Chapter 7
Cumulative Impacts

7.1 Introduction

Cumulative impacts are impacts that would result from the incremental addition of the proposed export terminal's impacts to the impacts of past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively adverse impacts 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 export terminal, including the export terminal's incremental contribution to cumulative impacts on the environment.

This chapter describes the scope of the cumulative impacts analysis, including the regulatory setting and methods used in the analysis, and identifies the reasonably foreseeable future actions considered. It then describes cumulative impacts that could result from construction and operation of the proposed export terminal in combination with the reasonably foreseeable future actions. The contribution of the On-Site Alternative and Off-Site Alternative to potential cumulative impacts is summarized for each resource area examined in Chapters 4, 5, and 6 of this Draft Environmental Impact Statement (Draft EIS).

7.2 Scope of Cumulative Impacts Analysis

This section provides an overview of the regulatory setting; methods; study area; and past, present, and reasonably foreseeable future actions.

7.2.1 Regulatory Setting

This cumulative impacts analysis is prepared in accordance with the National Environmental Policy Act (NEPA) 42 United States Code (USC) § 4321 *et seq*., and the U.S. Army Corps of Engineers (Corps) NEPA Environmental Regulations, 33 Code of Federal Regulations (CFR) Part 230. 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.

7.2.2 Methods

This analysis follows the guidance developed by CEQ for assessing cumulative effects. Based on CEQ guidance, the following guidelines were used to evaluate the cumulative impacts of construction and operation of the proposed export terminal.

- Identify the resource(s) with the potential to be adversely affected by the terminal, as discussed in Chapters 4, 5, and 6 of this Draft EIS.
- Consider other actions in relation to the geographic scope of the terminal (i.e., those actions that would have effects in the same area as the terminal).

- Consider other actions in relation to the temporal period of the terminal (i.e., those actions that would have effects during the same time as the terminal).
- Rely on the best available data at the time of analysis.

The cumulative impacts analysis year is 2038. This was selected as the analysis year because it is 20 years after the assumed start date for construction of the terminal (2018) and 10 years after the terminal would reach full operation (with a throughput of up to 44 million metric tons of coal per year). In addition, this analysis year conservatively accounts for future actions that may only be in the planning stages now but can reasonably be expected to be operational in the future.

This cumulative analysis considers the impacts on the environment in 2038 resulting from the incremental impacts of either the On-Site Alternative or Off-Site Alternative 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. If either the On-Site Alternative or Off-Site Alternative would not result in adverse impacts in a particular resource area, then it would not have the potential to contribute to cumulative impacts, and therefore, no cumulative analysis for the resource area is warranted.

Table 7-1 identifies the resource areas studied in this Draft EIS, whether either the On-Site Alternative or Off-Site Alternative would result in adverse impacts on the resource area, and whether either the On-Site Alternative or Off-Site Alternative could contribute to cumulative impacts. The resource areas where either the On-Site Alternative or Off-Site Alternative could contribute to cumulative impacts are assessed in Section 7.3, *Cumulative Impacts by Resource Area*.

Table 7-1. Resources where Project Potentially Contributes to Cumulative Impacts

Section	Environmental Resource Area	Adverse Impacts Resulting from Export Terminal and Potential for Cumulative Impacts?[a]	Qualitative or Quantitative Analysis?
Chapter 4: Built Environment			
4.1	Land Use	Yes	Qualitative
4.2	Social and Community Resources	Yes	Qualitative
4.3	Aesthetics	Yes	Qualitative
4.4	Cultural Resources	Yes	Qualitative
4.5	Tribal Treaty Rights and Trust Responsibilities	Yes	Qualitative
4.6	Hazardous Materials	Yes	Qualitative
4.7	Energy	Yes	Qualitative
Chapter 5: Natural Environment			
5.1	Geology and Soils	Yes	Qualitative
5.2	Surface Water and Floodplains	Yes	Qualitative
5.3	Wetlands	Yes	Qualitative
5.4	Groundwater	No	Qualitative
5.5	Water Quality	Yes	Qualitative
5.6	Vegetation	Yes	Qualitative
5.7	Fish	Yes	Qualitative
5.8	Wildlife	Yes	Qualitative

Section	Environmental Resource Area	Adverse Impacts Resulting from Export Terminal and Potential for Cumulative Impacts?[a]	Qualitative or Quantitative Analysis?
Chapter 6: Operations			
6.1	Rail Transportation	Yes	Quantitative
6.2	Rail Safety	Yes	Quantitative
6.3	Vehicle Transportation	Yes	Quantitative
6.4	Vessel Transportation	Yes	Quantitative
6.5	Noise and Vibration	Yes	Quantitative
6.6	Air Quality	Yes	Quantitative
6.7	Coal Dust	Yes	Qualitative
6.8	Greenhouse Gas Emissions	Yes	Quantitative

Notes:
[a] Indicates the potential for adverse impacts under either the On-Site Alternative or Off-Site Alternative.

The resource-specific methods and assumptions described in the respective sections of Chapter 4, Chapter 5, and Chapter 6 of this Draft EIS were used for the cumulative impacts analysis. Table 7-1 indicates whether a qualitative or quantitative assessment of cumulative impacts was conducted for each resource area. A discussion of specific methods is provided for each of the resource areas where a quantitative assessment was conducted.

7.2.2.1 Study Area

The cumulative impacts study area is defined for each resource that would be affected by construction and operation of the proposed export terminal. Where applicable, the cumulative impacts study area for each resource is defined in each resource section. In some instances, multiple study areas are defined for each of the resources to identify potential cumulative impacts related to activities in the project areas for the On-Site Alternative and Off-Site Alternative, and activities beyond the project areas, such as rail and vessel transportation, to the extent these activities are within the NEPA scope of analysis.

7.2.2.2 Past and Present Actions

Past and present actions have contributed to the existing condition of resources at the project areas, in the surrounding region, in the Columbia River, and along the rail route serving the project area. Past and present actions include prior industrial development in the project area for the On-Site Alternative, Applicant's leased area, and along the lower Columbia River, including the Weyerhaeuser facilities adjacent to the Applicant's leased area, developments at the Port of Longview such as the EGT export facility, ongoing development at the Mint Farm Industrial Park near the project areas, the expansion of the TEMCO grain export terminal at the Port of Kalama, and changes to container shipping in the lower Columbia River with the end of container shipping service at the Port of Portland by the Hanjin and Hapag-Lloyd shipping companies. Other past and present actions include the development of transportation infrastructure, including the Reynolds Lead and BNSF Spur, BNSF Railway Company (BNSF) main line, Interstate 5 (I-5), State Route (SR) 432 (Industrial Way), and the Columbia River navigation channel; and ongoing maintenance of this infrastructure. In particular, maintenance of the Columbia River navigation channel requires the dredging of approximately 6 to 9 million cubic yards of material from the lower Columbia River each

year and disposal of this material at upland, shoreline, or in-water dredged material placement sites (USACE 2014). The relevant past and present actions are described in the affected environment discussion for each respective resource section of Chapters 4, 5, and 6 of this Draft EIS and accounted for in the impacts analyses.

7.2.2.3 Reasonably Foreseeable Future Actions

An inventory of future actions that could contribute to cumulative impacts in conjunction with the proposed export terminal were analyzed (Figure 7-1 and Table 7-2). The future actions are organized by the following types of project.

- Potential projects that would introduce rail traffic to the Reynolds Lead and BNSF Spur, or vessel traffic to the lower Columbia River.[1]
- Potential projects that would result in local construction and operation activities in Cowlitz County, the City of Longview, and the City of Kelso.
- Potential projects that would modify existing railroad infrastructure expected to be used by project-related trains (Reynolds Lead and BNSF Spur).

The locations of these projects are shown in Figure 7-1. These projects are referred to as the cumulative projects.

[1] For purposes of this EIS, the lower Columbia River ends at the landward limit of the Territorial Sea, which is a line drawn between the seaward tips of the North Jetty and South Jetty.

Figure 7-1. Cumulative Project Locations

ID	Project Name
1	Vancouver Energy Project
2	Kalama Manufacturing and Marine Export Facility
3	Northwest Innovation Works Methanol Facility
4	Vancouver Transportation Logistic Improvement Project
5	Columbia Pacific Bio-Refinery
6	Riverside Refinery
7	Woodland Marine Terminal
8	Washington Energy Storage and Transfer
9	Barlow Point Master Plan
10	SR 432 Rail Realignment and Highway Improvement Project
11	Reynolds Lead and BNSF Spur Improvements

Table 7-2. Reasonably Foreseeable Future Actions

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
1	Vancouver Energy Project	Tesoro Savage Petroleum, LLC	Port of Vancouver, WA Berths 13 and 14	Proposed construction and operation of a crude-by-rail terminal capable of receiving an average of 360,000 barrels of crude oil per day, storing it, and loading it onto marine vessels.	Proposed action would increase vessel traffic in the Columbia River by 290 vessels (580 one-way transits) per year.	Pending Department of the Army permit application in review by Corps (Seattle District). SEPA Draft EIS released in November 2015.
2	Kalama Manufacturing and Marine Export Facility	Northwest Innovation Works, LLC	Port of Kalama, WA	Proposed construction and operation of a natural gas-to-methanol production facility. Facility would manufacture, store, and ship methanol by vessel to global markets. Natural gas would be delivered via a pipeline lateral. The Port would construct a dock and would dredge to create a deep draft marine terminal on the Columbia River. Anticipated full operation would produce 3.6 million metric tons of methanol per year.	Proposed action would increase vessel traffic in the Columbia River by 36 to 72 vessels (72 to 144 one-way transits) per year.	Pending Department of the Army permit application in review by Corps (Portland District). SEPA Draft EIS released in March 2016. Construction is anticipated to begin in late 2016 if permits are issued.

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
2	Northwest Innovation Works Methanol Facility[b]	Northwest Innovation Works, LLC	Port Westward in Clatskanie, OR	Proposed construction and operation of a natural gas-to-methanol production facility on approximately 90 acres. Facility would manufacture, store, and ship methanol by vessel to global markets. Natural gas would be delivered to plants via transmission pipeline lateral. Port would construct a dock and dredge to create a deep-draft marine terminal on the Columbia River. Anticipated full operation would be 3.6 million metric tons of methanol per year.	Proposed action would increase vessel traffic in the Columbia River by 36 to 72 vessels (72 to 144 one-way transits) per year.	In permitting process.
4	Vancouver Transportation Logistic Improvement Project	NuStar Energy LP	Port of Vancouver, WA	Proposed retrofit of part of existing bulk product terminal to become a crude-by-rail terminal, with an average throughput of up to 22,000 barrels of crude oil per day. Facility would receive oil by rail, then transfer it to marine vessels on the Columbia River.	Proposed action would increase vessel traffic in the Columbia River by 18 vessels (36 one-way transits) per year.	SEPA EIS in process.
5	Columbia Pacific Bio-Refinery	Global Partners LP	Port Westward in Clatskanie, OR	Facility to transport crude oil and biofuel by rail, barges, or ships.	Operations would increase vessel traffic in the Columbia River by 108 vessels (216 one-way transits) per year.	Permits issued and facility is operating.

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
6	Riverside Refinery	Waterside Energy, LLC	Port of Longview, WA	Proposed construction and operation of refinery. The refinery would produce 30,000 barrels per day of gasoline, diesel, jet fuel, and atmospheric residuals and 15,000 barrels per day of renewable fuels. Crude oil would arrive by rail. Renewable fuels would be refined from used cooking oils and virgin seed and vegetable oils imported by vessel (medium and large liquid carriers) from international markets. Product would be exported by barge to local and regional markets and potentially by larger vessels to other West Coast markets.	Proposed action would increase BNSF Spur rail traffic by an average of 0.6 train trip (loaded and unloaded) per day and vessel traffic in the Columbia River by 24 vessels (48 one-way transits) per year.	As of early 2016, the proposal is no longer active.[c]

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
7	Woodland Marine Terminal	Columbia River Carbonates	Woodland, WA	Proposed construction and operation of a marine off-loading facility. Barges would transport raw calcium carbonate stone to facility where the stone would be stored and then hauled via truck to an existing CRC processing facility in Woodland, WA.	Proposed action would increase vessel traffic in the Columbia River by 24 vessels (48 one-way transits) per year.	Pending Department of the Army permit application in review by Corps (Seattle District). Cowlitz County issued SEPA Mitigated Determination of Non-Significance (MDNS) January 9, 2014, and SEPA Revised MDNS June 16, 2015.
8	Washington Energy Storage & Transfer	Waterside Energy, LLC	Port of Longview, WA	Proposed construction and operation of liquefied petroleum gas (propane and butane) export facility. The proposed action would receive 75,000 barrels per day, store it on site, and export it from a marine terminal located on an adjacent privately owned parcel. Liquid petroleum gas would be loaded onto very large gas carriers for export to international customers.	Proposed action would increase BNSF Spur rail traffic by an average of 2 train trips (loaded and unloaded) per day and vessel traffic in the Columbia River by 54 vessels (108 one-way transits) per year.	As of early 2016, the proposal is no longer active.[c]

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
9	Barlow Point Master Plan[d]	Port of Longview	Longview, WA	Master plan identifying high-level concepts of facilities, rail configuration, waterfront development, etc. for 280-acre site on Columbia River. Development concepts include multiuse, dry-bulk cargo loading, wharf improvements, storage areas, auto import/export, LNG terminals, biofuel import/ blending/processing/transfer, etc. Proposal to change comprehensive plan land use designation for Barlow Point from Mixed Use Residential/ Commercial to Heavy Industry.	Local construction and operation. Potential for increased rail traffic. Potential for increased vessel traffic.	Longview City Council postponed action on land use designation proposal until the comprehensive plan update is completed.
10	SR 432 Rail Realignment and Highway Improvement Project	Cowlitz County, Cowlitz-Wahkiakum Council of Governments support from WSDOT, FHWA, BNSF, etc.	SR 432 and rail routes from I-5 to Barlow Point property (Port of Longview).	Proposed improvement of rail and highway systems along SR 432 to accommodate projected rail and vehicle growth. Improvements seek to address safety, traffic congestion, mobility, and capacity concerns. Tier 1 Priority improvement is to grade separate SR 432/SR 433 (Industrial Way/Oregon Way intersection).	Local construction and operation. May result in delays or disruption in vehicle travel during construction. Upon completion, would accommodate increased vehicle traffic.	NEPA and SEPA EIS in process for Oregon Way/Industrial Way intersection. The 2015 transportation package passed by the Washington State Senate includes $85 million to construct the preferred alternative identified after conclusion of the NEPA and SEPA processes.

Project No.	Project	Proponent	Location	Description	Contributing Activity[a]	Schedule/Status
11	Reynolds Lead and BNSF Spur Improvements	Longview Switching Company	Reynolds Lead and BNSF Spur	Project to improve Reynolds Lead and BNSF Spur if warranted by increased traffic. Project would include adding ballast, and replacing ties to improve safety and rail speed. LVSW would also install signals and upgrade the traffic control system and add an electric, remotely operated switch from the BNSF Spur to the Reynolds Lead to increase capacity on the line.	Increased safety, speed, and capacity for rail traffic.	Longview Switching Company proposes to upgrade the Reynolds Lead and part of the BNSF Spur as a separate action should it be warranted by increased rail traffic resulting from existing and future customers.

Notes:

[a] The terms *train trip* and *vessel transit* refer to a one-way trip (either inbound or outbound). Each train may make a loaded inbound trip and an unloaded outbound trip. A single vessel call to a marine terminal includes one inbound and one outbound transit.

[b] Northwest Innovation Works, LLC proposed action at Port Westward is understood to be similar in size and scope to the Kalama Manufacturing and Marine Export Facility.

[c] Although these projects are no longer active, these sites could be developed with industrial uses in the future. These projects are included in the cumulative analysis because they represent the type of development that could occur on these sites. Furthermore, these projects could seek to locate on other sites in the region and could introduce similar rail or vessel traffic from other locations.

[d] The Barlow Point Master Plan is at the site of the Off-Site Alternative project area. This project would not occur if the proposed export terminal is constructed at the Off-Site Alternative location. Therefore, the Barlow Point Master Plan is not included in the assessment of cumulative impacts for the Off-Site Alternative.

Sources: City of Longview 2015; Cowlitz County Department of Building and Planning 2015; Cowlitz-Wahkiakum Council of Governments 2014; Energy Facility Site Evaluation Council 2015; Florip 2015; ICF International 2016; ICF International and Hellerworx 2016; KPFF Consulting Engineers 2014; Northwest Innovation Works 2016; Oregon Department of Environmental Quality 2015; Port of Kalama and Cowlitz County 2014; Port of Longview 2015; Vancouver Energy 2014; Vaughn 2016; Waterside Energy 2015.

Tables 7-3 and 7-4 summarize the rail and vessel traffic in the study areas associated with the reasonably foreseeable future actions contributing to cumulative impacts. Table 7-4 also provides the 2038 projected baseline vessel traffic in the Columbia River.

Table 7-3. Rail Traffic for Reasonably Foreseeable Future Actions

	Train Trips		
Project	**Daily**	**Weekly**	**Annual**
Riverside Refinery	0.6	4.2	219
Washington Energy Storage & Transfer	2.0	14.0	730
Total Rail Trips	**2.6**	**18.2**	**949**

Notes:
This table does not include project-related rail traffic. Trips from these two projects would travel on the BNSF Spur only and not the Reynolds Lead.

Table 7-4. Vessel Traffic for Reasonably Foreseeable Future Actions

Project	**Annual Vessel Calls[a]**	**Annual Vessel Transits[a]**
Vancouver Energy Project	290	580
Kalama Manufacturing and Marine Export Facility	54	108
Northwest Innovation Works Methanol Facility	54	108
Vancouver Transportation Logistic Improvement Project	18	36
Columbia Pacific Bio-Refinery	108	216
Riverside Refinery	24	48
Woodland Marine Terminal	24	48
Washington Energy Storage & Transfer	54	108
Total Cumulative Project Vessel Trips	626	1,252

Notes:
This table does not include project-related vessel traffic.
[a] The maximum anticipated number of vessel calls and vessel transits is presented.

7.3 Cumulative Impacts by Resource Area

The following sections present potential cumulative impacts for the built environment, natural environment, and operational resources. The analysis discusses the potential impacts from the On-Site Alternative and Off-Site Alternative that could contribute to cumulative impacts. For most resource areas, the On-Site Alternative and Off-Site Alternative would result in the same potential cumulative impacts. Throughout this section, the term *proposed export terminal* refers to both the On-Site Alternative and Off-Site Alternative.

7.3.1 Built Environment

This section presents potential cumulative impacts for the built environment resources.

7.3.1.1 Land Use

Study Area

The cumulative impacts study area for land use is the Longview-Kelso urban area and nearby unincorporated areas of Cowlitz County.[2]

The following cumulative projects are located in this study area: Barlow Point Master Plan (On-Site Alternative only), Riverside Refinery, Washington Energy Storage & Transfer, SR 432 Rail Realignment and Highway Improvement Project, Reynolds Lead and BNSF Spur Improvements, and the Kelso Martin's Bluff Rail Improvement Project.

Cumulative Impacts

As discussed in Chapter 4, Section 4.1, *Land Use*, the On-Site Alternative would not result in direct or indirect land use impacts on parks and recreation facilities or agricultural uses. The Off-Site Alternative would also not result in impacts on parks and recreation facilities. The Off-Site Alternative would displace agricultural land uses, but none of the cumulative projects within the study area would affect agricultural land. Therefore, the On-Site Alternative and Off-Site Alternative would not contribute to cumulative impacts on these resources and no cumulative impacts analysis is necessary.

Operation of the proposed terminal at the On-Site Alternative location would result in a new industrial use that would be consistent with the land use character of the project area and the surrounding vicinity. The cumulative projects in the study area include other industrial development projects and transportation projects. These cumulative projects would change the land use of their respective project sites to more intensive industrial uses or would provide transportation improvements to support industrial uses. The Riverside Refinery and Washington Energy Storage & Transfer projects, like the On-Site Alternative, would be located in areas designated for industrial uses in the *Cowlitz County Comprehensive Plan* (Cowlitz County 2014). In these cases, the cumulative projects have already been accounted for in local land use planning. Similarly, the Off-Site Alternative would be located primarily in an area designated for heavy industrial use by the Cowlitz County and City of Longview comprehensive plans. With the required City of Longview Comprehensive Plan Map Amendment and Cowlitz County Zoning Map Amendment, the Off-Site Alternative would be consistent with applicable zoning and comprehensive plan designations. Therefore, because the On-Site Alternative, Off-Site Alternative, and cumulative projects in the study area would be consistent with surrounding industrial uses and the comprehensive plan designations on their respective project sites, the On-Site Alternative and Off-Site Alternative would not contribute to cumulative impacts on land use.

The terminal would result in new development in the shoreline area regulated by the Cowlitz County Shoreline Management Master Program (SMP) and City of Longview SMP (Off-Site Alternative only). The Barlow Point Master Plan, Riverside Refinery, and Washington Energy Storage & Transfer projects would be expected to result in new development in shoreline areas regulated by the Cowlitz County or City of Longview SMPs. The terminal, in combination with the cumulative projects, would contribute to cumulative impacts on shoreline use due to the

[2] This study area is the Longview-Kelso urban area as defined in the 2010 U.S. Census and adjusted to include the unincorporated areas of Cowlitz County adjacent to the project area, which are not part of the Census-defined urban area.

development of new structures and uses in the shoreline area. These impacts would be permanent but would affect shoreline areas only at the location of each cumulative project, which represent a small portion of the Columbia River shoreline area in Cowlitz County and the City of Longview. The proposed export terminal and cumulative projects would be required to demonstrate consistency with the policies and use regulations of the applicable local SMP and would require Shoreline Substantial Development Permits and, potentially, Conditional Use Permits.

7.3.1.2 Social and Community Resources

This section discusses potential cumulative impacts on social and community resources, including social and community cohesion and public services, the local economy, utilities, and environmental justice.

Study Area

The cumulative impacts study area for social and community resources is Cowlitz County.

The following cumulative projects are located in this study area: Barlow Point Master Plan, Riverside Refinery, Washington Energy Storage & Transfer, the Kalama Manufacturing and Marine Export Facility, Woodland Marine Terminal, SR 432 Rail Realignment and Highway Improvement Project, and the Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

The following section discusses each element of social and community resources and potential impacts from the proposed export terminal and cumulative projects.

Social and Community Cohesion and Public Services

As discussed in Chapter 4, Section 4.2, *Social and Community Resources*, the proposed export terminal would result in direct and indirect impacts on social and community cohesion and public services by placing new demands on fire protection services, affecting accessibility to community resources and public services, and increasing noise levels in Archie Anderson Park, Highlands Trail, and Gerhart Gardens Park.

The terminal and cumulative projects would add rail traffic to the BNSF Spur.[3] The rail traffic attributable to the terminal and cumulative projects on the BNSF Spur would increase vehicle delay at the Dike Road crossing as a result of increased gate downtime. The Dike Road crossing is located away from residential areas in Longview and does not provide access to public facilities except for the Cowlitz County Landfill. Increased vehicle delay at the Dike Road crossing from the cumulative rail traffic would be unlikely to adversely affect social and community cohesion.

LVSW proposes improvements to the Reynolds Lead and BNSF Spur should it be warranted by increased rail traffic resulting from existing and future customers (Reynolds Lead and BNSF Spur Improvements Project). This project would increase train speeds on the Reynolds Lead and a portion of the BNSF Spur, which would decrease vehicle delay at the at-grade crossings. Decreased vehicle delay would contribute to a beneficial cumulative impact on social and community cohesion compared to vehicle delay at the at-grade crossings if improvements are not made to the Reynolds

[3] The cumulative projects would not add rail traffic on the Reynolds Lead; the cumulative impacts would be the same as described in Chapter 4, Section 4.2, *Social and Community Resources*.

Lead and BNSF Spur. Chapter 6, Section 6.3, *Vehicle Transportation*, addresses the vehicle delay at the crossings along the Reynolds Lead and BNSF Spur with and without improvements to the Reynolds Lead and BNSF Spur in 2028.

Project-related trains would increase rail traffic-related noise levels in Archie Anderson Park, Highlands Trail, and Gerhart Gardens Park, all of which are located near the Reynolds Lead or BNSF Spur. As discussed in Section 7.3.3.5, *Noise and Vibration*, the cumulative projects would not increase noise levels along the Reynolds Lead and would result in an imperceptible increase in noise levels at Gerhart Gardens Park. Therefore, the cumulative projects would not contribute to cumulative noise impacts on Archie Anderson Park or Gerhart Gardens Park.

The terminal would place new demands on fire protection services. However, it is expected the cumulative projects in Cowlitz County would be served by other fire departments in the area, such as the City of Longview Fire Department and Cowlitz County Fire District 5, and Cowlitz 2 Fire & Rescue. Therefore, there would be a low potential for the terminal to contribute to cumulative impacts on fire protection services.

The proposed export terminal in combination with the cumulative projects would generate additional employment opportunities in Cowlitz County, which could increase the demand for housing and public services. According to U.S. Census Bureau 2009–2013 estimates, Cowlitz County has more than 3,500 vacant housing units, and employees of the proposed export terminal and cumulative projects could reside anywhere in Cowlitz, Clark, Columbia, or Lewis Counties, based on current commute patterns. Some employees of the proposed export terminal and cumulative projects would be drawn from existing residents in the area, and new demands for housing and public services would be distributed across a wide area. Therefore, there would be low potential for cumulative impacts related to increased demand for housing and public services.

Local Economy

Construction and operation of the proposed export terminal and cumulative projects would affect the local economy by generating economic benefits for the local area, Cowlitz County, and Washington in the form of new jobs, wages, economic output, and tax revenues. The terminal would create 1,350 temporary jobs during construction and 135 permanent jobs during operations, and the Riverside Refinery and Washington Energy Storage & Transfer are projected to create a combined total of approximately 700 temporary construction jobs and 180 permanent jobs during operations (Waterside Energy 2015). Therefore, the proposed export terminal, in combination with the cumulative projects, would contribute to beneficial cumulative impacts on the local economy.

The rail traffic attributable to the proposed export terminal and cumulative projects on the BNSF Spur would increase vehicle delay at the Dike Road crossing as a result of increased gate downtime. Increased vehicle delay at the Dike Road crossing would adversely affect business accessibility. The Reynolds Lead and BNSF Spur Improvements Project would increase train speeds on the Reynolds Lead and a portion of the BNSF Spur, which would decrease vehicle delay at the at-grade crossings. Decreased vehicle delay would contribute to beneficial cumulative impact on business accessibility compared to conditions without this project.

Utilities

Operation of the proposed export terminal would create new sanitary sewage flows to the Three Rivers Regional Wastewater Treatment Plant and result in a small increase in demand for potable

water from the City of Longview water system. Construction and operation of the cumulative projects would also create new sanitary sewage flows and demands for potable water. It is expected the cumulative projects would use the Three Rivers Regional Wastewater Treatment Plant and the City of Longview water system. As noted in Chapter 4, Section 4.2, *Social and Community Resources*, the Three Rivers Regional Wastewater Treatment Plant has a design capacity of 26.0 million gallons per day, compared to an average wet weather flow (typically the highest flow rate) of 3.04 million gallons per day, and with anticipated demand by 2038, would have sufficient capacity to treat additional wastewater flows. The cumulative projects would be required to obtain the applicable wastewater discharge permit from the Three Rivers Regional Wastewater Authority. This permit would include effluent limits, best management practices, and pretreatment standards to ensure the Three Rivers Regional Wastewater Authority remains in compliance with its National Pollutant Discharge Elimination System (NPDES) permit. The cumulative projects would also be required to obtain the applicable utility service permit for water service from the City of Longview, which would allow the City of Longview to determine whether there is sufficient capacity to provide service. The City of Longview water supply has been designed to meet the service area's projected water demand through 2059. Therefore, the proposed export terminal and the cumulative projects would contribute to cumulative impacts related to increased demand for water and sewage utility services, but these impacts would be minor because existing utility services are expected to be able to accommodate the increased demand.

Environmental Justice

The analysis of environmental justice concluded horn noise from project-related trains on the Reynolds Lead during operations would have a disproportionately high and adverse effect on minority and low-income populations. The cumulative projects would not add rail traffic to the Reynolds Lead, and would not contribute to increased noise levels due to horn noise. The 2028 noise levels presented in Chapter 6, Section 6.5, *Noise and Vibration*, would be the same in 2038. Therefore, rail traffic associated with the cumulative projects would not contribute to a further impact on minority and low-income communities along the Reynolds Lead beyond what has been discussed for the proposed export terminal.

7.3.1.3 Aesthetics

Study Area

The cumulative impacts study area for aesthetics is the project area viewshed, as defined in Chapter 4, Section 4.3, *Aesthetics*.

The following cumulative projects are located in this study area: Barlow Point Master Plan (On-Site Alternative only), Riverside Refinery, Washington Energy Storage & Transfer, SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

The proposed export terminal would result in impacts related to aesthetics by introducing new visual features and sources of light and glare to the project areas that would be visible to viewers at urban and industrial, rural and residential, and natural viewpoints. Viewers at viewpoints 1, 2, 3, 4, 5, 9, and 11 (as described in Chapter 4, Section 4.3, *Aesthetics*) would be unlikely to experience views that would include both the export terminal and one or more cumulative projects. Therefore,

the cumulative projects would not contribute to cumulative impacts on visual resources from these viewpoints.

Viewers at certain rural, residential, and natural viewpoints (viewpoints 6, 7, 8, and 10 described in Chapter 4, Section 4.3, *Aesthetics*) on the Oregon side of the Columbia River could experience views of the proposed export terminal and the cumulative projects. In these views, the export terminal and cumulative projects would introduce new industrial facilities and structures and new sources of light and glare. These impacts would occur within the corridor of industrial, transportation, and utility land uses along the Columbia River. The proposed export terminal and cumulative projects would generally be visually consistent with existing industrial facilities along the Columbia River. Overall, the proposed export terminal, in combination with the cumulative projects, would contribute to cumulative impacts related to aesthetics by adding to the concentration of industrial features along the Columbia River visible to viewers at rural, residential, and natural viewpoints.

7.3.1.4 Cultural Resources

Study Area

Cultural resources include historic resources (i.e., buildings and structures) and archaeological resources. The cumulative impacts study area for cultural resources is the study area defined in Chapter 4, Section 4.4, *Cultural Resources* (the project area, areas of the Columbia River that would be directly affected by overwater structures and dredging, and a buffer surrounding the project area encompassing other areas that would be affected by construction of the proposed export terminal).

The following cumulative projects are located in this study area: Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

During construction, the proposed export terminal's direct impacts would be limited to the project areas for either the On-Site Alternative or Off-Site Alternative. The cumulative projects in the study area would not affect these areas and, therefore, would not contribute to cumulative impacts on historic resources during construction.

Constructing the terminal at the On-Site Alternative location would demolish buildings and structures associated with the Reynolds Metals Reduction Plant Historic District, and would affect the historic value of the Consolidated Diking Improvement District #1 (CDID #1) levee and the Bonneville Power Administration (BPA) Longview Substation. As discussed in Chapter 4, Section 4.4, *Cultural Resources*, the CDID #1 levee and the BPA Longview Substation's integrity of setting and association would be diminished by the demolition of buildings and structures contributing to Reynolds Metals Reduction Plant Historic District. The cumulative projects in the historic resources study area would further alter the setting of these resources. Therefore, the On-Site Alternative, in combination with the cumulative projects, would contribute to cumulative impacts on the historic value of the CDID #1 levee and the BPA Longview Substation.

The Off-Site Alternative would not result in the demolition of portions of the Reynolds Metals Reduction Plant Historic District. Therefore, the Off-Site Alternative would not affect the historic value of the CDID #1 levee and the BPA Longview Substation, and would not contribute to cumulative impacts on these resources.

7.3.1.5 Tribal Treaty Rights and Trust Responsibilities

Study Area

The cumulative impacts study area for tribal resources is the study area defined in Chapter 4, Section 4.5, *Tribal Treaty Rights and Trust Responsibilities.* This includes the On-Site Alternative and Off-Site Alternative project areas, the area around the project area for a distance of 1 mile, the area in the Columbia River surrounding the docks, the Columbia River from Vancouver, Washington, to the mouth of the river, the Willamette River from the Columbia River to the Port of Portland, and the CDID #1 stormwater system drainage ditches.

The following known cumulative projects are located in this study area: Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, Reynolds Lead and BNSF Spur Improvements, the Riverside Refinery, Washington Energy Storage & Transfer, and any cumulative project that would introduce new vessel traffic to the Columbia River (Table 7-4). Past, present, and future maintenance dredging activities in the Columbia River navigation channel and at nearby industrial sites in Longview are also in this study area.

Cumulative Impacts

The study area is located in a territory having been occupied by various Indian groups since well before Euroamerican contact. A village was located in the general vicinity of the project area, and its occupants could have used the area for fishing, hunting, and/or gathering for both subsistence and ceremonial purposes. Tribes that signed treaties with the United States retained certain rights such as fishing, hunting, and gathering, as well as rights to determine use of reserved land and its resources. As the area was settled by Euroamericans, Indian groups were displaced. As development occurred, tribal resources were impacted as described in the affect environment for Chapter 5, Sections 5.6, *Vegetation*, 5.7, *Fish,* and 5.8, *Wildlife*. The potential cumulative impacts on these tribal resources from the proposed export terminal are as described in the appropriate section of this chapter for these resources. This is also the case for the impacts from vessel traffic and for water quality concerns.

The tribal treaty right to fish in usual and accustomed (U&A) places has been adjudicated and the Columbia River Management Plan was signed in 1977. As it currently stands, the tribes exercise their treaty fishing rights in Zone 6, which is outside of the NEPA scope of analysis for this EIS. The subsequent 2008–2017 Agreement extended tribal fishing to locations downstream from Bonneville Dam, but upstream from the City of Vancouver. These areas, too, are outside the NEPA scope of analysis. However, further agreements in the future could extend tribal fishing as far downstream as the location of the On-Site Alternative and Off-Site Alternative, or to other areas within the study area. If that were to occur, the tribe's ability to fish could be affected by operation of the proposed export terminal or the cumulative projects.

The Corps has initiated consultation with the affected Indian tribes to help assess the extent to which the proposed action has the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before any final Department of the Army permit decision is made. Should any of the cumulative projects require a Department of the Army permit, consultation with the affected Indian tribes would also occur for those projects.

7.3.1.6 Hazardous Materials

Study Area

The cumulative impacts study area for each action alternative consists of the project area, the area within 1 mile of the proposed docks (Docks 2 and 3 for the On-Site Alternative, Docks A and B for the Off-Site Alternative), the Reynolds Lead and BNSF Spur rail corridor, and the Columbia River from the project area to the mouth of the river. This study area includes the Barlow Point Master Plan, SR 432 Rail Realignment and Highway Improvement Project, Reynolds Lead and BNSF Spur Improvements, and the cumulative projects that would introduce new vessel traffic to the Columbia River (Table 7-4).

There are no cumulative projects that would add rail traffic to the Reynolds Lead. Therefore, cumulative impacts related to hazardous materials releases during rail transport would be the same as the project-related impacts presented in Chapter 4, Section 4.6, *Hazardous Materials*.

Cumulative Impacts

Construction and operation of the proposed export terminal could introduce new sources of hazardous materials to the project area. The cumulative projects could also introduce new sources of hazardous materials such as fuels, solvents, paints, oils, concrete-curing compounds, and grease. The transport, use, storage, and disposal of hazardous materials must meet applicable federal, state, and local laws. The export terminal's hazardous material impacts would primarily affect the project areas for the On-Site Alternative or Off-Site Alternative; areas adjacent to the project areas; and road, rail, and vessel transportation routes. The cumulative projects would not be expected to result in hazardous material impacts on the project areas or areas adjacent to the project areas, and it is unlikely that they would result in a release along a transportation route at the same time as the export terminal. Therefore, there is low potential for the export terminal to contribute to cumulative impacts related to the introduction of hazardous materials.

None of the cumulative projects in the study area would add rail traffic to the Reynolds Lead that could contribute to a cumulative impact.

7.3.1.7 Energy

Study Area

The cumulative impacts study area for energy is the project areas for the On-Site Alternative and Off-Site Alternative, and the area within 0.25 mile of the project areas.

The following cumulative projects are in this study area: the Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

As discussed in Chapter 4, Section 4.7, *Energy*, the proposed export terminal would increase energy use, in the form of electricity, gasoline, oil, propane, and diesel fuel. The cumulative projects could also increase energy use. Projects associated with the Barlow Point Master Plan would generate temporary and permanent demand for energy. The SR 432 Realignment and Highway Improvement

Project and Reynolds Lead and BNSF Spur Improvements project as infrastructure projects would generate temporary demand for energy during construction, and would require minimal energy after operations (such as for signaling and lighting). Therefore, the proposed export terminal, in combination with the cumulative projects, would contribute to cumulative impacts related to energy. An overview of local energy sources and existing supply demand is provided in Chapter 4, Section 4.7, *Energy*. It is expected the cumulative demand for additional energy, however, would be minor compared to the current regional demand for electricity and other fuels, and could be met by existing local and regional supplies.

7.3.2 Natural Environment

This section presents potential cumulative impacts for the natural environment resources.

7.3.2.1 Geology and Soils

Study Area

The cumulative impacts study area for geology and soils is the project areas for the On-Site Alternative and Off-Site Alternative and land in the immediate vicinity of the project areas.

The following cumulative projects are in this study area: the Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

The proposed export terminal would result in a slight potential for soil erosion during construction and exposure to geologic hazards (e.g., seismic events and landslides) during operations. Impacts related to soil erosion during construction would be temporary and best management practices would avoid and minimize erosion impacts. The cumulative projects in the immediate vicinity could also result in temporary impacts related to soil erosion as a result of the exposure of bare soil during construction activities. Soil erosion would have the potential for off-site transport of eroded soil materials to waterways such as the Columbia River. Therefore, the proposed export terminal, in combination with the cumulative projects, could contribute to cumulative impacts related to soil erosion. Cumulative soil erosion impacts would be limited to small, localized areas and would only occur if both the proposed export terminal and one or more cumulative projects in the study area are under construction at the same time. Like the export terminal, the cumulative projects would likely be required to obtain an NPDES Construction Stormwater General Permit and implement an erosion control plan to minimize the potential for erosion during construction activities. With these measures, the potential for cumulative erosion impacts from site-specific actions would be minimal. Geologic hazards could affect the export terminal and other cumulative projects in the region, but these impacts would not result from the cumulative projects.

7.3.2.2 Surface Water and Floodplains

Study Area

The study area for cumulative impacts on surface water is the project areas for the On-Site Alternative and Off-Site Alternative, shoreline and nearshore areas along the north bank of the

Columbia River in the project areas, the CDID #1 stormwater system drainage ditches adjacent to the project areas, and the Columbia River extending 1 mile downriver from the project areas. The Barlow Point Master Plan is the only cumulative project located in the study area. Because the Barlow Point Master Plan is located in the Off-Site Alternative project area, land use changes identified in the plan would not occur if the Off-Site Alternative is constructed. Therefore, there are no cumulative projects within the surface water study area for the Off-Site Alternative. The Off-Site Alternative would not result in cumulative impacts on surface water.

The study area for cumulative impacts on floodplains is the 500-year floodplain for the Columbia River within Cowlitz County. The following cumulative projects are located in this study area: Barlow Point Master Plan, Riverside Refinery, Washington Energy Storage & Transfer, the Kalama Manufacturing and Marine Export Facility, Woodland Marine Terminal, SR 432 Rail Realignment and Highway Improvement Project, and the Reynolds Lead and BNSF Spur Improvements.

Cumulative Impacts

The On-Site Alternative would affect surface water during construction by temporarily altering the project area drainage patterns, which could result in localized flooding and increased erosion from redirected sheetflow. Cumulative impacts on drainage patterns during construction are not expected because it is unlikely both projects would be under construction at the same time, and both would be required to implement erosion and sediment control best management practices pursuant to an NPDES Construction Stormwater General Permit.

During operations, the On-Site Alternative would alter water collection and discharge patterns at the project area with the implementation of a new system to collect all stormwater and surface water from the project area. Projects associated with the Barlow Point Master Plan would be located on a parcel adjacent to the On-Site Alternative project area, and construction and operations activities for that project would also alter local drainage and water collection and discharge patterns. Cumulative impacts on water collection and discharge patterns during operations could occur if both the On-Site Alternative and the Barlow Point Master Plan are constructed. The proposed export terminal and projects associated with the Barlow Point Master Plan would be required to develop water management systems consistent with the requirements of an NPDES Industrial Stormwater Permit.

The On-Site Alternative would result in less water discharged to the CDID #1 stormwater system drainage ditches from the project area than under current conditions. This could result in a beneficial indirect impact on the CDID #1 ditches. Therefore, the On-Site Alternative would not contribute to adverse cumulative impacts on the CDID #1 ditches.

Construction of the terminal would also affect surface waters with the placement of piles in the Columbia River and shoreline area. Projects associated with the Barlow Point Master Plan would also likely result in new development along the shoreline and in the Columbia River in the surface water study area. Therefore, the On-Site Alternative, in combination with projects associated with the Barlow Point Master Plan, would contribute to cumulative impacts on surface waters and the shoreline area due to the construction of new in-water structures, which would permanently alter the Columbia River and benthic habitat with the placement of piles. The On-Site Alternative and any cumulative projects resulting in new development in the shoreline area are regulated by the Washington State Shoreline Management Act and the applicable local shoreline master program. Such projects require Shoreline Substantial Development Permits, and potentially, Conditional Use Permits, which can require mitigation to protect shoreline environmental resources.

As discussed in Chapter 5, Section 5.2, *Surface Water and Floodplains*, the On-Site Alternative project area and Off-Site Alternative project area are within the Columbia River 500-year floodplain, but are protected from the 100-year flood event by a levee. Construction and operation of the export terminal and cumulative projects would be unlikely to have any measurable impact on floodplain function during a 500-year flood event due to the extent of floodplain inundation and level of development within this area. Thus, the export terminal and cumulative projects would not decrease flood storage in the 500-year floodplain.

7.3.2.3 Wetlands

Study Area

The cumulative impacts study area for wetlands is the Washington State Water Resources Inventory Area 25, which is the Grays-Elochoman watershed.

The following cumulative projects are located in this study area: the Barlow Point Master Plan (On-Site Alternative only), the Riverside Refinery, Washington Energy Storage & Transfer, Reynolds Lead and BNSF Spur Improvements, and the SR 432 Rail Realignment and Highway Improvement Project.

Cumulative Impacts

As discussed in Chapter 5, Section 5.3, *Wetlands*, constructing the proposed export terminal at the On-Site Alternative location would permanently fill 24.1 acres of wetlands, resulting in the total loss of wetland functions throughout this area. Constructing the proposed terminal at the Off-Site Alternative location would permanently fill 51.28 acres of wetlands. Projects associated with the Barlow Point Master Plan (which would only be cumulative under the On-Site Alternative) would also result in the loss of wetland functions; it is expected that projects associated with the Barlow Point Master Plan would fill a similar amount of wetlands as the Off-Site Alternative. The Reynolds Lead and BNSF Spur Improvements and the SR 432 Rail Realignment and Highway Improvement Project may also result in permanent wetland fill, although an estimate of wetland fill area for these projects is not available at this time. Based on National Wetland Inventory data, the Riverside Refinery and Washington Energy Storage & Transfer would not result in wetland fill in their respective project sites. Therefore, the export terminal, in combination with the cumulative projects, would contribute to cumulative impacts on wetlands related to the filling of wetlands and the permanent loss of wetland functions. The cumulative impacts would be part of an ongoing historical trend of filling wetlands along the Columbia River for development in and around the City of Longview.

For the export terminal, the Applicant would prepare a compensatory mitigation plan in coordination with the U.S. Army Corps of Engineers (Corps), Washington State Department of Ecology (Ecology), and Cowlitz County to help offset the adverse impact on the aquatic ecosystem from permanently filling wetlands at the project site. Cumulative projects resulting in impacts on wetlands might also be required to prepare and implement compensatory mitigation plans, depending on the extent of the impact. Stormwater runoff currently discharging into wetlands that would be impacted by the export terminal and cumulative projects is expected to be redirected to new stormwater facilities associated with the projects. Construction of the export terminal and cumulative projects would also permanently remove habitat functions in filled wetlands. However,

habitat function is relatively low because of the previous industrial development on the sites (except for the Barlow Point Master Plan) and in the surrounding areas.

7.3.2.4 Water Quality

Study Area

The cumulative impacts study area for water quality includes the On-Site Alternative and Off-Site Alternative project areas (including dredged material disposal sites), the CDID #1 stormwater system drainage ditches adjacent to the project areas, the Columbia River downriver 1 mile from each project area, and the dredged material disposal site. The Barlow Point Master Plan is the only cumulative project located in the study area. Because the Barlow Point Master Plan is located in the Off-Site Alternative project area, it would not occur if the Off-Site Alternative is constructed. Therefore, there are no cumulative projects within the water quality study area for the Off-Site Alternative. The Off-Site Alternative would not result in cumulative impacts on water quality.

Cumulative Impacts

During construction, the export terminal could temporarily introduce pollutants due to equipment and material use. During operation, the export terminal could introduce coal and other contaminants such as diesel fuel, oils, and grease. Most operation-related impacts would result from inadvertent spills of contaminants either directly into surface waters or in locations where they could be transported and discharged to surface water or groundwater.

Projects associated with the Barlow Point Master Plan could also introduce pollutants due to construction equipment and material use, or because of releases during operations. However, the export terminal would be required to have a site-specific construction stormwater pollution prevention plan that includes best management practices for material handling and construction waste management to reduce the potential for water quality impacts from these sources (i.e., from spills of contaminants to locations where they would be conveyed to the export terminal's water management system). It is expected similar measures would be required for the cumulative projects, and the likelihood of concurrent releases of contaminants from both projects would be low. Therefore, the export terminal, in combination with projects associated with the Barlow Point Master Plan, would be unlikely to contribute to cumulative impacts on water quality related to the potential release of contaminants. As discussed in Chapter 5, Section 5.5, *Water Quality*, coal dust from operations of the terminal is not expected to have a demonstrable effect on water quality, and thus would not contribute to cumulative water quality impacts.

Construction of the upland portions of the export terminal would not be expected to cause a measurable impact on water clarity, water quality, or designated beneficial uses because of soil disturbance or the introduction of hazardous materials during demolition of existing structures or construction of new structures and facilities. As discussed in Chapter 5, Section 5.5, *Water Quality*, the implementation of best management practices in compliance with the NPDES Construction Stormwater General Permit that would be obtained for the export terminal would reduce the potential for demolition- and construction-related pollutants to enter and contaminate surface waters. Therefore, the export terminal would not contribute to cumulative impacts on water quality due to construction-related upland soil disturbance or structure and facility demolition and construction-related activities.

Construction of the export terminal could temporarily mobilize pollutants or increase turbidity from in-water work such as pile-driving and removal, initial construction dredging and ongoing operations-related maintenance dredging, and flow lane disposal of dredge material. Projects associated with the Barlow Point Master Plan may involve dredging activities and potential flow lane disposal. The potential for cumulative water quality impacts related to dredging and in-water construction would be limited because such activities would be temporary and would only be cumulative if they occur at the same time for both projects.

Projects that involve dredging are required to comply with the Washington's Dredged Material Management Program. Potential cumulative impacts on water quality from in-water and above-water work and dredging would be minimized with the preparation and implementation of a project-specific dredging and disposal quality control plan in compliance with the dredged material management program as required by state (Ecology and Washington State Department of Natural Resources) and federal agencies (the Corps and the U.S. Environmental Protection Agency [EPA]). Authorization of flow lane disposal of dredged material on a project-specific basis requires a sediment suitability determination from the Dredged Material Management Office and a modeling analysis of total suspended solids by the Corps. Adhering to a plan developed in compliance with the dredged material management program would avoid and minimize water quality impacts by ensuring that dredged material is free of hazardous materials in toxic quantities and suitable for in-water disposal. This would ensure potential impacts of the export terminal and cumulative projects are limited to localized temporary increases in suspended sediment and turbidity.

Operation of the export terminal, including discharge of treated stormwater, is not expected to cause a measureable increase in chemical indicators in the Columbia River. Operations would not cause a measurable impact on water quality or biological indicators or affect designated beneficial uses due to contaminants from stormwater runoff. Therefore, the export terminal would not contribute to cumulative impacts on water quality related to stormwater.

Operation of the export terminal could indirectly affect water quality by introducing contaminants from shipping vessels. These impacts could arise from localized scour of the channel bottom and elevated turbidity or pollution associated with propeller wash, ballast water discharges, or fuel spills from vessels. Projects associated with the Barlow Point Master Plan would also introduce increased vessel traffic on the Columbia River. This additional vessel traffic could result in similar impacts on water quality as the export terminal. In particular, a greater number of vessels in the study area could increase the potential for fuel spills from vessels. Therefore, the export terminal, in combination with the cumulative projects, would contribute to cumulative impacts on water quality from vessel transportation.

However, the potential cumulative impacts on water quality related to vessel transportation would be temporary and localized. The cumulative projects would be required to adhere to local, state, and federal regulations intended to minimize potential long-term impacts for individual projects, which would minimize the cumulative impact. Additionally, state and federal regulations regulate the discharge and quality of ballast water, and the large commercial vessels related to the export terminal, as well as cumulative project vessels, would be required to comply with such regulations, thereby minimizing potential cumulative impacts on water quality associated with the discharge of ballast water.

Spills of fuel or other hazardous materials from a vessel could affect water quality based on the location, material spilled, quantity spilled, and response actions taken. Increased vessel traffic could

contribute to cumulative impacts related to a spill. However, when, where, and what materials may potentially be spilled cannot be predicted. A spill could result in a relatively minor release that could be quickly contained and cleaned-up, or a relatively large release that could have long-term and potentially substantial impacts on water quality. Thus, there is a relatively broad range in the intensity of cumulative impacts on water quality that could occur as a result of a spill or release from a vessel.

7.3.2.5 Vegetation

Study Area

The study area for cumulative impacts to vegetation is the project areas and land within 1 mile of the project areas. The following cumulative projects are in this study area: the Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

The cumulative impacts study area also includes the Columbia River from the project area downriver to the mouth of the river to consider the effect of vessel traffic on vegetation along the banks of the river. Any cumulative project that would introduce new vessel traffic to the Columbia River is in this study area (Table 7-4).

Cumulative Impacts

Construction and operation of the On-Site Alternative would permanently alter and/or remove 212 acres of land cover types from the project area. Most of the clearing would affect disturbed vegetation and weedy areas that generally do not support native plant species or provide suitable wildlife habitat. The Off-Site Alternative would remove approximately 225 acres of land cover types. The cumulative projects would also permanently alter and/or remove vegetation from their respective project sites. It is assumed projects associated with the Barlow Point Master Plan would alter or remove a similar area of vegetation as the Off-Site Alternative. The SR 432 Rail Realignment and Highway Improvement Project and Reynolds Lead and BNSF Spur Improvements may also remove vegetation, although vegetation along these transportation corridors is unlikely to provide suitable wildlife habitat. Therefore, the export terminal would contribute to a cumulative impact related to the permanent removal of vegetation within the study area. Among the cumulative projects, the Off-Site Alternative (or projects associated with the Barlow Point Master Plan) would contribute the largest removal of vegetation and wildlife habitat. The cumulative impacts would be part of a trend to remove vegetation for additional development in and around the City of Longview.

Operation of the export terminal would result in indirect impacts on vegetation due to the shoreline erosion from vessel wakes and the disturbance of vegetation during vessel transport. Vessel wakes and associated shoreline erosion of the Columbia River currently occurs due to existing vessel traffic, and operation of the proposed export terminal would increase vessel traffic and potentially increase or intensify the extent and/or rate of shoreline erosion and vegetation loss. As discussed in Chapter 5, Section 5.6, *Vegetation*, the location and extent of shoreline erosion by project-related vessels would depend on various factors such as vessel design, hull shape, vessel weight and speed, angle of travel relative to the shoreline, proximity to the shoreline, currents and waves, and water depth. The potential for shoreline erosion can also be influenced by the slope and physical character of the shoreline (e.g., erodibility of soils), as well as the amount and type of vegetation occurring

along the shoreline. Additional discussion of the shoreline erosion process and factors that influence the process is provided in Chapter 5, Section 5.6, *Vegetation*.

There may be a potential for the proposed terminal to result in shoreline erosion on the thin strip of shoreline vegetation along the northern end of Lord Island (under the On-Site Alternative) or the northeastern end of Walker Island (under the Off-Site Alternative), where large or perpendicular wakes would be more likely. There is also the potential for impacts related to vessel wakes on vegetation along the shoreline of the lower Columbia River as a result of the proposed terminal. The cumulative projects listed in Table 7-4 (except the Woodland Marine Terminal, which would use barges) would introduce additional vessels that would contribute to shoreline erosion. Therefore, the export terminal, in combination with the cumulative projects, would contribute to shoreline erosion and disturbance of vegetation along the lower Columbia River.

Measures that could be implemented to reduce shoreline erosion and impacts to vegetation could include actions outside the control of the Applicant and permitting agencies. These actions include, but are not limited to, soft beach armoring, planting of native vegetation, and bank armoring. In addition, vessel operations in the lower Columbia River are federally regulated with respect to ship size, speed, and navigation. The navigation channel and its maintenance are also managed and regulated at the federal level.

7.3.2.6 Fish

Study Area

The cumulative impacts study area for impacts on fish due to on-site activities includes the On-Site Alternative and Off-Site Alternative project areas and the area extending 300 feet from the dredging area and each dredged material disposal site. The study area also includes the main channel of the Columbia River 3.92 miles upriver and downriver of the project areas (measured from the proposed docks) to account for potential cumulative impacts related to underwater noise, and the Columbia River from the project areas to the mouth of the river, to account for potential cumulative impacts related to vessel traffic.

The following cumulative projects are in these study areas: the Barlow Point Master Plan (On-Site Alternative only), the Riverside Refinery, Washington Energy Storage & Transfer, and any cumulative project that would introduce new vessel traffic to the Columbia River (Table 7-4). Past, present, and future maintenance dredging activities in the Columbia River navigation channel and at nearby industrial sites in Longview are also in this study area.

Cumulative Impacts

As discussed in Chapter 5, Section 5.7, *Fish*, construction and operation of the export terminal would result in the following potential impacts on fish and fish habitat: alteration and removal of aquatic habitat, elevated turbidity, increased underwater noise, increased shading of aquatic habitat, leaks and spills affecting water quality, stranding from vessel wakes, and deposition of coal dust in the aquatic environment.

On-Site Activities

During construction, the export terminal's potential impacts related to alteration and removal of aquatic habitat, elevated turbidity, shading, and leaks and spills would be localized to the project

areas, the proposed dredging area and dredged material disposal sites, and the area extending 300 feet downriver. Projects associated with the Barlow Point Master Plan and future maintenance dredging activities could result in similar impacts as the proposed terminal in this area. Therefore, cumulative impacts on fish from construction activities could occur if the proposed terminal and the Barlow Point Master Plan are under construction at the same time, or if future maintenance dredging activities occur at the same time as terminal construction. The cumulative impacts at any given time would depend on which construction activities are occurring simultaneously and the proximity of those activities. The proposed terminal, cumulative projects, and future maintenance dredging activities would alter and remove aquatic habitat, and would, therefore, contribute to a cumulative impact on aquatic habitat.

Dredging activities for the proposed terminal, cumulative projects, and future maintenance dredging would alter benthic habitat and habitat that may be suitable for eulachon spawning, and would temporarily increase turbidity. However, recolonization of dredged areas by benthic organisms would be relatively rapid (i.e., 30 to 45 days), and disturbed habitats would return to reference conditions following recolonization. The permitting process for the proposed terminal, cumulative projects, and maintenance dredging would impose timing restrictions on dredging activities to avoid and minimize impacts to spawning adult, egg, and larval eulachon. Elevated turbidity during dredging activities would be temporary and localized, and would only be cumulative if activities occurred at the same time and in close proximity.

Operation of the export terminal would result in direct impacts on fish related to increased shading and to potential leaks and spills from vehicles or equipment. Shading would not result in measurable impacts at the population scale. Appropriate training and implementation of prevention and control measures would reduce the potential for leaks and spills that could degrade water quality and thus reduce the potential for such incidents to affect fish and fish habitat. Nonetheless, the export terminal could contribute to cumulative impacts related to increased shading and accidental leaks and spills in combination with the Barlow Point Master Plan, Riverside Refinery, and Washington Energy Storage & Transfer. The potential for spills and leaks would increase as a result of the cumulative projects. The potential impacts from increased overwater shading could result in localized reductions in primary productivity, changes in fish migration, predation and foraging. The potential magnitude of these changes would depend on the aquatic habitat (i.e., shallow water or deep-water habitats). For example, juvenile salmonids tend to migrate along channel margins in shallow water. However, permits issued for the construction of docks tend to require that docks be located over deep-water habitat, or if located in shallow water habitat, provide features such as grating that allow penetration of ambient light or other measures to reduce potential impacts associated with shading such as reduced primary productivity or changes in fish migration, predation or foraging patterns. It is assumed that docks constructed for cumulative projects would meet similar conditions, thereby reducing the potential for substantial cumulative impacts associated with shading.

Fugitive coal dust particles would be generated by the export terminal through the movement of coal into and around the project area as well as during transfer onto vessels or from stockpiles in the project area. There are no cumulative projects in the study area that would also involve coal; therefore, there would be no potential for cumulative impacts on vegetation from coal dust deposition.

Underwater Noise

Underwater noise impacts during pile-driving activities would affect the main channel of the Columbia River 3.92 miles upriver and downriver of the project areas. Projects associated with the Barlow Point Master Plan, Washington Energy Storage & Transfer, and Riverside Refinery could also result in in-water pile-driving activities in or near this area. At this time, it is not known whether these projects would require pile-driving, but this analysis conservatively assumes they would. Cumulative impacts on fish from underwater pile-driving noise could occur if the export terminal is conducting pile-driving activities at the same time as one of the nearby cumulative projects. Simultaneous pile-driving from one or more of the cumulative projects could cumulatively have a negative effect on fish migration, foraging success, rearing, and residence in the Columbia River near these projects as fish avoid areas of elevated underwater noise resulting from pile-driving.

The export terminal and the cumulative projects would comply with mitigation measures imposed through the local, state, and federal permitting process. For those cumulative projects that have a federal nexus, compliance with the federal Endangered Species Act Section 7 consultation process would also be required, which would identify avoidance and minimization measures that would reduce the potential impact on federally protected species. Consultation would also reduce the potential impact on species that are not federally protected, such as species identified by Washington State as threatened, endangered, species of concern, or other special-status species. Reasonable and prudent measures for actions that could adversely affect federally protected species would also be identified through the Section 7 consultation process. Mitigation requirements as well as avoidance and minimization measures would reduce potential impacts associated with underwater noise generated during pile-driving; impacts associated with pile removal; and increased turbidity resulting from dredging, erosion, and sediment transport. Mitigation would also establish appropriate construction timing and general construction practices (e.g., spill containment). These requirements and measures would reduce the potential cumulative impacts of construction activities on fish and fish habitat.

Vessel Traffic

Operation of the export terminal would impact fish via increased underwater noise generated by project related vessels and fish stranding associated with wakes from project-related vessels. The cumulative projects listed in Table 7-4 (except the Woodland Marine Terminal, which would use barges) would introduce additional vessels that would produce wakes that would contribute to fish stranding. In 2038, with full export terminal throughput, it is estimated the export terminal and cumulative projects would represent approximately 37% of the projected vessel traffic volume in the lower Columbia River (Table 7-11). Increased vessel traffic associated with the cumulative projects could increase the potential for fish stranding caused by vessel wakes and behavioral responses to vessel noise. Therefore, the export terminal, in combination with the cumulative projects, would contribute to cumulative impacts related to fish stranding and vessel noise in the Columbia River.

7.3.2.7 Wildlife

Study Area

The study area for cumulative impacts on terrestrial wildlife is the project areas and adjacent, contiguous forestland and intact vegetation communities. The following cumulative projects are in this study area: the Barlow Point Master Plan (On-Site Alternative only), SR 432 Rail Realignment and Highway Improvement Project, and Reynolds Lead and BNSF Spur Improvements.

The study area for cumulative impacts on aquatic wildlife for the On-Site Alternative is the main channel of the Columbia River and extends approximately 5.1 miles upriver and 2.1 miles downriver from the upriver and downriver ends of the proposed docks (Docks 2 and 3), respectively. The study area for cumulative impacts on aquatic wildlife for the Off-Site Alternative is the main channel of the Columbia River and extends approximately 7.1 miles upriver and 6.8 miles downriver from the upriver and downriver ends of the proposed docks), respectively. The following cumulative projects are in these study areas: the Barlow Point Master Plan (On-Site Alternative only), the Riverside Refinery, and Washington Energy Storage & Transfer.

The study area for cumulative impacts on aquatic wildlife also includes the Columbia River from the project areas to the mouth of the river to account for potential impacts related to vessel traffic. Any cumulative project that would introduce new vessel traffic to the Columbia River is in this study area (Table 7-4).

Cumulative Impacts

Terrestrial Wildlife

During construction, the export terminal would result in potential direct impacts on terrestrial wildlife related to the alteration and removal of habitat, temporary displacement or mortality of wildlife, disturbance from construction noise and human activities, and potential contamination from leaks and spills. Projects associated with the Barlow Point Master Plan and the SR 432 Rail Realignment and Highway Improvement Project would be developed and could result in similar impacts in the study area. Therefore, cumulative impacts on terrestrial wildlife from construction activities could occur if the export terminal and the cumulative projects are constructed at the same time. The cumulative impacts at any given time would depend on which construction activities are occurring simultaneously and the proximity of those activities. Wildlife in the project area and adjacent areas are likely habituated to current noise levels and activities associated with industrial areas and are generally mobile. The cumulative impacts of construction activities and construction-related noise could affect individuals of a species but is not anticipated to affect the overall fitness of a population. The On-Site Alternative and projects associated with the Barlow Point Master Plan would both alter and remove terrestrial habitat, and would therefore contribute to an adverse cumulative impact on these habitats. The On-Site Alternative would permanently remove 201.5 acres of terrestrial habitat, of which 151 acres is currently developed. Projects associated with the Barlow Point Master Plan would remove 216.4 acres of habitat, of which 9 acres is currently developed and much of the rest has been altered or degraded by past recreational and agriculture activities. The SR 432 Rail Realignment and Highway Improvement Project may also result in permanent removal of terrestrial habitat, although an estimate of impact area for this project is not available at this time. Overall, much of the terrestrial habitat removed by the proposed terminal and

cumulative projects would be currently developed land that does not provide suitable habitat for many species of wildlife or has already been altered by past activities.

Coal dust would be generated by the export terminal by coal moving through the project area, from unloading coal from rail cars, storing coal on site, and transferring the coal to vessels. There would be no cumulative projects in the study area that would also involve coal; therefore, there would be no potential for cumulative impacts on wildlife from coal dust deposition.

Aquatic Wildlife

During construction, the export terminal would result in potential direct impacts on aquatic wildlife related to the alteration and removal of habitat, disturbance from underwater noise during pile-driving, and potential contamination from leaks and spills. As noted, projects associated with the Barlow Point Master Plan, Washington Energy Storage & Transfer, and Riverside Refinery could also result in in-water pile-driving activities in the aquatic wildlife cumulative impacts study area. At this time, it is not known whether these projects would require pile-driving; this analysis conservatively assumes that they would. Therefore, cumulative impacts on aquatic wildlife from construction activities would be unlikely because they would only occur if the export terminal and cumulative projects are constructed at the same time. The cumulative impacts at any given time would depend on which construction activities occur simultaneously and the proximity of those activities. Cumulative impacts on pinnipeds and diving birds from underwater pile-driving noise could occur if the export terminal is conducting pile-driving activities at the same time as one of the nearby cumulative projects. Impacts on pinnipeds and diving birds would likely result in behavioral shifts and avoidance of those areas where underwater noise from in-water pile-driving would occur.

Operation of the export terminal and cumulative projects would increase vessel traffic in the Columbia River. The export terminal and cumulative projects would increase vessel traffic by 2,932 vessel transits per year, which would represent 37% of the projected vessel traffic volume in the lower Columbia River in 2038 (Table 7-11). This would increase the risk of vessel collisions with pinnipeds. Large vessels transiting the Columbia River generally travel at speeds between 8 and 12 knots. While the behavior of pinnipeds in the path of an approaching vessel is uncertain, it is likely that an individual would have the ability to avoid and swim away from the vessel, considering a vessel's large size (i.e., Handymax and Panamax) and relatively slow speed (less than 14 knots). Additionally, pinnipeds in the Columbia River are likely habituated to vessel traffic and quite capable of avoiding vessels. Therefore, the potential risk for a vessel collision with a pinniped would be low for the export terminal and cumulative projects.

Cumulative impacts on pinnipeds from vessel noise could occur. By 2038, approximately 7,834 vessel transits per year would occur in the Columbia River, including the 1,680 vessel transits associated with the export terminal and 1,252 associated with the cumulative projects. The peak hearing sensitivity frequencies of Steller sea lions, California sea lions, and harbor seals are generally outside of the noise frequencies generated by vessels, and these species would likely be habituated to vessel-generated noise levels in the Columbia River.

The export terminal and the cumulative projects would be required to comply with measures imposed through permits and federal Endangered Species Act Section 7 consultation. Mitigation measures would address pile-driving and removal, dredging and sediment control, construction timing, and general construction practices (e.g., spill containment), as appropriate. These measures would reduce potential cumulative impacts on terrestrial and aquatic wildlife and habitats during construction activities. Chapter 5, Section 5.8, *Wildlife,* identifies the mitigation measures that would

be implemented as part of the export terminal. It is likely that similar measures would be implemented for the cumulative projects, thus reducing the potential impacts in similar ways.

7.3.3 Operations

This section presents potential cumulative impacts for the operations resources.

7.3.3.1 Rail Transportation

Study Area

The study area for cumulative impacts includes the project areas and the rail corridor through the Longview industrial area, which was defined as the Reynolds Lead and BNSF Spur between the project areas and BNSF main line (at Longview Junction). Two cumulative projects at the Port of Longview (Riverside Refinery and Washington Energy Storage & Transfer) would increase rail traffic on the BNSF Spur (Table 7-3).

Methods

Cumulative rail traffic in 2038 on the BNSF Spur and Reynolds Lead was projected by adding the rail traffic for the cumulative projects to the estimated 2038 baseline rail traffic. The cumulative rail transportation analysis considered two scenarios.

- **Cumulative No-Action scenario.** Represents cumulative rail traffic in 2038 without project-related trains.
- **Cumulative export terminal scenario.** Represents cumulative rail traffic in 2038 with project-related trains.

Capacities for the Reynolds Lead and BNSF Spur were estimated using the methods developed by the Association of American Railroads.

Cumulative Impacts

As discussed in Chapter 6, Section 6.1, *Rail Transportation*, the export terminal would have no direct impacts on rail transportation. The export terminal would have indirect impacts on rail transportation because an additional 16 project-related trains per day would travel on the Reynolds Lead and BNSF Spur once the terminal reaches full operational capacity.

This section describes the cumulative impacts on rail transportation with and without project-related trains in 2038. Table 7-5 illustrates the projected trains per day in 2038 on the Reynolds Lead and BNSF Spur by scenario.

Table 7-5. Projected Trains per Day on Reynolds Lead and BNSF Spur in 2038 by Scenario

	Projected Trains Per Day in 2038	
Spur Line	**Cumulative No-Action Scenario**	**Cumulative Export Terminal Scenario**
Reynolds Lead	4.0	20.0
BNSF Spur	9.6	25.6

Two reasonably foreseeable actions at the Port of Longview (Washington Energy Storage & Transfer and Riverside Refinery) would add, on average, 2.6 new rail trips daily on the BNSF Spur. With project-related trains, approximately 25.6 trains would operate on the BNSF Spur in 2038. Trains related to these two projects at the Port of Longview would not operate on the Reynolds Lead. Therefore, rail traffic on the Reynolds Lead would be the same in 2038 as in 2028 (20 trains per day). If the Longview Switching Company (LVSW) does not make improvements to the Reynolds Lead and BNSF Spur, capacity of the Reynolds Lead and BNSF Spur would be approximately 24 trains per day. Without capacity improvements, cumulative rail traffic (25.6 trains per day) would slightly exceed the BNSF Spur's current capacity (24 trains per day). Therefore, the proposed export terminal and cumulative projects combined would have an adverse cumulative impact on rail transportation on the BNSF Spur. LVSW has indicated it is prepared to increase the capacity of the Reynolds Lead and part of the BNSF Spur as a separate future action should that work be warranted by further increases in rail traffic from existing and future customers.

7.3.3.2 Rail Safety

Study Area

The study area for cumulative impacts includes the project areas and the rail corridor through the Longview industrial area, which was defined as the Reynolds Lead and BNSF Spur between the project areas and BNSF main line (at Longview Junction). Two cumulative projects at the Port of Longview (Riverside Refinery and Washington Energy Storage & Transfer) would increase rail traffic on the BNSF Spur (Table 7-3).

Methods

The analysis used the same methods as No-Action and export terminal analyses for 2028, as documented in Chapter 6, Section 6.2, *Rail Safety*.

In 2038, two projects at the Port of Longview (Riverside Refinery and Washington Energy Storage & Transfer) would add, on average, 2.6 new rail trips daily on the BNSF Spur. With project-related trains, approximately 25.6 trains daily would operate on the BNSF Spur in 2038. Trains related to the two projects at the Port of Longview would not operate on the Reynolds Lead. Therefore, rail traffic on the Reynolds Lead would be the same in 2038 as 2028.

The cumulative rail safety analysis considered three scenarios.

- **Cumulative No-Action scenario.** Represents cumulative rail traffic in 2038 without project-related trains.
- **Cumulative export terminal scenario.** Represents cumulative rail traffic in 2038 with project-related trains.

Cumulative Impacts

As discussed in Chapter 6, Section 6.2, *Rail Safety*, the export terminal would have no direct impacts on rail safety but could have indirect impacts on rail safety because project-related trains traveling on the Reynolds Lead and BNSF Spur would increase the potential for train accidents.

This section describes the potential cumulative impacts on rail safety with and without project-related trains in 2038. Table 7-6 illustrates the estimated accidents per year by scenario.

The Federal Railroad Administration (FRA) accident reporting threshold was $10,500 in 2015, which means any incident of $10,500 or more is classified as an accident. Therefore, accidents include a wide a variety of incident types and severities, and are not limited to collisions or derailments.

Table 7-6. Predicted Train Accidents per Year by Cumulative Export Terminal Scenario in 2038

Route Segment	Miles	Predicted Accidents Per Year in 2038	
		Cumulative No-Action Scenario	Cumulative Export Terminal Scenario
BNSF Spur	2.1	0.09	0.24
Reynolds Lead	5.0	0.09	0.44

The predicted number of accidents on the Reynolds Lead and BNSF Spur without project-related trains is 0.18 per year, or one accident every 5 to 6 years. The predicted number of accidents on the Reynolds Lead and BNSF Spur with project-related trains is 0.68 per year. As described in Section 7.3.3.1, *Rail Transportation*, LVSW has indicated it would expand capacity to meet projected volume from existing and future customers. This analysis assumes the Reynolds Lead and BNSF Spur would be upgraded to meet Track Class 2 requirements. However, if the Reynolds Lead and BNSF Spur are not improved to Track Class 2 standards, the estimates for the Reynolds Lead and BNSF Spur would be approximately 1.5 to 3 times higher. In summary, the export terminal and the cumulative projects would increase the predicted train accident rate on the Reynolds Lead and BNSF Spur.

7.3.3.3 Vehicle Transportation

Study Area

The study area for cumulative impacts includes the project areas and the arterials and secondary roads in the vicinity of the Longview industrial area along the Columbia River between the project area and Interstate 5. For the purposes of the analysis, this includes the active public and private at-grade crossings at the Reynolds Lead and BNSF Spur. Vehicle traffic generated by the cumulative projects in the study area is assumed to be included in the annual traffic growth rate used to perform the analysis as described below.

Methods

This section describes the methods used to evaluate the potential cumulative impacts on vehicle transportation in the study area.

Analysis Scenarios

The following scenarios were analyzed.

- **Cumulative No-Action scenario**. This scenario represents conditions in 2038 without construction of the export terminal. It includes 10 years of added vehicle growth from 2028 conditions. It also assumes existing and planned activities for the Applicant's bulk product terminal as defined in Chapter 3, *Alternatives*.
- **Cumulative export terminal scenario**. This scenario represents conditions in 2038 with all cumulative projects, including the export terminal. It includes 10 years of added vehicle growth

from 2028 conditions. It also assumes existing and planned activities for the Applicant's bulk product terminal as defined in Chapter 3, *Alternatives* under either the On-Site Alternative or Off-Site Alternative.

Vehicle and Train Volumes

The following sections describe the methods to establish vehicular and train volumes for the analysis scenarios.

Vehicles

Table 7-7 shows the average daily traffic and PM peak hour (hereinafter referred to as peak hour) traffic data for all study crossings in 2038. Future traffic volumes for 2038 included a combination of background traffic and vehicular traffic associated with the export terminal.

Background traffic was estimated by developing a linear growth rate between existing and forecast traffic volumes in the immediate area. Traffic volumes are forecast to increase at a rate of 2% annually. For comparison purposes, a 2% annual growth rate was applied to traffic count data to reflect baseline traffic conditions in the *SR 432 Highway Improvements and Rail Realignment Study* (Cowlitz-Wahkiakum Council of Governments 2014). The 2% annual growth rate was applied to the 2028 No-Action scenario traffic volumes for 10 years to develop 2038 Cumulative No-Action scenario traffic volumes. Vehicular traffic related to the export terminal were added to the 2038 Cumulative No-Action scenario to develop the 2038 Cumulative Export Terminal scenario traffic volumes.

Trains

Cumulative rail traffic on the BNSF Spur and Reynolds Lead was developed by adding the rail traffic for all cumulative projects to baseline rail traffic. As described in Section 7.3.3.1, *Rail Transportation*, two reasonably foreseeable actions at the Port of Longview (Riverside Refinery and Washington Energy Storage and & Transfer) would add an average of 2.6 trains daily to the Dike Road crossing on the BNSF Spur. Rail traffic on the Reynolds Lead in 2038 would be the same as 2028. Table 7-7 illustrates the number of trains for each 2038 Cumulative Export Terminal scenario on the Reynolds Lead and BNSF Spur.

Table 7-7. Motor Vehicle and Train Volumes at Study Crossings in 2038

Crossing Name (USDOT Crossing ID)	Time Period	2038 Cumulative No-Action Scenario		2038 Cumulative Export Terminal Scenario	
		Vehicle	Train	Vehicle	Train
Project area access at 38th Avenue	Per Day	300	4.0	1,400	20.0
	Peak Hour	30	1.0	140	2.0
Weyerhaeuser access at Washington Way	Per Day	4,500	4.0	4,500	20.0
	Peak Hour	450	1.0	450	2.0
Weyerhaeuser NORPAC access	Per Day	950	4.0	950	20.0
	Peak Hour	95	1.0	95	2.0
Industrial Way (SR 432) (101806G)	Per Day	12,800	4.0	13,450	20.0
	Peak Hour	1,280	1.0	1,345	2.0
Oregon Way (SR 433) (101805A)	Per Day	21,800	4.0	22,050	20.0
	Peak Hour	2,180	1.0	2,205	2.0
California Way (101821J)	Per Day	5,600	4.0	5,600	20.0
	Peak Hour	560	1.0	560	2.0
3rd Avenue (SR 432) (101826T)	Per Day	24,150	4.0	24,350	20.0
	Peak Hour	2,415	1.0	2,435	2.0
Dike Road (101791U)	Per Day	1,300	9.7	1,300	25.7
	Peak Hour	130	1.0	130	2.0

Performance Measures

Unlike passenger trains, freight trains do not run on a schedule. Railroad companies evaluate each situation and dispatch trains based on a number of criteria, including available crew, number of cars, cost of fuel, and overall revenue. Analysis and projection of rail impact operations requires analyzing the rail traffic and developing typical operations. To analyze the highest potential vehicle delay impacts that could occur related to the export terminal, an analysis of vehicle delay during the peak traffic hour was completed. The following performance measures were used to assess adverse vehicle transportation cumulative impacts.

- **Level of service:** A study crossing that would operate below level of service D under the Cumulative Export Terminal scenario that would not otherwise operate below level of service D under the Cumulative No-Action scenario for the same year.
- **Queuing:** An estimated queue length that would extend from a study crossing that exceeds available storage length under the Cumulative Export Terminal scenario that would not otherwise exceed the available storage length under the Cumulative No-Action scenario from the same year.
- **Vehicle safety:** A study crossing that would have a predicted accident probability above 0.04 accident per year under the Cumulative Export Terminal scenario that would be at or below 0.04 accident per year under the Cumulative No-Action scenario.

Chapter 6, Section 6.3, *Vehicle Transportation*, describes these performance measures in more detail.

Cumulative Impacts

As described in Chapter 6, Section 6.3, *Vehicle Transportation*, the export terminal would not result in direct impacts on vehicle transportation in the project area. The export terminal would have adverse vehicle delay and vehicle safety impacts at selected at-grade crossings on the Reynolds Lead and BNSF Spur. The following section describes the cumulative impacts for the Cumulative Export Terminal scenario.

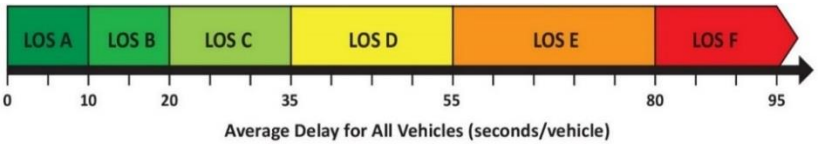
Average Vehicle Delay

Table 7-8 shows the estimated average delay per vehicle and level of service that would be experienced during a 24-hour period at the study crossings along the Reynolds Lead and BNSF Spur in 2038.

Table 7-8. Estimated 24-Hour Average Level of Service at Reynolds Lead and BNSF Spur Study Crossings in 2038 by Scenario[a]

Crossing	Cumulative No-Action Scenario	Cumulative Export Terminal Scenario
Project Area Access at 38th Avenue	A	**F**
Weyerhaeuser Access at Washington Way	A	C
Weyerhaeuser NORPAC Access	A	B
Industrial Way (SR 432)	A	A
Oregon Way (SR 433)	A	A
California Way	A	B
3rd Avenue (SR 432)	A	B
Dike Road	A	C

Notes:



[a] **Bolded, shaded gray** values indicate an adverse vehicle delay impact (a study crossing that operates below level of service D under the Cumulative Export Terminal scenario that would not otherwise operate below level of service D under the Cumulative No-Action scenario for the same year).

The export terminal would increase the average delay per vehicle from up to 10 seconds (level of service A) to up to 35 seconds per vehicle (level of service C), except the project area access opposite 38th Avenue, which would experience an average vehicle delay of greater than 80 seconds (level of service F).

Peak Hour Vehicle Delay

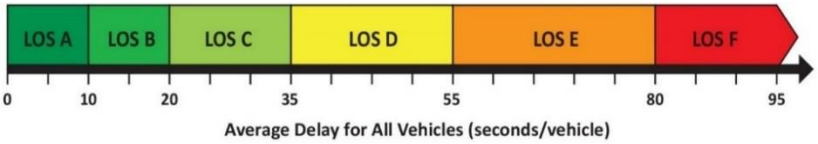
This analysis evaluates the potential impacts if 2 project-related trains travel during the peak vehicle traffic hour as a potential worst-case analysis for vehicle delay. It is unlikely 2 project-related trains would travel during every peak hour. Vehicle delay at study crossings would be lower than presented in this subsection if project-related trains travel outside of the peak hour (during the other 23 hours of the day) or if only one project-related train travels during the peak hour. The 24-hour average analysis in the previous subsection represents the average delay for all drivers and is more representative of potential cumulative vehicle delay at the study crossings.

Table 7-9 shows the estimated peak hour vehicle delay at the study crossings on the Reynolds Lead and BNSF Spur by scenario in 2038 if 2 project-related trains travel during the peak hour. The average delay for all drivers during the peak hour would be more than 55 seconds (level of service E or F) at four of the eight study crossings (including two public crossings) if 2 project-related trains travel during the peak hour. No study crossings would operate below level of service D without project-related trains.

Table 7-9. Estimated Peak Hour Level of Service at Reynolds Lead and BNSF Spur Study Crossings in 2038 by Scenario[a]

Crossing	Cumulative No-Action Scenario	Cumulative Export Terminal Scenario[b]
Project Area Access at 38th Avenue	B	**F**
Weyerhaeuser Access at Washington Way	A	**E**
Weyerhaeuser NORPAC Access	A	C
Industrial Way (SR 432)	A	D
Oregon Way (SR 433)	A	C
California Way	A	D
3rd Avenue (SR 432)	B	**E**
Dike Road	C	**E**

Notes:



[a] **Bolded, shaded gray** values indicate an adverse vehicle delay impact (a study crossing that operates below level of service D under the Cumulative Export Terminal scenario that would not otherwise operate below level of service D under the Cumulative No-Action scenario for the same year).

[b] This level of service would occur if 2 project-related trains travel during the peak hour, represents a potential worst-case scenario, and would not occur daily.

Vehicle Queuing

Increased vehicle delay from trains blocking grade crossings can have secondary impacts on nearby intersections. As vehicles begin to queue while waiting for the crossing to open, increased roadway congestion can affect upstream intersections. Table 7-10 illustrates the grade crossings with an estimated queue that would exceed the available storage length during the peak hour. Two queue lengths during the peak hour are estimated to exceed the available storage length under the Cumulative Export Terminal scenario (with project-related trains) that would not be exceeded under the Cumulative No-Action scenario (without project-related trains). Vehicles would exceed available storage lengths and would affect vehicle delay but would not be expected to block access driveways to adjacent land uses.

Table 7-10. Estimated Cumulative Peak Hour Vehicle Queue Lengths in 2038 by Scenario[a]

Crossing Name	Road Movement[b]	Estimated Queue Length at Crossing (feet)		Intersection Affected by Queue from Crossing	Intersection Movement[c]	Estimated Queue Length at Intersection (feet)	
		2038 Cumulative No-Action	2038 Cumulative			2038 Cumulative No-Action	2038 Cumulative
Project Area Access at 38th Avenue	Northbound	40	1,100	Industrial Way/ 38th Avenue	Westbound Left	20	200
	Southbound	20	220		Eastbound Right	20	20
Weyerhaeuser Access at Washington Way	Northbound	580	1,200	Industrial Way/ Washington Way	Westbound Left	160	180
					Eastbound Right	40	60
	Southbound	180	320		Southbound Through	100	300
Weyerhaeuser NORPAC Access	Northbound	80	160	Industrial Way/ NORPAC Access	Westbound Left	20	20
	Southbound	20	20		Eastbound Right	20	20
Industrial Way	Northbound	380	500	Industrial Way/ Weyerhaeuser	Eastbound Left	180	360
	Southbound	340	880		Northbound Through	260	380
Oregon Way	Northbound	2,220	3,220	Industrial Way/ Oregon Way	Northbound Through	2,000	3,000
					Eastbound Left	240	300
					Westbound Right	100	100
	Southbound	1,320	2,820	Oregon Way/ Alabama Street	Eastbound Right	120	120
					Westbound Left	100	100
					Southbound Through	620	2,120
California Way	Northbound	140	280	Industrial Way/ California Way	N/A	N/A	N/A
	Southbound	200	500				
3rd Avenue	Northbound	600	1,580	3rd Avenue/ Industrial Way	Westbound Right	60	100
					Northbound Through	200	1,180
				Industrial Way/ California Way	Southbound Left	N/A	160
	Southbound	1,260	3,200		Northbound Right		80
					Eastbound Through		940
Dike Road	Northbound	60	180	None	N/A	N/A	N/A
	Southbound	100	240				

Notes:
[a] Shaded gray values indicate a study crossing or intersection queue that exceeds available storage for the scenario. Shaded black values indicate an adverse queuing impact.
[b] Roadway movement approaching the rail crossing.
[c] Movement at nearby intersection affected by queue from rail crossing; N/A = data not applicable.

Vehicle Safety

An accident prediction analysis was conducted using the FRA GradeDec.Net web-based software. GradeDec.Net contains a predicted accident frequency model based on the U.S. Department of Transportation accident prediction and severity formula. The following sections provide the findings by scenario.

- **Cumulative No-Action scenario.** No study crossings were estimated to have a predicted accident probability above 0.04 accident per year, the benchmark used for the analysis, with existing crossing safety protection. There would be no adverse cumulative vehicle safety impact under this scenario.
- **Cumulative Export Terminal scenario.** The predicted accident probability was estimated to be above 0.04 accident per year, the benchmark used for the analysis, with existing crossing safety protection at the 3rd Avenue (SR 432) study crossing along the Reynolds Lead. There would be an adverse cumulative vehicle safety impact at this crossing under this scenario.

7.3.3.4 Vessel Transportation

This section discusses potential cumulative impacts on vessel transportation.

Study Area

The cumulative impacts study area for vessel transportation consists of the area within 1 mile of the proposed docks, where docking and undocking maneuvers and vessel moorage activities would occur, as well as the lower Columbia River to Vancouver, Washington.[4] Cumulative projects that would introduce new vessel traffic to the lower Columbia River are included in this study area (Table 7-4).

Methods

This section focuses on large commercial vessels, excluding fishing vessels and smaller commercial passenger vessels, calling at ports in the study area. These are primarily cargo vessels, ships and barges carrying various cargo (i.e., dry bulk, automobiles, containers, bulk liquids, and other general cargo).

Future vessel traffic volumes were projected for 2038 conditions without the export terminal (2038 Cumulative No-Action scenario) and with the export terminal (2038 Cumulative Export Terminal scenario). The 2038 Cumulative No-Action scenario vessel traffic projection applied a 1% annual growth rate to the 2014 baseline vessel traffic data for all vessel categories and added the anticipated vessel transits for the cumulative projects presented in Table 7-4. The 2038 Cumulative Export Terminal scenario applied the same 1% annual growth rate to the 2014 baseline vessel traffic data for all vessel categories, added the anticipated vessel transits for the cumulative projects, and added the projected vessel transits for the export terminal.[5] For each of these scenarios,

[4] For purposes of this EIS, the lower Columbia River ends at the landward limit of the Territorial Sea, which is a line drawn between the seaward tips of the North Jetty and South Jetty. The Port of Vancouver is the furthest upriver port receiving large commercial vessels.

[5] The projection of incident frequencies is based on a larger number of vessel transits than projected using this methodology and, therefore, provides a conservative assessment.

incident frequencies and the likelihood of a bunker oil spill and volume were estimated using a model. In addition to the vessel transit projections, the model used environmental data (wind, visibility, and sea-state data).

Cumulative Impacts

The export terminal would result in indirect impacts on the vessel transportation system along the Columbia River navigation channel due to vessel operations. These impacts could include increased risks of vessel allision (with fixed object), other incidents (collisions, groundings, or fires), and oil spills. The cumulative projects that would add vessel traffic to the study area would have a similar potential to affect the vessel transportation system along the Columbia River navigation channel due to vessel operations. Therefore, the export terminal, in combination with the cumulative projects, would contribute to cumulative impacts on vessel transportation.

2038 Vessel Traffic

As shown in Table 7-11, the 2038 Cumulative No-Action scenario includes a total of 6,206 vessel transits in the study area. The 2038 Cumulative Export Terminal scenario includes 7,834 vessel transits in the study area. For comparison, the historical peak vessel traffic years for the Columbia River were 1999 with 2,269 calls (4,538 transits) based on vessels entry and transit data (Washington State Department of Ecology 2014) and 1979 with 2,376 calls (4,752 transits), based on the Bar Pilots' data (Jordan pers. comm.).

Table 7-11. 2038 Cumulative Vessel Trips per Year

Annual Vessel Transits[a]	2038 Cumulative No-Action Scenario (Cumulative Projects and Projected Growth Rate)	2038 Cumulative Export Terminal Scenario
2038 Baseline[b]	4,902	4,902
Cumulative Projects	1,252	1,252
No-Action Alternative/Export Terminal	52	1,680
Total Vessel Transits	**6,206**	**7,834**

Notes:
[a] Vessel transits represent one-way trips.
[b] A projected growth rate of 1% per year was applied to the 2014 baseline vessel traffic data.
Source: DNV GL 2016.

Vessel Incidents in the Project Area

During operations, the export terminal would result in direct impacts due to an increased risk of vessel emergency while at the proposed docks for the On-Site Alternative (Docks 2 and 3) and Off-Site Alternative (Docks A and B). The increased risk of vessel emergency would be related to export terminal vessels and would not be affected by cumulative project vessels. Therefore, the increased risk of vessel emergency at the dock would not contribute to cumulative impacts.

As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, the export terminal would result in the potential for another vessel to allide with a project vessel. An allision entails a vessel striking a fixed structure, such as another vessel striking a vessel at berth. Increased vessel traffic from the cumulative projects and background vessel traffic growth could result in an increased risk of an allision with a terminal vessel at the proposed new docks. The likelihood of an allision under these

circumstances in the 2038 Cumulative Export Terminal scenario would be once in 25 years (DNV GL 2016). As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, the magnitude of the incident could vary from little to no damage to greater consequence events. As shown in Table 6.4-10 of Section 6.4, *Vessel Transportation,* there were 56 vessel allisions in the study area from 2001 to 2014. Of these just over half (52%) resulted in no damage. Of the remaining incidents, 43% resulted in some level of damage and 5% result in total loss (all fishing vessels). More substantial consequences, such as total vessel loss, would be less likely to occur (5% of the total incidents reviewed resulted in total loss due to fishing vessel allisions only) based on a data survey of allisions in the study area (2001 to 2014).[6]

Vessel Incidents in the Study Area

As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, there is a potential for project-related vessel traffic to affect or be affected by other vessel movements in the study area. The factors that influence the potential for incidents during vessel transport are complex but are driven largely by changes in the pattern of vessel traffic, particularly those vessels limited to the navigation channel (i.e., deep-draft vessels). Incidents with the potential to occur in the study area during vessel transit include allision, collision, grounding (powered or drift), or fire and can involve vessels limited to the channel (i.e., deep-draft vessels) and other typically smaller vessels (e.g., recreational boats or commercial fishing vessels). In addition, increased traffic related to the export terminal has the potential to result in increased risk of oil spills from these incidents and from spills during bunkering in the study area.

As noted above, the cumulative projects would increase vessel traffic and would contribute to the potential for marine incidents in the study area. A quantitative risk assessment was completed to model the projected increase in risks for both the 2038 Cumulative No-Action scenario and the 2038 Cumulative Export Terminal scenario (DNV GL 2016).

This section describes the cumulative increases in risk that could result from the export terminal in combination with the cumulative projects. The cumulative increase in risk for the 2038 Cumulative No-Action scenario is also described.

Vessel Allision during Transit

As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, the likelihood of a vessel allision is low in the Columbia River because there are few impediments close to the edge of the navigation channel. There were 56 vessel allisions in the study area from 2004 to 2014 (DNV GL 2016). Just over half of the allision incidents (52%) resulted in no damage, 43% resulted in some level of damage and 5% resulted in total loss. Because of the low risk associated with vessel allisions involving large commercial vessels that result in damage, the cumulative risks were not quantitatively evaluated in the risk assessment. Given the increase in vessel traffic volumes in the 2038 Cumulative No-Action scenario and the 2038 Cumulative Export Terminal scenario, both scenarios would result in an increase in the risk of vessel allisions compared to existing conditions. However, it is not expected that the export terminal and cumulative projects would substantively change the outcome distribution of vessel allision incidents. In other words, in both the 2038 Cumulative No-Action scenario and 2038 Cumulative Export Terminal scenario, about half of the vessel allision incidents would be expected to result in no damage, and a very small proportion

[6] The data also show that between 2001 and 2014, 4% of the allisions resulting in some damage were bulk carrier allisions.

would result in total loss of a vessel. Therefore, the overall cumulative risks related to allisions would remain low.

Other Incidents during Transit

The risks of other incidents, such as collisions, groundings, or fires in the study area would increase under both the 2038 Cumulative No-Action scenario and the 2038 Cumulative Export Terminal scenario due to the increase in the number of vessels in the study area. Table 7-12 provides a summary of the results of the quantitative risk assessment for cumulative conditions and for 2028 conditions with just the terminal vessel traffic.[7]

Table 7-12. Likelihood of Incident Related to the Export Terminal and Cumulative Projects in 2038

	Predicted Annual Incident Frequency				
Scenario	Collision	Powered Grounding	Drift Grounding	Fire	Total
2028 Export Terminal	2.91	14.40	3.60	0.0040	20.90
2038 Cumulative No-Action	3.95	16.50	4.22	0.0047	24.70
2038 Cumulative Export Terminal	4.42	17.30	4.54	0.0051	26.30
Incremental Increase (2038 Cumulative No-Action to 2038 Cumulative)	0.47	0.80	0.32	0.0004	1.60

Notes:
The projection of incident frequencies is based on a larger number of vessel transits in the study area than presented in Table 7-11, and therefore provides a conservative assessment of the predicted annual incident frequency.
Source: DNV GL 2016

As shown in Table 7-12, the likelihood of all incidents would increase over time as the volume of vessel traffic in the study area increases unrelated to the export terminal. The 2038 Cumulative Export Terminal scenario would have the highest vessel traffic, and thus has the greatest predicted incident frequency. As discussed above, the 2038 Cumulative Export Terminal scenario accounts for vessel traffic associated with projected background growth and the cumulative projects. The most frequent incident would be a powered grounding and the least frequent incident would be a fire. The consequences of a modeled incident can vary greatly from no damage to total loss and an increase in likelihood alone is not representative of the magnitude of the potential consequences. In other words, not all of these incidents are likely to result in notable damages.

Overall, the export terminal, in combination with the cumulative projects, would contribute to a cumulative increase in predicted vessel incident frequency in the study area. The modeling predicts approximately 26.30 incidents per year in 2038 Cumulative Export Terminal scenario conditions, compared to 24.70 incidents in 2038 Cumulative No-Action scenario conditions. Groundings (powered and drift) are projected to account for 21.84 of the incidents (17.30 powered groundings and 4.54 drift groundings). The export terminal's incremental contribution to this cumulative impact would be small, approximately 1.6 incidents per year over the 2038 Cumulative No-Action

[7] This analysis uses the 2038 projected cumulative vessel transits from the *SEPA Millennium Bulk Terminals-Longview Draft Environmental Impact Statemen*t (Cowlitz County and Washington State Department of Ecology 2016), which considered a larger number of vessel transits within the study area than this Draft EIS, and is therefore a conservative cumulative vessel incident analysis.

scenario. As shown in Table 7-12, the likelihood of all incidents would be substantially higher in the 2038 Cumulative No-Action scenario than in the 2028 Export Terminal condition due to the increase in vessel traffic associated with the cumulative projects and projected background growth unrelated to the export terminal.

Oil Spills (Fuel)

As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, risks of fuel (oil) spills during transit could occur as the result of an incident or during the transfer of fuel onboard. If an incident occurred that resulted in an impact near the stern of a vessel, there is a possibility that a fuel tank could be damaged and fuel spilled. Oil spills could also occur during bunkering (refueling) at anchorages in the study area. In general, the risks of oil spills would increase under the 2038 Cumulative Export Terminal scenario due to the increase in the number of vessels in the study area. To provide additional information about the relative likelihood of various sized oil spills, the risk assessment quantitatively evaluated the increase in risks in the 2038 Cumulative Export Terminal scenario.

Table 7-13 presents the likelihood (in return period years) of different spill sizes that are most likely to occur as a result of the increased risk of collisions or groundings with vessel traffic from the export terminal and the cumulative projects in 2038. As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, oil spills could also occur as a result of a grounding incident. The risk of an oil spill due to a grounding were quantified for export terminal vessels only, which would remain constant between 2028 and 2038 (840 vessel calls per year). Therefore, the risk of an oil spill due to grounding would be the same in 2038 and is 2028 (Table 6.4-17 in Chapter 6, Section 6.4, *Vessel Transportation*).

Table 7-13. Likelihood of Different Oil Spill Sizes from Collisions Related to the Export terminal and Cumulative Projects in 2038

Predicted Return Period (Once in…)	Oil Spill Volume (gallons)
222 years	Greater than 0
224 years	20,900 gallons or less
381 years	59,300 gallons or less
444 years	107,400 gallons or less
2,461 years	166,500 gallons or less

Notes:
Source: DNV GL 2016

As shown in Table 7-13 the likelihood of oil spills from collisions would be relatively low in the 2038 Cumulative Export Terminal scenario, with the most likely scenario occurring once every 224 years with a spill of 20,900 gallons or less. In comparison, the return period of the same size spill in 2028 with just the export terminal (without the cumulative projects) would be once every 341 years (Table 6.4-16 in Chapter 6, Section 6.4, *Vessel Transportation*).

As noted in Chapter 6, Section 6.4, *Vessel Transportation*, spills in the study area from 2004 to 2014 have ranged from 0.1 gallon to 1,603 gallons, with 84% having a volume of less than 10 gallons. Spills of more than 100 gallons have occurred at a frequency of 0.4 per year or once every 2.2 years. The average size of these relatively larger spills is approximately 630 gallons. A collision that results in an oil spill would be a serious incident with a spill size greater than historical oil spill incidents. This is because a collision that results in an oil spill must strike the location of the oil tank on the vessel with sufficient energy to puncture it. Such an incident would result in a large spill. In general,

the cumulative increase in vessel traffic would also result in an increase in the likelihood of these smaller spills.

As discussed in Chapter 6, Section 6.4, *Vessel Transportation*, an amendment to Maritime Air Pollution from Ships Annex that went into effect in 2007 included a new regulation 12A on oil fuel tank protection. The regulation limits an individual fuel tank to a maximum capacity limit of 3,270 cubic yards (15,725 barrels) and also includes requirements for the protected location of the fuel tanks and performance standards for accidental oil fuel outflow. These requirements can help reduce the extent of releases in the event of a vessel incident.

Overall, the export terminal would contribute to an increase in the likelihood of an oil spill; however, the relative contribution of the export terminal to the overall risk would decline over time (as the cumulative total of trips increased) and the risks in general, due to a vessel incident, would remain low.

Other Impacts

Increased vessel traffic associated with the export terminal and cumulative projects would also have the potential to result in cumulative impacts related to vessel wake, propeller wash, underwater noise and vibration, discharge of ballast water, and shoreline erosion. These potential cumulative impacts are addressed in Section 7.3.2.2, *Surface Water and Floodplains*; Section 7.3.2.4, *Water Quality*; Section 7.3.2.5, *Vegetation*; Section 7.3.2.6, *Fish*, and Section 7.3.2.7, *Wildlife*. These vessel-related cumulative impacts are particularly complex and depend on a variety of interrelated factors. In general, the increase in deep-draft vessels associated with the export terminal and cumulative projects would result in the increased potential for vessel-related cumulative impacts to occur.

7.3.3.5 Noise and Vibration

This section discusses potential cumulative noise impacts. Based on the analysis in Chapter 6, Section 6.5, *Noise and Vibration*, the export terminal would have negligible vibration impacts during operations. For this reason, only the potential cumulative noise impacts in the project area and rail and vessel operations are discussed in this section.

Study Area

The study area for the cumulative noise impacts is defined as the On-Site Alternative and Off-Site Alternative study areas and the Reynolds Lead and BNSF Spur rail corridor. The study area for noise and vibration also includes the Columbia River to account for cumulative vessel noise impacts. Two cumulative projects (Riverside Refinery and Washington Energy Storage & Transfer) would increase rail traffic on the BNSF Spur (Table 7-3).

Methods

Two cumulative projects at the Port of Longview (Riverside Refinery and Washington Energy Storage & Transfer) would increase rail traffic on the BNSF Spur. A qualitative assessment was performed to assess the potential cumulative noise impacts at noise-sensitive receptors near the BNSF Spur.

An assessment of vessel noise was performed by identifying the potential noise exposure at varying distances from the Columbia River navigation channel.

Cumulative Impacts

As described in Chapter 6, Section 6.5, *Noise and Vibration*, noise from export terminal operations is projected to exceed the Washington State noise standard at one residence for the On-Site Alternative and two residences for the Off-Site Alternative. The addition of project-related trains on the Reynolds Lead would increase noise to levels that would exceed applicable noise level criteria at noise-sensitive receptors including residences near the Reynolds Lead. These noise levels would range from noticeable to highly annoying depending on location. Project-related vessels would emit noise on the Columbia River, primarily from ventilation systems, engine operation, and foghorns.

Terminal Operations

There are no cumulative projects near the residences where noise levels would be exceeded with export terminal operations for the On-Site Alternative (one residence) and Off-Site Alternative (two residences). The Barlow Point Master Plan identifies potential land use changes near these residences, but no specific land use actions have been proposed at the Barlow Point site. Therefore, the 2028 On-Site Alternative noise levels at these residences presented in Chapter 6, Section 6.5, *Noise and Vibration*, would be the same in 2038.

Rail

Rail traffic on the Reynolds Lead would be the same in 2038 as 2028 (approximately 20 trains per day). Therefore, the estimated 2028 noise levels presented in Chapter 6, Section 6.5, *Noise and Vibration*, would be the same in 2038.

There is the potential for decreased train horn noise near the Oregon Way and Industrial Way crossings of the Reynolds Lead. The *SR 432 Highway Improvements and Rail Realignment Study* completed in September 2014 (Cowlitz-Wahkiakum Council of Governments 2014) identified various design concepts for rail and highway improvements to improve safety, mobility, congestion, and freight capacity. The top project that emerged from the study was a grade-separated intersection at the Industrial Way/Oregon Way intersection (SR 432/SR 433 intersection). This project, called the Industrial Way/Oregon Way Intersection Project led by Cowlitz County, is currently in the preliminary design and NEPA and SEPA environmental review phase to address traffic congestion, freight mobility, and safety issues at this intersection. The 2015 transportation package passed by the Washington State Senate includes $85 million to construct the preferred alternative identified after the conclusion of the NEPA and SEPA processes for that project. If the project grade-separates the Oregon Way and/or Industrial Way crossings of the Reynolds Lead, freight trains on the Reynolds Lead would not be required to sound train horns for public safety, which would decrease rail-related noise levels at these crossings.

Two reasonably foreseeable actions at the Port of Longview (Riverside Refinery and Washington Energy Storage & Transfer) would add approximately 2.6 trains daily to the BNSF Spur. Trains would travel from Longview Junction to the Port of Longview and would not travel on the Reynolds Lead. In total, approximately 25.7 trains daily would travel on the BNSF Spur in 2038. The only noise-sensitive-receiver near the BNSF Spur is Gerhart Gardens Park located north of SR 432. The relative increase in noise exposure level from the addition of 2.6 trains to the BNSF Spur would be approximately 0.5 A-weighted decibels (dBA), which is within measurement error and prediction accuracy. A measurable increase in noise is also unlikely to result due to vehicle-related noise from SR 432 located between the BNSF Spur and the Gerhart Gardens Park, and acoustical shielding

provided by a highway embankment. Therefore, no cumulative noise impacts related to rail noise at Gerhart Gardens Park are anticipated.

Vessels

Project-related vessel traffic would be approximately 70 ships per month or approximately 840 ships per year in 2038 (1,680 one-way transits). As shown in Section 7.3.3.4, *Vessel Transportation*, vessel traffic is projected to increase approximately 1% annually plus vessel traffic related to the cumulative projects.

Table 7-14 illustrates the potential noise level from project-related vessel traffic at various perpendicular distances from the Columbia River navigation channel. The cumulative noise exposure from each project-related vessel trip was assumed to be similar to the noise exposure from all cumulative vessel noise traffic. The estimated noise exposure from project-related vessel traffic would be comparable or less than ambient noise levels at the noise-sensitive receivers and would, therefore, not be expected to result in any cumulative noise impacts at noise-sensitive receivers.

Table 7-14. Potential Noise Exposure Levels from Vessel Traffic at Various Perpendicular Distances from the Columbia River Navigational Channel

Distance (feet)	Day-Night Sound Level (L_{dn})
400	44
600	40
800	38
1,000	36
1,200	34
1,400	33
1,600	32

7.3.3.6 Air Quality

This section discusses potential cumulative impacts on air quality.

Study Area

The study area for the cumulative impacts on air quality includes the On-Site Alternative and Off-Site Alternative project areas, Reynolds Lead and BNSF Spur rail corridor, and the lower Columbia River. The Washington Energy Storage & Transfer and Riverside Refinery cumulative projects are in this study area because these projects would increase rail traffic on the BNSF Spur. Any cumulative project that would add vessel traffic to the lower Columbia River is in the study area (Table 7-4).

Methods

The air quality assessment for the export terminal considered on-site activities that would generate particulate matter, locomotive exhaust during the unloading and movement of coal cars, emissions at the dock during vessel loading, emissions from tugs used to maneuver vessels into the terminal, and emissions from operations (e.g., loader) and maintenance equipment.

The air quality assessment for the proposed Riverside Refinery project considered activities from the refinery operation for both the renewable portion and the conventional micro-refinery operation. For the renewable portion this included estimating emissions from the hot oil heater and production and purification system. This includes such activities as crude oil distillation, petroleum conversion, treating, and product handling. In addition, the transport of crude oil via rail and refined product via vessel was included in the emissions estimate.

The air quality assessment for the Washington Energy Storage & Transfer Project included the processes that would generate emissions, including assumed gas-fired turbines used for refrigeration, fugitive leaks from the storage tanks, and power generation turbines used to load vessels. In addition, the transport via rail and vessel was included in the analysis.

The cumulative air quality impacts are discussed in terms of the relative change in air emissions relative to the current countywide emissions.

Cumulative Impacts

This section describes the impacts on air quality that could result from the cumulative operations of the three facilities.

As described in Chapter 6, Section 6.6, *Air Quality*, operation of the export terminal would include emissions from coal handling and mobile sources from maintenance and operation, and emissions from project-related trains and vessels in the project area. Indirect emissions would include emissions from project-related trains on the Reynolds Lead and BNSF Spur, and vessel emissions from project-related vessels in the lower Columbia River.

BNSF Spur and Reynolds Lead

Sources of air pollution from the three facilities include stationary source emissions from operation of compressors, oil heaters and distillation processes as well as transportation emissions from rail and vessels servicing the facilities (Table 7-15). Refinery operations represent the largest source of volatile organic compound emissions mostly associated with the conventional refinery operation. The largest source of carbon monoxide emissions would be from the refrigeration compressors operating for the Washington Energy Storage & Transfer project. Similar levels of nitrogen oxide emissions would occur in each of the facilities. Sulfur oxide emissions would be largest for the refinery but this is highly dependent on the sulfur content in the crude oil and the sulfur oxides control technology used. The particulate emissions are mostly associated with combustion process and are about twice as high for the refinery operation than the export terminal operations.

The pollutant emission totals in Cowlitz County for the three facilities under maximum production levels are also shown in Table 7-15 with the 2011 Cowlitz County emissions inventory totals. The largest emissions increase for any single pollutant associated with the operation of the three facilities is for sulfur oxide and PM2.5, which would increase total Cowlitz County emissions by approximately 3.3 and 4.7%, respectively. PM2.5 emissions would be due mainly to combustion processes at each facility. Overall, the increase in emissions would range from 1.0 to 4.7% of Cowlitz County total emissions.

Table 7-15. 2038 Estimated Total Emissions from Export Terminal, Riverside Refinery, and Washington Energy Storage & Transfer Compared to Cowlitz County Total Emissions

Emission	Total Emissions (ton/year)	Cowlitz County Total (ton/year)[a]	Percent
VOC	165.5	16,919	1.0%
CO	675.0	36,142	1.9%
NO_X	201.6	10,382	1.9%
SO_X	33.9	1,020	3.3%
PM10	51.0	1,872	2.7%
PM2.5	45.3	971	4.7%

Notes:
[a] Total Cowlitz County emissions for 2011.
VOC = volatile organic compounds; CO = carbon monoxide; NO_X = nitrogen oxides; SO_X = sulfur oxides; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less

Vessels

Vessel trips in the Columbia River are projected to increase by 2038 compared to existing conditions, and air emissions would increase similarly with the exception of nitrogen oxide. The Maritime Air Pollution from Ships Annex VI, to which the United States is a signatory, requires compliance with Tier III nitrogen oxide emission standards for marine vessel engines built on or after January 1st, 2016 that operate in the North American emission control area. Assuming all vessels by 2038 comply with the requirement, nitrogen oxide emissions would decrease by about 34% relative to current Columbia River vessel emissions. Therefore, while cumulative vessel traffic in 2038 is projected to increase air emissions, nitrogen oxide emissions are estimated to be lower than current levels.

7.3.3.7 Coal Dust

This section discusses potential cumulative impacts from coal dust. The study area for cumulative impacts from coal dust is the project areas for the On-Site Alternative and Off-Site Alternative and the Reynolds Lead and BNSF Spur rail corridors up to 1,000 feet from the rail line.

There are no cumulative projects in this study area that would transport or handle coal. Cumulative coal dust impacts in the project area and on the Reynolds Lead and BNSF Spur would be the same as the project-related impacts presented in Chapter 6, Section 6.7, *Coal Dust*.

7.3.3.8 Greenhouse Gas Emissions

Study Area

The study area for the cumulative impacts from greenhouse gas emissions is the same as the air quality cumulative study area: the On-Site Alternative and Off-Site Alternative project areas, Reynolds Lead and BNSF Spur rail corridor, and the lower Columbia River. The Washington Energy Storage & Transfer and Riverside Refinery cumulative projects are in this study area because these projects would increase rail traffic on the BNSF Spur. Any cumulative project that would add vessel traffic to the lower Columbia River is in the study area (Table 7-4).

Methods

The methods for the greenhouse gas cumulative analysis is the same as described for the air quality analysis. The greenhouse gas emissions from the export terminal, Riverside Refinery, and Washington Energy Storage & Transfer in metric tons of carbon dioxide-equivalent were estimated and compared to a carbon dioxide national target and a Washington State goal to provide context.

7.3.3.9 Cumulative Impacts

The export terminal would increase greenhouse gas emissions from activities in and outside the project areas. The pollutant emission totals in Cowlitz County for the export terminal and cumulative projects under maximum production levels are shown in Table 7-15.

In 2015, the EPA finalized state-specific targets to reduce carbon dioxide emissions in the power sector to 32% below 2005 levels by 2030. The statewide mass-based carbon dioxide performance goal for Washington State is approximately 10.74 million short tons (9.74 million metric tons). Estimated 2038 emissions for the export terminal and cumulative projects in the study area would be approximately 0.8% of that total.

Revised Code of Washington (RCW) 70.235.050, Limiting Greenhouse Gas Emissions, requires annual greenhouse gas emissions to be reduced to 25% below 1990 levels (88.4 million metric tons of CO_2 equivalent [$MMTCO_2e$]) by 2035 (66.3 $MMTCO_2e$). The Washington State goal for 2035 represent a reduction of 25.4 $MMTCO_2e$ below the 2011 state emissions levels (91.7 $MMTCO_2e$). Estimated greenhouse gas emissions in 2038 for the export terminal and cumulative projects would total about 0.2% of the 2035 emissions goal.

For vessel trips in the lower Columbia River, as shown in Section 7.3.3.4, *Vessel Transportation*, vessel trips are projected to increase by 2038, and cumulative greenhouse gas emissions would increase similarly with the exception of nitrogen oxide. Assuming all vessels by 2038 comply with a new requirement, nitrogen oxide emissions would decrease by about 34% relative to current Columbia River vessel emissions. Therefore, vessel trips related to the export terminal and cumulative projects would increase greenhouse gas emissions, but emissions related to nitrogen oxide would be expected to decrease relative to existing Columbia River vessel emissions.