also depends on the material: Bakken crude oil is more flammable than other heavier crude oils. The flammability of diluted bitumen varies based on the diluent (diluting agent) used. Other proposed bulk liquids, such as jet fuel, gasoline, kerosene, and naphtha are also highly flammable.

Although fires or explosions can result from spills resulting from events like collisions and derailments, long-term historical data show that most spills do not result in fires or explosions. A fire or explosion would be less likely to occur than a spill. While there have been multiple recent derailments of trains on main lines that resulted in fires or explosions, the chance of an extreme derailment is very limited in the study area because of the slow speeds on the PS&P rail line, which are slower than typical mainline speeds. In general, large derailments from high-speed trains lead to releases from multiple rail cars. The energy involved in high-speed derailments and the resulting scatter of rail cars yield the greatest chance of a fire or explosion that affects other rail cars.

The cumulative risks of fires or explosions during rail transport are presented graphically in Figure 6-11. Additional information regarding the risks of fire and explosions during rail transport is provided in in Chapter 4, *Environmental Health and Safety,* and Appendix M, *Risk Assessment Technical Report*.

Figure 6-11. Cumulative Environmental Health Risks from Potential Fires/Explosions from Rail Transport

Vessel Risks

The risks of fires or explosions during vessel transport related to cumulative projects are presented graphically in Figure 6-12. Additional information regarding the risks of fire and explosions during rail transport is provided in Chapter 4, *Environmental Health and Safety*, and Appendix M, *Risk Assessment Technical Report*.

Figure 6-12. Cumulative Environmental Health Risks from Potential Fires/Explosions during Vessel Transport

Impacts on Resources

With the cumulative projects, although the chance of an incident occurring would be cumulatively greater, the potential consequences of any one event would be similar to those described in Chapter 4, *Environmental Health and Safety.* While the increased activities from the concurrent operation of all cumulative projects would increase the risk of a release, the expected impacts from any of the release scenarios would remain the same. As discussed in Chapter 4, Section 4.7, *Impacts on Resources*, exposure to the proposed bulk liquids could result in adverse impacts on the following resources.

- **Water, plants, and animals.** In general, the proposed bulk liquids can degrade water quality and result in toxic exposure of plants and animals to harmful chemicals. Depending on the specific circumstances, exposure can cause tissue damage in plants and animals that can affect respiration, reproduction, and behavior. In extreme cases, exposure can result in death.
- **Tribal resources.** Harm to natural resources used by tribes for commercial, subsistence, or ceremonial purposes could result in adverse impacts on tribal resources.
- **Aesthetics, recreation, and cultural resources.** Crude oil can cause aesthetic impacts by coating the environment and resulting in large areas of reduced vegetative growth. These impacts can disrupt recreational activities if areas affected by spills have to be closed to prevent harm of exposure to people or to conduct cleanup activities. Spilled oil can also cause damage to historic structures or other important cultural resources. Depending on the circumstances of the incident and the nature of the cleanup activities, ground disturbance during cleanup may also adversely affect archaeological resources.
- **Human health.** Exposure to the bulk liquids can adversely affect humans, primarily through exposure to harmful air pollutants in the first few minutes of a spill. Depending on the circumstances of the incident, if people inhale crude oil vapors, they may suffer irritation to their respiratory systems, which can cause dizziness, rapid heat rate, headaches, confusion, nausea, and / or vomiting.

If a spill results in a fire or explosion, additional damage could occur, including those listed in Chapter 4, Section 4.7, *Impacts on Resources*, that have occurred related to recent rail incidents. The air pollutants of health concern are carbon monoxide, lead, nitrogen dioxide, particulate matter, sulfur dioxide, and polycyclic aromatic hydrocarbons. Inhalation of these byproducts can cause irritation of the respirator system. This may harm the nose, passages and lungs by causing difficulty in breathing, coughing, and itching. Similar types of air pollutants would be found from the burning of refined crude oil distillates (gasoline, naptha, heating fuel, jet fuel, diesel).

Fires or explosions can also harm plants and animals. Depending on the extent of the damage, changes affecting community structure and function of ecosystems could occur. For example, if exposed to high, sustained temperatures, specific plant and animal communities could become more susceptible to other harm, such as increased risk of disease or predation. If individual species are adversely affected at a broader population level, the overall structure and function of the community could be altered. Harm to natural resources used by tribes for commercial, subsistence, or ceremonial purposes could also result in adverse impacts on tribal resources.

Similar to potential impacts associated with spills, damage caused by fires or explosions could adversely affect aesthetic resources, important historic structures, or recreational resources. This damage could be made worse due to cleanup activities.

6.5.7.3 Mitigation Measures

Operation of the cumulative projects would increase the risk of environmental damage along the PS&P rail line, at the project site, and in Grays Harbor. Implementation of the applicant mitigation measures identified in Chapter 4, *Environmental Health and Safety*, and repeated below, would reduce cumulative impacts.

- To improve response times and communication in the event of an incident that could affect tribal resources, the applicant will include tribal contacts (names and/or phone numbers) in notification protocols in the oil spill contingency plan.
- To reduce the impacts from an oil spill, the applicant will establish and implement a procedure for blocking all drains on the dock prior to oil transfers and observing the area for discharges before removal.
- To improve oil recovery in the case of a spill during vessel loading at the dock, the applicant will retain a licensed engineer to perform an independent engineering analysis and feasibility study to determine the number of days it is safe and effective to pre-boom oil transfers and to identify site-specific improvements to maximize successful prebooming. The applicant will ensure the study is submitted to Ecology for review. If approved, Ecology will amend the applicant's oil spill contingency to require prebooming and improvements consistent with the study.

  If improvements to allow for pre-booming are determined to be unfeasible by Ecology and until changes are in place, the applicant will implement alternative measures, including but not limited to the following (in addition to those already required by regulation) to mitigate the absence of preventative boom in the water during transfers: stage dedicated response vessels, additional containment and clean-up equipment, and trained personnel at the terminal dock and/or at a nearby staging area during oil transfers. At a minimum, this alternative must include the following elements.

  - One oil spill response vessel with crew, skimmer, and at least 1,000 feet of boom at the dock.
  - On-water tank barge storage devices (not including bladders) prestaged at the dock with the skimmer to ensure a minimum of 450 barrels of recovery ready to be deployed.
- To reduce the risk of a spill, the applicant will require the facility person-in-charge (certified facility operator for oil transfers) to verify all connections are properly functioning for each oil transfer prior to the commencement of a transfer.
- To prepare for spills, the applicant will fully comply with Washington State contingency planning standards in place of any alternative measures previously approved in the oil spill contingency plan.
- To reduce the risks and impacts from an oil spill, prior to beginning the proposed operations the applicant will conduct a study to identify an appropriate level of financial responsibility for the potential costs for response and cleanup of oil spills, natural resource damages, and costs to state and affected counties and cities for their response actions. The study should follow Revised Code of Washington 88.40.025, Evidence of Financial Responsibility for Onshore or Offshore Facilities, and consider factors including a reasonable worst-case spill volume, the cost of cleaning up the spilled oil, the frequency of operations at the facility, and the damages that could result from the spill (including restoration). The study should identify any constraints related to the commercial availability and affordability of financial responsibility. Based on the study, Ecology shall determine the appropriate level of financial responsibility and require the

applicant to demonstrate their financial responsibility to the satisfaction of Ecology. Proof of financial responsibility will be included as documentation in the applicant's contingency plan.

- To improve preparedness for incidents, including oils spills, explosions, and fires, the applicant will ensure an emergency preparedness workshop is conducted prior to beginning project operations. The applicant will coordinate the workshop with Ecology. The workshop will be no more than 1 day in length and be held prior to beginning operations and annually thereafter. The initial workshop will focus on familiarizing local emergency responders, tribes, and communities with the contents of the Northwest Area Contingency Plan, the Grays Harbor and Chehalis Geographic Response Plans, other local response plans, the facility response plan, and the measures that are in place for a rapid and effective spill response.
- To improve the safe transport of crude oils with different volatilities and sinking tendencies, the applicant will not accept crude oil by rail unless the following actions have occurred.
  - The applicant has received verification that a sample of the oil has been tested and properly classified and characterized.
  - Where classification and characteristics of the oil are available in advance, the applicant has fully described this information and the implications for emergency response in its oil spill contingency plan.
- To reduce risks of a spill due to a rail incident, the applicant will not accept crude oil unit trains by rail unless the train has in place a functioning two-way end-of-train device or distributed power for operations on the PS&P rail line to the local yard.
- Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of special-status species, to improve coordination and response capabilities in the event of a rail accident, the applicant will not accept crude oil by rail unless PS&P prepares, submits to Ecology for approval, and implements a contingency plan meeting the requirements identified below. This requirement will remain in place until state contingency plan requirements for railroads are implemented by Ecology pursuant to ESHB 1449, Section 5, and/or amendments to the federal oil spill response plan rule (49 Code of Federal Regulations 130) is adopted.
  - Disclose full details of the method of response to spills to various sizes.
  - Define a worst-case spill planning volume.
  - Identify response notification and coordination procedures.
  - Identify personnel assigned to implement the plan.
  - Reference applicable Washington State geographic response plans.
  - Describe a training and exercise program for personnel and equipment.
  - Identify prepositioned spill containment and cleanup equipment and trained personnel.
  - Identify arrangement for enlisting qualified and trained cleanup personnel to implement the plan.
  - Describe how plan relates to other relevant contingency plans, such as facility plans, other rail plans, including federal oil spill response plans, and regional plans.
- To improve first response effectiveness and safety, the applicant will consult with the Olympic Region Clean Air Agency and U.S. Environmental Protection Agency to identify air monitoring

equipment needs for public health and safety in the case of a spill or explosion. The applicant will ensure equipment identified that is necessary for determining air quality conditions but not available through local agencies or fire departments will be made available to local fire departments.

- To increase the timeliness of responses to spills and incidents involving trains and to maximize coordination of responses along the PS&P rail line, the applicant will not accept crude oil by rail unless the following measures are completed.
  - PS&P participates with the local fire districts in a public safety drill at least once every 2 years.
  - PS&P tests one geographic response plan strategy annually and invites Ecology to participate.
  - PS&P participates in testing the applicant's oil spill contingency plan with a rail scenario at least once every 3 years, including participating in at least one drill every 3 years. This drill will be designed with Ecology and scheduled on the regional drill calendar.
- To improve response capability for spills that may occur on the Chehalis River, the applicant will coordinate with Ecology to advertise and extend registration of Vessels of Opportunity to the Chehalis River and to tribal boat owners prior to beginning operations. Applicants for the Vessel of Opportunity Program should be directed to www.oilspills101.wa.gov for information and registration.
- To improve response capability for trains transporting product to the project site, the applicant will not accept crude oil until a foam truck has been provided to the Elma Fire Department to provide fire-fighting capability along the PS&P rail line. The foam truck must be available and operational prior to beginning operations. The applicant will consult with Ecology and the local fire department to determine the capacity of the foam truck.
- To improve response times to reduce the initial impacts of an oil spill, the applicant will ensure that two trailers containing the spill response equipment listed below are available prior to beginning crude oil operations for use by initial local and emergency responders along the PS&P rail line. This equipment will be offered to fire departments along the PS&P rail line and the Chehalis Indian Tribe. The trailer and equipment will be maintained by the applicant and inspected annually. The equipment will only be provided to fire departments and Chehalis Tribe if they agree to store the equipment in a secure location and ensure the equipment used by appropriately trained personnel. The applicant will work with Ecology and local emergency officials to appropriately update the Western Region Response List website (www.wrrl.us), any applicable spills response plans to address the emergency equipment caches and to document notification protocols, necessary training, use of Personal Protective Equipment, and equipment deployment procedures. Mobile trailers of will be large enough to hold the following.
  - 3,000 feet of river boom in four 500-foot sections and five 200-foot sections
  - 5,000 feet of sausage sorbent boom
  - 30 kits – anchoring systems (anchors, lines, floats)
  - 20 kits – shoreside anchoring systems
  - 1 towing bridle
  - 4 heaving lines

- 1 machete (or other vegetation cutting tool)
- 1 pair of bolt cutters
- 50 sandbags
- 1 roll plastic sheeting
- 4 each plywood sheets (4 feet by 8 feet)
- 500 feet 3/8-inch poly line
- PPE: coveralls or Tyvek ® disposable suits, gloves, outer (chemical-resistant and disposable) boots, safety glasses or chemical splash goggles, hard hats – sufficient for 5 people

- To reduce risks related to an oil spill, the applicant will not accept crude oil by rail until PS&P meets with local emergency management officials to identify training needs for local responders who will respond to an emergency on the PS&P rail line. This effort will include development and execution of a training program to these responders to increase level of awareness and understanding of the hazards associated with an oil train incident. The training will include identification of notification protocols, use of Personal Protective Equipment, and equipment deployment procedures. This training will be completed before the applicant begins receiving oil trains and will be offered at least annually.
- To improve response capability on the Confederated Tribes of the Chehalis Reservation lands in the case of an oil spill, the applicant will ensure that an annual 1-day hazard awareness oil spill training for identified Chehalis tribal members is provided, including conducting and inviting tribal members to participate in drills.
- To improve response capability in the Grays Harbor area in the case of an oil spill, the applicant will ensure an annual one-day hazard awareness oil spill training is provided for identified Quinault Indian Nation tribal members, including conducting and inviting tribal members to participate in drills.
- To increase the timeliness and maximize the coordination of responses to spills and incidents involving crude oil trains along the PS&P rail line, the applicant will ensure the Grays Harbor Local Emergency Planning Committee's emergency response plan is updated to address the applicant's operations. This information must be included prior to beginning operations.
- Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of sensitive species, to reduce potential risk of incident due to loss of propulsion, loss of steering, grounding, or severe weather, the applicant will not receive or load crude oil to tankers or tank barges, unless the vessels have tug escorts through Grays Harbor as described below. This requirement will remain in place until rules are implemented pursuant to ESHB 1449, Section 12, at which time the rules will apply to the project.
  - At least one escort tug must accompany a laden tanker or tank barge carrying oil between the Hoquiam River and Grays Harbor entrance, and two tugs (one escort tug and one assist tug) must assist the vessel during mooring procedures.
  - For laden tankers, the escort tug must be appropriately tethered while transiting Grays Harbor.

  - Escort tugs must have an aggregate shaft horsepower equivalent to at least 5% of the deadweight tons of the escorted oil tanker or tank barge.
  - Escort tugs will have sufficient mechanical capabilities to provide for safe escort.
- To ensure adequate safety for tug operations and thereby reduce the risk of an incident, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels supply Grays Harbor Pilots and tug companies with bollard pull capacities of the vessels prior to entering Grays Harbor.
- To reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will work with the U.S. Coast Guard, Ecology, the Port, and Grays Harbor Safety Committee to propose, develop, and implement a formal vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The vessel management system will be active prior to the applicant beginning the proposed operations. To reduce potential risk of incident of vessel collision while in Grays Harbor, the vessel management system should act as follows.
  - Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel.
  - Prohibit the transit of any other deep-draft vessels within the South Reach of the navigation channel (just off Westport) to Terminal 1 in both directions whenever a laden tank vessel is transiting within the same channel.
  - Include real-time Automatic Identification System tracking and monitoring.
- To reduce the risk of a fire or explosion from tank barges, the applicant will not receive or supply Bakken crude oil to tank barges unless the tank barges are able to inert their tanks when carrying Bakken crude oil.
- To reduce the risk of an incident, the applicant will coordinate with the Port and as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these must include the following elements.
  - Escort configurations and maneuvering characteristics of escorted tankers and tank barges.
  - Specific emergency connection and tethering procedures for connection of escort tugs to tankers and tank barges.
  - Specific maneuvers necessary for the escort tug to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering.
  - Appropriate safe speed of transit in Grays Harbor when escort tugs are tethered.
  - Guidelines for tanker or tank barge bridge team to rapidly recognize and respond to a loss of power or steering. By improving recognition and reaction time, the escort tug can more effectively steer the vessel through the navigation channel upon incident.
  - Requirement for a pretransit conference.
  - Refueling operations.

- To reduce the risk of an incident during vessel refueling, the applicant will ensure that any tank barges loaded with fuel for purposes of refueling vessels at the project site follow the navigation and safety mitigation measures for crude oil tank barges described in this section.
- To improve response times and increase coordination of responses, the applicant will develop and implement a program approved by Ecology to educate its tankers and tank barge customers on the reporting requirements for vessel incidents resulting in a threat of a spill under Revised Code of Washington 88.46.100, Notification of Vessel Emergencies Resulting in Discharge of Oil, prior to beginning the proposed operations.
- To improve response times and communication in the event of an incident that could affect commercial or recreational fishing, the applicant will develop a method for provide information on potential incidents to commercial and recreational fishing boats and will describe this measure in the oil spill contingency plan prior to beginning operations.

6.5.7.4 Voluntary Measures

- To reduce potential risk from tank car punctures and spills identified with use of DOT-111 tank cars for transport of Bakken crude oil, the applicant will not accept crude oil by rail unless the following actions occur.
  - The rail cars meet or exceed the new U.S. Department of Transportation specification 117 design or performance criteria.
  - Existing tank cars are retrofitted in accordance with the U.S. Department of Transportation-prescribed retrofit design or performance standard (80 *Federal Register* 26643).

6.5.7.5 Unavoidable and Significant Adverse Environmental Impacts

Impacts from an incident from any of the cumulative projects would likely result in unavoidable and significant adverse environmental impacts. As described in the risk analysis, the likelihood of an incident is low; however, the potential for significant impacts on the environment and human health in the case of an incident is high. The specific impacts would vary based on the location, type of liquid, amount spilled, and weather conditions. Examples of these impacts are described in Chapter 4, Section 4.7, *Impacts on Resources*. Existing regulatory requirements for the prevention, preparedness, and response to an incident and mitigation measures to reduce impacts are detailed above; however, no mitigation measures would completely eliminate the possibility of an incident from rail cars carrying crude oil or hazardous materials. No mitigation measures would completely eliminate the adverse consequences of an incident.

6.5.8 Extended Study Area

This section discusses potential cumulative impacts in the extended study area that would result from rail and vessel transport related to the cumulative projects.

In addition to the impacts addressed in Chapters 3, *Affected Environment, Impacts, and Mitigation*, and 4, *Environmental Health and Safety*, impacts related to increased rail and vessel traffic are described in Chapter 5, *Extended Rail and Vessel Transport*.

6.5.8.1 Rail Traffic

The rail traffic extended study area encompasses the BNSF main line tracks from Centralia, Washington (the eastern endpoint of the PS&P rail line) to the Bakken formation in North Dakota. The BNSF operates trains over 1,604 miles in Washington State, which represent almost 10% of its total system route miles. It is the largest rail operator in Washington, handling 1.4 million carloads in 2011 (Washington State Department of Transportation 2014a:37).

Anticipated increases in rail traffic related to the cumulative projects traveling to the project sites would account for a small percentage of BNSF rail traffic within Washington State. With approximately an additional 4.25 rail trips per day on average,[38] the new traffic would not have an impact on BNSF's rail network. As noted in Chapter 5, Table 5-8, existing daily traffic on the BNSF main line in Washington State is approximately 237 trains per day (Washington State Department of Transportation 2014b:Appendix 3-B).Even though the cumulative projects would add a relatively small amount of rail traffic, some impacts on other resources in the extended study area could occur. More specifically, the following impacts could occur as more trains, including the anticipated increases in Class I freight rail traffic, travel along the BNSF main line routes.

- Increased emissions resulting from more diesel trains.
- Increased noise at grade crossings and along the route.
- Increased potential for impacts on water quality and aquatic species as a result of a spill (Chapter 4, *Environmental Health and Safety*).
- Increased delay at grade crossings, including disruption to emergency vehicle response times.
- Increased risk of a derailment, oil spill, or other incident involving rail cars (Chapter 4, *Environmental Health and Safety*).

Stakeholders include but are not limited to the local, tribal, and regional governmental agencies along the BNSF main lines, as well as the regulatory agencies, Washington State Department of Transportation, Washington Utilities and Transportation Committee, FRA, and Pipeline and Hazardous Materials Safety Administration. These stakeholders and agencies should continue coordination to identify solutions (operationally or for larger capital improvement projects) to address current and future concerns related to increased rail traffic, vehicle delay, and safety at grade crossings, and other concerns specific to each community. This could include infrastructure improvements such as grade separations, additional grade-crossing protections, grade-crossing closures, and roadway improvements.

6.5.8.2 Vessel Traffic

The extended study area for vessel transport is the West Coast of the United States. Detailed information on vessel routes and traffic is included in Chapter 5, *Extended Rail and Vessel Transport*. Commercial vessel trips to principal West Coast ports in 2012 totaled 157,663 (National Oceanic and Atmospheric Administration 2014). Forecasted cumulative commercial vessel trips in Grays Harbor are anticipated to be approximately 738 vessel trips. These projects represent less than 1%

[38] As discussed in Section 6.4, *What methods were used to analyze cumulative impacts?* it is anticipated that 5.5 additional rail trips per day would occur on the project site related to operation of the cumulative projects.

of total West Coast port trips. The cumulative projects would have negligible impacts on vessel traffic in the extended study area.