Chapter 5
Operations: Existing Conditions, Project Impacts, and Potential Mitigation Measures

5.0 Introduction

For the purposes of this Draft Environmental Impact Statement (Draft EIS), environmental resource areas have been divided into three categories: the Built Environment, the Natural Environment, and Operations, and are discussed in Chapters 3, 4, and 5, respectively. The purpose of this chapter is to provide a discussion of the operations resource areas assessed for the Millennium Bulk Terminals—Longview project (Proposed Action).

Information contained in this Draft EIS was extracted from environmental technical reports located in Volume III of this Draft EIS and incorporated by reference. The technical reports include more detailed discussion on the determination of study areas, methods used for analysis, potential impacts, and mitigation.

Information sources used for this analysis are briefly discussed for each resource. In addition, a detailed list of sources is provided in Appendix A, *References*, of this Draft EIS.

5.0.1 Operations Resource Areas

Chapter 5, *Operations: Existing Conditions, Project Impacts, and Potential Mitigation Measures*, evaluates the operational resource areas relevant to the Proposed Action. The resource areas reviewed as part of the operations analysis include rail transportation; rail safety; vehicle transportation; vessel transportation; noise and vibration; air quality; coal dust; and greenhouse gas emissions and climate change (Table 5.0-1). Additional detailed information about these resources can also be found in the corresponding technical reports in Volume III of this Draft EIS.

In addition to these resource areas, Chapter 6, *Cumulative Impacts*, discusses cumulative impacts resulting from the Proposed Action combined with other past, present, and reasonably foreseeable actions.

Table 5.0-1. Resource Areas and Corresponding Draft EIS Chapters

Chapter	Section Number	Environmental Resource Area
Chapter 3, Built Environment	3.1	Land and Shoreline Use
	3.2	Social and Community Resources
	3.3	Aesthetics, Light, and Glare
	3.4	Cultural Resources
	3.5	Tribal Resources
	3.6	Hazardous Materials
Chapter 4, Natural Environment	4.1	Geology and Soils
	4.2	Surface Water and Floodplains
	4.3	Wetlands
	4.4	Groundwater
	4.5	Water Quality
	4.6	Vegetation
	4.7	Fish
	4.8	Wildlife
	4.9	Energy and Natural Resources
Chapter 5, Operations	5.1	Rail Transportation
	5.2	Rail Safety
	5.3	Vehicle Transportation
	5.4	Vessel Transportation
	5.5	Noise and Vibration
	5.6	Air Quality
	5.7	Coal Dust
	5.8	Greenhouse Gas Emissions and Climate Change

5.0.2 Alternatives and Timeframe for Analysis

This chapter analyzes the impacts that could occur as a result of construction and operation of the Proposed Action. The analysis contained in this chapter assumes construction beginning in 2018 and full operations[1] occurring by 2028.

This chapter also refers to Proposed Action-related rail and vessel traffic during construction and operations. Table 5.0-2 illustrates the Proposed Action-related rail and vessel traffic for the peak year of construction and full operations evaluated in this chapter, and the rail and vessel activity for the two stages between the peak year of construction and full operations. Throughout the discussions, the 190-acre coal export terminal site is referred to as the *project area*.

This chapter also analyzes impacts that could occur if the Proposed Action were not approved (the No-Action Alternative). Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, of this Draft EIS provides a description of the Proposed Action and No-Action Alternative.

[1] Full operation means an export terminal throughput of up to 44 million metric tons of coal per year, as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*.

Table 5.0-2. Proposed Action-Related Rail and Vessel Activity by Construction and Operation Stage[a]

	Peak Year of Construction (2018)	Stage 1a Start-up Operations	Stage 1b Increased Operations	Full Operations (by 2028)
Coal Export Terminal Throughput (metric tons per year)	0	10,000,000	25,000,000	44,000,000
Rail Traffic				
Average loaded train trips per day	0.65[b]	2	5	8
Average empty train trips per day	0.65[b]	2	5	8
Average total train trips per day	1.3[b]	4	10	16
Vessel Traffic				
Average vessels per month	63 barges[c]	15[d]	40[d]	70[d]

Notes:

[a] For additional information on the stages, see Chapter 2, Section 2.3.2, *Potential Future Operations and Transport*.

[b] If construction materials are delivered by rail to the project area, as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*.

[c] If construction materials are delivered by barge and transported via truck to the project area, as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*.

[d] Approximately 80% Panamax and 20%.

5.0.3 Study Areas and Type of Impacts Analyzed

Each resource area has its own study area depending on its physical characteristics or regulations that oversee the resource area. Two types of study areas were identified—a direct impacts study area and an indirect impacts study area. Table 5.0-3 explains the differences between these two study areas; in some cases, both study areas are the same.

Table 5.0-3. Types of Impacts and Corresponding Study Area

Type of Impact	Description	Description of Impacts Categories
Direct	An impact resulting from either construction or operation of the Proposed Action that occurs in the project area.	• **Construction:** Temporary operational impacts within the project area that are resolved or mitigated by the end of construction activity, or permanent impacts that result from changes to the project area due to construction of the coal export terminal. • **Operations:** Impacts occurring in the project area resulting from rail unloading, coal storage, machinery operations, equipment, vessel loading, etc.
Indirect	An impact resulting from operations of the Proposed Action that occurs beyond the project area.	• **Construction:** Impacts from activities beyond the project area during construction, such as vehicle and rail traffic. • **Operations:** Impacts from activities beyond the project area during operations, such as rail, vehicle and vessel traffic.

Table 5.0-4 provides a summary of the direct impacts and indirect impacts study areas by Chapter 5 resource.

Table 5.0-4. Summary of Direct Impacts and Indirect Impacts Study Areas by Resource

		Indirect Impacts Study Area	
Resource	**Direct Impacts Study Area**	**Cowlitz County**	**Washington State**
Section 5.1, Rail Transportation	Project area	• Reynolds Lead and BNSF Spur • BNSF main line	Rail routes for Proposed Action-related trains
Section 5.2, Rail Safety	Project area	• Reynolds Lead and BNSF Spur • BNSF main line	Rail routes for Proposed Action-related trains
Section 5.3, Vehicle Transportation	Project area	Public and private at-grade crossings on the Reynolds Lead and BNSF Spur, and all at-grade public crossings on the BNSF main line	Selected at-grade rail crossings along the rail routes for Proposed Action-related trains
Section 5.4, Vessel Transportation	Project area	Columbia River	Waterways that would be used by, or could be affected by vessels calling at the project area, including the waters out to 3 nautical miles offshore, the Columbia River Bar, the Columbia River upstream to Vancouver and the Willamette River upstream to the Port of Portland.
Section 5.5, Noise and Vibration	Noise and vibration impacts within 1 mile of the project area	• Area within 1 mile of the BNSF Spur and Reynolds Lead • BNSF main line • Columbia River	• Rail routes for Proposed Action-related trains • Columbia River between the project area and 3 nautical miles offshore
Section 5.6, Air Quality	Project area and Proposed Action-related trains on the Reynolds Lead and BNSF Spur	Cowlitz County	• Rail routes for Proposed Action-related trains • Columbia River between the project area and 3 nautical miles offshore
Section 5.7, Coal Dust	Project area	• Reynolds Lead and BNSF Spur • BNSF main line (Ecology study area only)	Rail routes for Proposed Action-related trains (Ecology study area only)

Resource	Direct Impacts Study Area	Indirect Impacts Study Area	
		Cowlitz County	Washington State
Section 5.8.1, Greenhouse Gas Emissions	• Cowlitz County (study area for both co-leads) • Rail and vessel transportation routes and combustion of coal in Asia (i.e., beyond Washington State) (Ecology study area only)	Same as direct impacts (direct and indirect impacts were not differentiated for the analysis)	
Section 5.8.2, Climate Change	Project area and transportation routes leading to the project area	Same as direct impacts (direct and indirect impacts were not differentiated for the analysis)	

5.0.4 Mitigation Measures Development Approach

Applicable regulations, specific permit conditions, and required planning documents were evaluated to determine if they would address potentially significant adverse impacts identified in this Draft EIS. When applicable, each section describes specific voluntary measures (Voluntary Mitigation) to be executed by the Applicant during construction or operations. When potential significant environmental impacts remained, other potential mitigation measures were identified to reduce the impact (Applicant Mitigation). These potential mitigation measures were identified as required by the Washington State Environmental Policy Act (SEPA) consistent with Washington Administrative Code [WAC] 197-11-660, which states that mitigation shall be reasonable, capable of being accomplished and imposed to the extent attributable to the identified adverse impact of the proposal.

The thresholds of significance and potential mitigation measures were determined by the co-lead agencies (Cowlitz County and the Washington State Department of Ecology). Additionally, when applicable, each section identifies potential mitigation measures to be considered by other agencies, groups, or companies (Other Measures to be Considered) to reduce potential Proposed Action-related impacts that are beyond the Applicant's control or authority.

5.1 Rail Transportation

Railroads provide transportation for passengers and a wide range of commercial goods, and support regional economic activity. Similar to other forms of transportation, rail traffic is subject to various regulatory requirements, including requirements for tracks, rail cars and locomotives, crew, operations, inspection and maintenance, tariffs, and methods and types of goods and services that can be transported.

This section assesses the potential rail transportation impacts of the Proposed Action and No-Action Alternative. For the purposes of this assessment, rail transportation refers to unit trains[1] that would service the project area (Proposed Action-related trains), as well as the type and volume of other rail traffic using the same rail lines. The Proposed Action, at full operations, would bring approximately 8 incoming unit trains carrying coal to the project area and send out approximately 8 empty unit trains each day from the project area. No rail construction outside of the project area is proposed by the Applicant.

This section describes the regulatory setting, presents the historical and current rail transportation conditions in the study area, establishes the methods for assessing potential rail transportation impacts, assesses potential impacts, and identifies measures to mitigate those impacts, where applicable.

5.1.1 Regulatory Setting

Laws and regulations relevant to rail transportation are summarized in Table 5.1-1.

Table 5.1-1. Regulations, Statutes, and Guidelines for Rail Transportation

Regulation, Statute, Guideline	Description
Federal	
Federal Railroad Safety Act of 1970	Gives FRA rulemaking authority over all areas of rail line safety. FRA has designated that state and local law enforcement agencies have jurisdiction over most aspects of highway/rail grade crossings, including warning devices and traffic law enforcement.
Highway Safety Act and the Federal Railroad Safety Act	Gives FHWA and FRA regulatory jurisdiction over safety at federal highway/rail grade crossings.
Federal Railroad Administration general regulations (49 CFR Parts 200–299)	Establishes railroad regulations, including safety requirements related to tracks, operations, and cars.
Interstate Commerce Commission Termination Act of 1995 (49 USC 101)	Establishes the Surface Transportation Board and upholds the common carrier obligations of railroads; requires railroads to provide service upon reasonable request.

[1] A unit train is a train in which all cars carry the same commodity and are shipped from the same origin to the same destination.

Regulation, Statute, Guideline	Description
State	
Washington Utilities and Transportation Commission	Inspects and issues violations for hazardous materials, tracks, signal and train control, and rail operations. WUTC regulates the construction, closure, or modification of public railroad crossings. In addition, WUTC inspects and issues defect notices if a crossing does not meet minimum standards.
WSDOT Local Agency Guidelines M 36-63.28, June 2015, Chapter 32, Railroad/Highway Crossing Program	Focuses on adding protection that improves safety and efficiency of railroad/highway crossings. Provides a process for investigating alternatives for improving grade-crossing safety, such as closure, consolidation, and installation of warning devices.
WSDOT Design Manual M 22.01.10, November 2015, Chapter 1350, Railroad Grade Crossings	Provides specific guidance for the design of at-grade railroad crossings.
Rail Companies—Operation (WAC 480-62)	Establishes operating procedures for railroad companies operating in Washington State.
Local	
Longview Municipal Code 11.40.080 (Railroad Trains Not to Block Streets)	Prohibits trains from using any street or highway for a period of time longer than five minutes, except trains or cars in motion other than those engaged in switching activities.

Notes:
FRA = Federal Railroad Administration; FHWA = Federal Highway Administration; CFR = Code of Federal Regulations; USC = United States Code; WUTC = Washington Utilities and Transportation Commission; WSDOT = Washington State Department of Transportation; WAC = Washington Administrative Code

5.1.2 Study Area

The study area for direct impacts on rail transportation is the project area for the Proposed Action. The study area for indirect impacts on rail transportation includes the rail routes expected to be used by Proposed Action-related trains between the project area and the Powder River Basin and Uinta Basin.

The assessment of potential indirect impacts focuses on the Reynolds Lead and BNSF Spur and the BNSF Railway Company (BNSF) main line in Cowlitz County. An assessment along the BNSF main line in Washington State and to and from the Powder River Basin and the Uinta Basin is also presented.

5.1.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts on rail transportation associated with the construction and operation of the Proposed Action and No-Action Alternative.

5.1.3.1 Information Sources

The following sources of information were used to define the existing conditions relevant to rail transportation and identify the potential impacts of the Proposed Action and No-Action Alternative on rail transportation in the study areas.

Rail Segment Capacity

Estimates of rail segment capacity for the Reynolds Lead and BNSF Spur were based on the methods developed for the Association of American Railroads (Cambridge Systematics 2007). The *Washington State Rail Plan* (Washington State Department of Transportation 2014a) was used to estimate rail segment capacity on BNSF main line routes in Washington State.

Existing, Projected, and No-Action Alternative Rail Traffic

Existing and projected rail traffic for the Reynolds Lead and BNSF Spur were based on information from the Longview Switching Company (LVSW) as operator of the Reynolds Lead and BNSF Spur and field observations. Existing and projected rail traffic for routes within Washington State was based on the *Washington State Rail Plan*. The Applicant provided estimates of rail traffic under the No-Action Alternative (approximately 2 additional trains per day in 2028).

Rail Operations

The following information sources were used for Proposed Action-related rail operations.

- **Volumes.** Proposed Action-related rail traffic to the project area at full operations would include 8 loaded trains per day and 8 empty trains per day.

  The types and number of trains from Longview Junction to the project area for 2015 and 2028 were developed from meetings with LVSW and the Port of Longview. The types and number of baseline train traffic beyond Longview Junction on main line routes were developed from the *Washington State Rail Plan* using linear extrapolation of 2010 and 2035 projected train traffic to 2015 and 2028.

- **Routes.** Representative coal mines were selected to identify rail routes outside Washington State. Routes to and from the project area within Washington State were based on existing BNSF and Union Pacific Railroad (UP) operational practices and Washington State Department of Transportation (WSDOT) documents including the *Washington State Rail Plan* and *Washington State Freight Mobility Plan* (Washington State Department of Transportation 2014b).

- **Train parameters.** Train parameters including the number of rail cars per unit train (125 rail cars for each train) and number of locomotives (3 per unit train) were based on information provided by the Applicant, input from BNSF, and existing BNSF coal train operations (BNSF Railway Company 2016).

- **Reynolds Lead, BNSF Spur, and project area operations**. Operations of the Reynolds Lead, BNSF Spur, and the project area were based on information provided by LVSW and the Applicant.

5.1.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on rail transportation. For the purposes of this analysis, potential impacts resulting from operations impacts are based on the Applicant's planned maximum throughput capacity of up to 44 million metric tons per year.

Train Parameters

For purposes of this analysis, all Proposed Action-related trains were assumed to have the parameters shown in Table 5.1-2.

Table 5.1-2. Train Parameters

Rail Cars	
Type	Alum Rotary Gondola
Gross rail load (tons)	143
Tare weight (tons)[a]	20.9
Lading per car (tons)[b]	122.1
Coupled Length (feet)	53
Locomotives	
Type	4400 HP AC
Weight (tons)	216
Length (feet)	73
Number in train	3
Configuration[c]	2-0-1
Total Train	
Cars per train	125
Total tare weight of cars (tons)[a]	2,613
Total lading weight (tons)[b]	15,263
Locomotive weight (tons)	648
Total train weight (tons)	18,524
Total train length (feet)	6,844

Notes:
[a] Empty weight
[b] Weight of coal
[c] Locomotives are distributed through trains (distributed power) in various configurations. Proposed Action-related trains would likely have two locomotives at the head and one at the rear of the train (Wolter pers. comm. verified by field observations December 4, 2014).

According to the Applicant, proposed rail operations would support terminal throughput of 40 million metric tons per year. The Proposed Action is based on a throughput of up to 44 million metric tons of coal per year. The Applicant assumes a 10% increase in throughput (4 million metric tons of coal per year) from rail car capacity that can be achieved through industry process and technological improvements by 2028.

Rail Segment Capacity

Capacities for the Reynolds Lead and BNSF Spur were estimated using the methods developed by the Association of American Railroads. Capacity estimates provided are practical capacities consistent with the capacity estimates presented in the *Washington State Rail Plan*. Capacity estimates for main line routes in Washington State were obtained from the *Washington State Rail Plan*.[2] The capacity estimates involve estimating maximum practical capacity in number of trains per day, determined by signal type, number of tracks, and geometric limitations. Practical capacity provides a more realistic and reasonable figure because of these considerations where operational capacity only considers the number of trains per day that could run over a route.

Traffic-control systems dictate capacity and help maintain a safe distance between trains passing or meeting on the same track. There are three basic types of systems.

- **Automatic Block Signals (ABS).** ABS is an electronic signal system that can control when a train can advance into the next block. A block is a section of track with signals at each end. Only one train can occupy a block at one time at normal speed.
- **Traffic Warrant Control (TWC).** Under this control system, train crews obtain authority to occupy and move on a main track from the dispatcher in the form of a completed track warrant form. Usually the track warrant information is transmitted to the train crew by phone, radio, or electronic transmission to the locomotive.
- **Centralized Traffic Control (CTC)**. With CTC, electrical circuits monitor the location of trains, allowing dispatchers to control train movements from a remote location, usually a central dispatching office. The signal system prevents trains from being authorized to enter sections of track occupied by other trains moving in the opposite direction.

In 2008, Congress passed the Rail Safety Improvement Act of 2008, which requires all passenger railroads and Class I freight railroads to install Positive Train Control (PTC) on all lines that carry passengers or certain hazardous liquids. PTC is designed to reduce train accidents caused by human error. PTC is a system that automatically stops a train if the engineer does not respond properly to a signal indication. While future generations of PTC may help railroads increase capacity on individual corridors, the PTC technology currently being installed on U.S. railroads is not expected to have a meaningful impact on corridor capacity (Association of American Railroads 2014).

Train Routes

Proposed Action-related train routes from mines in the Powder River Basin in Montana and Wyoming, and Uinta Basin in Utah and Colorado to the project area, and the return of empty trains, was assumed to be the same as current BNSF and UP routes and as documented in adopted WSDOT publications, including the *Washington State Rail Plan* and *Washington State Freight Mobility Plan*. The *Washington State Rail Plan* examines rail volume and capacity for all BNSF routes in Washington State because volume and capacity, and thus routing decisions, are dynamic.

In 2012, BNSF changed its train operations protocol to enhance use of existing capacity using directional running. This strategy routes all westbound-loaded unit trains (including coal) from

[2] Capacity estimates in the *Washington State Rail Plan* for 2010 were used for existing conditions and capacity estimates for 2035 were used for 2028 conditions. As described in the *Washington State Rail Plan*, Class I railroads (BNSF and UP) and other infrastructure owners will likely address key capacity issues as they emerge.

Pasco via the Columbia River Gorge to Vancouver, where they continue on the BNSF north-south main line to their final destination. Empty unit bulk trains from north of Vancouver, including Cowlitz County, return to Pasco and to points east via Stampede Pass. This analysis assumes this protocol would be used for Proposed Action-related trains. The following describes the expected routes for BNSF and UP empty and loaded Proposed Action-related trains.

- **Loaded BNSF trains.** Loaded BNSF trains would originate in the Powder River Basin in Montana and Wyoming, and travel over BNSF and Montana Rail Link lines through Billings, Montana, and Sandpoint, Idaho, crossing into Washington east of Spokane. Trains would proceed through Spokane and Pasco to Vancouver. From Vancouver, trains would move north to Longview Junction and enter the LVSW rail line at Longview Junction on the BNSF Spur, cross the Cowlitz River Bridge and continue on the Reynolds Lead to the project area. Trains would be unloaded, inspected, and prepared for empty movement.
- **Empty BNSF trains.** Empty BNSF trains would move from the project area over the Reynolds Lead and BNSF Spur to Longview Junction. From Longview Junction, trains would move north on the BNSF main line to Auburn. From Auburn, trains would move east over Stampede Pass to Pasco. From Pasco, empty BNSF trains would move over the same route as loaded trains to the Powder River Basin in Montana and Wyoming.
- **Loaded UP trains.** Loaded UP trains from the Uinta Basin in Utah and Colorado and the Powder River Basin in Wyoming would move via the UP main line through Salt Lake City and Pocatello following the Columbia River on the Oregon side to North Portland Junction in Portland, Oregon. From North Portland Junction, trains would cross the Columbia River and move on the BNSF main line to Longview Junction. All loaded UP trains would operate on the same track between Longview Junction and the project area as described for loaded BNSF trains.
- **Empty UP trains.** Empty UP trains would move back to Longview Junction via the Reynolds Lead and BNSF Spur. From Longview Junction, UP trains would move south to North Portland Junction in Portland, Oregon, and back to the Uinta Basin and Powder River Basin via the same route as loaded UP trains.

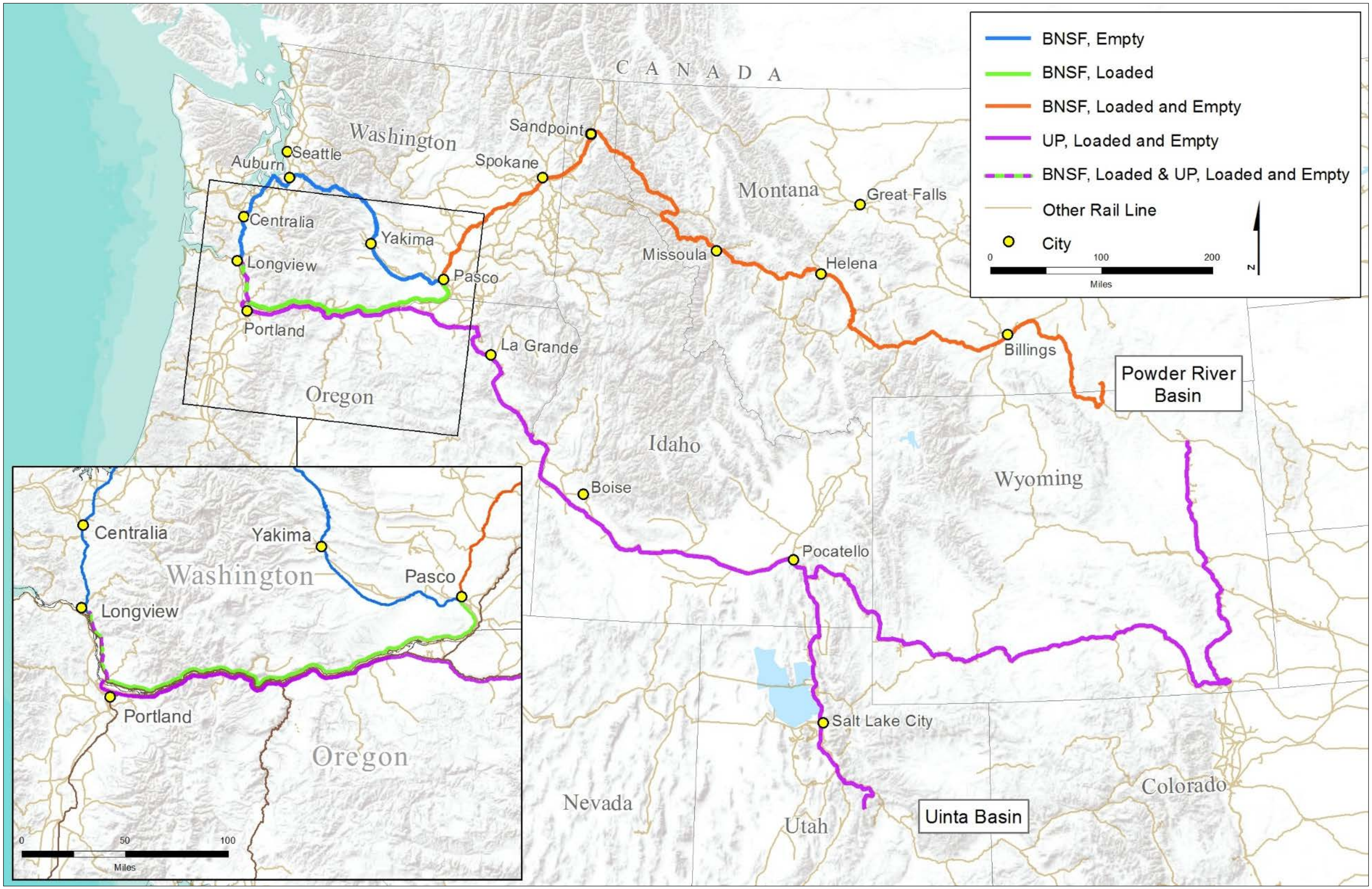
Figure 5.1-1 illustrates the routes used for this analysis. However, BNSF and UP have alternative routes. As volume increases on any one-line segment, BNSF and UP may revise operations to distribute traffic over existing infrastructure. BNSF and UP may also expand their infrastructure, which occurs on an ongoing basis based on demand.

Future Rail Traffic

Rail traffic estimates in the *Washington State Rail Plan* were used to determine potential impacts of Proposed Action-related trains to rail traffic capacity in Washington State. The types and number of baseline train traffic beyond Longview Junction were developed using linear extrapolation of 2010 and 2035 projected train traffic to 2015 and 2028.[3] Rail traffic estimates provided in the *Washington State Rail Plan* do not include the rail traffic for proposed coal or crude oil projects in Washington State. Therefore, Proposed Action-related rail traffic was added to 2028 baseline rail traffic estimates for the purposes of this analysis.

[3] The rail traffic estimates in the *Washington State Rail Plan* are based on data collected between 2010 and 2013. Rail traffic is highly dynamic and fluctuates as a result of changing demand. The 2028 rail traffic estimates are intended to provide a "snapshot" of estimated rail traffic volumes; the rail traffic estimates do not represent actual volumes for 2028.

Figure 5.1-1. Expected Routes of Loaded and Empty Proposed Action-Related Trains



Train Speed and Travel Time

The current maximum speed for the Reynolds Lead is 10 miles per hour. The maximum speed over the Reynolds Lead could increase from 10 miles per hour (mph) to up to 25 mph if track improvements are made by LVSW.[4] This improvement would reduce the train travel time from Longview Junction to the project area from approximately 49 minutes to approximately 32 minutes. For purposes of this analysis, it was assumed that Proposed Action-related trains would reach a maximum speed of 20 mph if the planned improvements were made, with an average speed of approximately 11 mph on the BNSF Spur and Reynolds Lead. Because these improvements are not certain, the impact analysis includes train speeds and transit time over each road crossing with and without planned improvements to the Reynolds Lead and BNSF Spur.

5.1.4 Existing Conditions

This section describes the existing environmental conditions in the study area related to rail transportation that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative.

5.1.4.1 Project Area

As described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, the project area is located on 190 acres, primarily within the 540-acre Applicant's leased area. The project area includes a portion of a rail loop that transitions from the Reynolds Lead onto the project area and extends from the project area to the Applicant's leased area. Rail traffic within the project area serves the existing bulk product terminal adjacent to the project area and within the Applicant's leased area as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*.

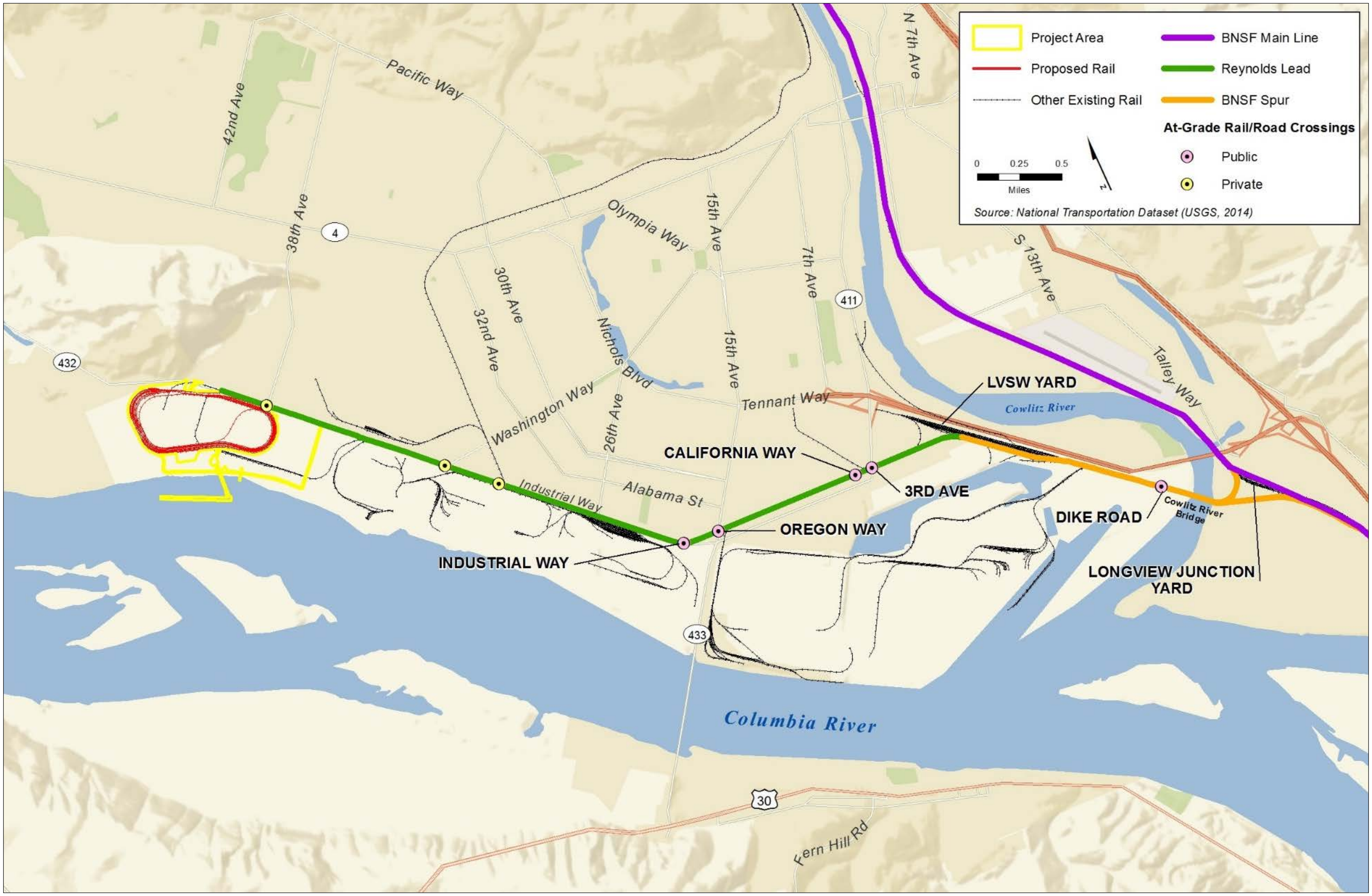
5.1.4.2 BNSF Spur and Reynolds Lead

The project area is located at the end of the Reynolds Lead, an existing rail line that serves the Port of Longview and several industries, and connects via the BNSF Spur to the BNSF main line. The junction of the BNSF Spur and BNSF main line is called Longview Junction (Figure 5.1-2). The speed limit on Reynolds Lead and BNSF Spur is 10 mph. At an average speed of 9 mph, the existing travel time from Longview Junction to the project area is approximately 49 minutes. The following describes the BNSF Spur and Reynolds Lead.

Between Longview Junction and the project area there are five public and three private at-grade road crossings (Figure 5.1-2). These road crossings experience rail traffic from current train operations to and from the Port of Longview and/or from industrial switching activities at locations along the Reynolds Lead.

[4] As described in Section 5.1.5, LVSW 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. These upgrades would include adding ballast, replacing ties, upgrading rail, and upgrading the traffic control system.

Figure 5.1-2. Reynolds Lead and BNSF Spur



BNSF Spur

The BNSF Spur runs from the BNSF Seattle Subdivision main line switch at Longview Junction, across the Cowlitz River Bridge to the LVSW yard (Figure 5.1-2). There is one main track with TWC traffic control. The Cowlitz River Bridge is a manually operated drawbridge controlled by LVSW. The bridge opens once every 4 to 5 years to allow passage of river-dredging vessels. The speed limit through this area is 10 mph because of speed restrictions on the bridge.

Existing rail traffic on the BNSF Spur is about 7 trains per day. Capacity is about 16 trains per day, which supports the current volume (Cambridge Systematics 2007). The 7 trains average 78 rail cars per train and 4,920 feet in length. Dike Road is the only public at-grade road crossing on the BNSF Spur.

Existing trains consist of approximately 4 grain trains per day (2 loaded and 2 empty) to and from the EGT grain terminal at the Port of Longview, 2 to 3 manifest trains[5] per day from the BNSF main line to the LVSW yard, and an occasional unit train of clay, soda ash, or other trains destined to or from the Port of Longview. The Port Industrial Rail Corridor connects with the BNSF Spur just east of the LVSW yard. The switch is a remotely controlled switch operated by the BNSF dispatcher. Trains to or from Port of Longview facilities leave or enter the BNSF Spur at the Industrial Rail Corridor switch. Other trains originate or terminate in the LVSW yard.

Reynolds Lead

The Reynolds Lead runs from the west end of the LVSW yard to the project area (Figure 5.1-2). There is one main track with TWC traffic control. The speed limit is 10 mph, and capacity is about 16 trains per day (Cambridge Systematics 2007). Average existing traffic is approximately 2.3 trains per day. Each train averages 21 rail cars per train with an average train length of approximately 1,450 feet. There are four public at-grade road crossings on the Reynolds Lead between the LVSW yard and the project area: 3rd Avenue (State Route 432), California Way, Oregon Way (State Route 433), and Industrial Way (State Route 432) (Figure 5.1-2).

Existing trains operating on the Reynolds Lead include an LVSW local crew that places and pulls cars at industrial facilities along the Reynolds Lead 3 days per week, and a local crew that delivers and picks up cars that are interchanged to and from the Columbia & Cowlitz Railway at two sidings just west of California Way. The Columbia & Cowlitz Railway also operates on the Reynolds Lead between the Weyerhaeuser plant near Industrial Way and these sidings to deliver and pick up interchange cars to or from the LVSW rail line.

5.1.4.3 Main Line Routes in Washington State

Proposed Action-related trains would travel on BNSF main line routes within Washington State beyond Longview Junction. Table 5.1-3 summarizes infrastructure and traffic data for the route segments expected to be used by Proposed Action-related trains and the route segments are summarized below. Figure 5.1-3 illustrates estimated 2015 rail traffic and capacity using estimates provided in the *Washington State Rail Plan*.

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[5] Unlike unit trains, manifest trains are composed of rail cars with different commodities originating in different locations and delivered to different locations.

Table 5.1-3. Washington State Rail Route Segments

Route Segment	Railroad	Subdivision	Miles	Current Traffic Control System[a]	Current Main Tracks [a]	Current Passenger Train Route?	Future Passenger Train Route?	Estimated 2015 Capacity (Trains/day)[b]	Estimated 2015 Trains Per Day[c]	Projected 2035 Trains per Day[a]
Idaho/Washington State Line-Spokane	BNSF	Spokane	18.6	CTC	2	Yes	Yes	76	70	125
Spokane-Pasco	BNSF	Lakeside	145.5	CTC	1	Yes	Yes	37	39	66
Pasco-Vancouver	BNSF	Fallbridge	221.4	CTC	1	Yes	Yes	40	34	56
Vancouver-Longview Junction	BNSF	Seattle	34.8	CTC	2	Yes	Yes	78	50	85
Longview Junction-LVSW Yard (BNSF Spur)	BNSF	LVSW	2.1	TWC	1	No	No	16	7	N/A
LVSW Yard-Project Area (Reynolds Lead)	BNSF	LVSW	5.0	TWC	1	No	No	16	2	N/A
Longview Junction-Auburn	BNSF	Seattle	118.6	CTC	2	Yes	Yes	78	50	85
Auburn-Yakima	BNSF	Stampede	139.6	TWC	1	No	No	39	7	13
Yakima-Pasco	BNSF	Yakima Valley	89.4	TWC	1	No	No	39	7	13

Notes:

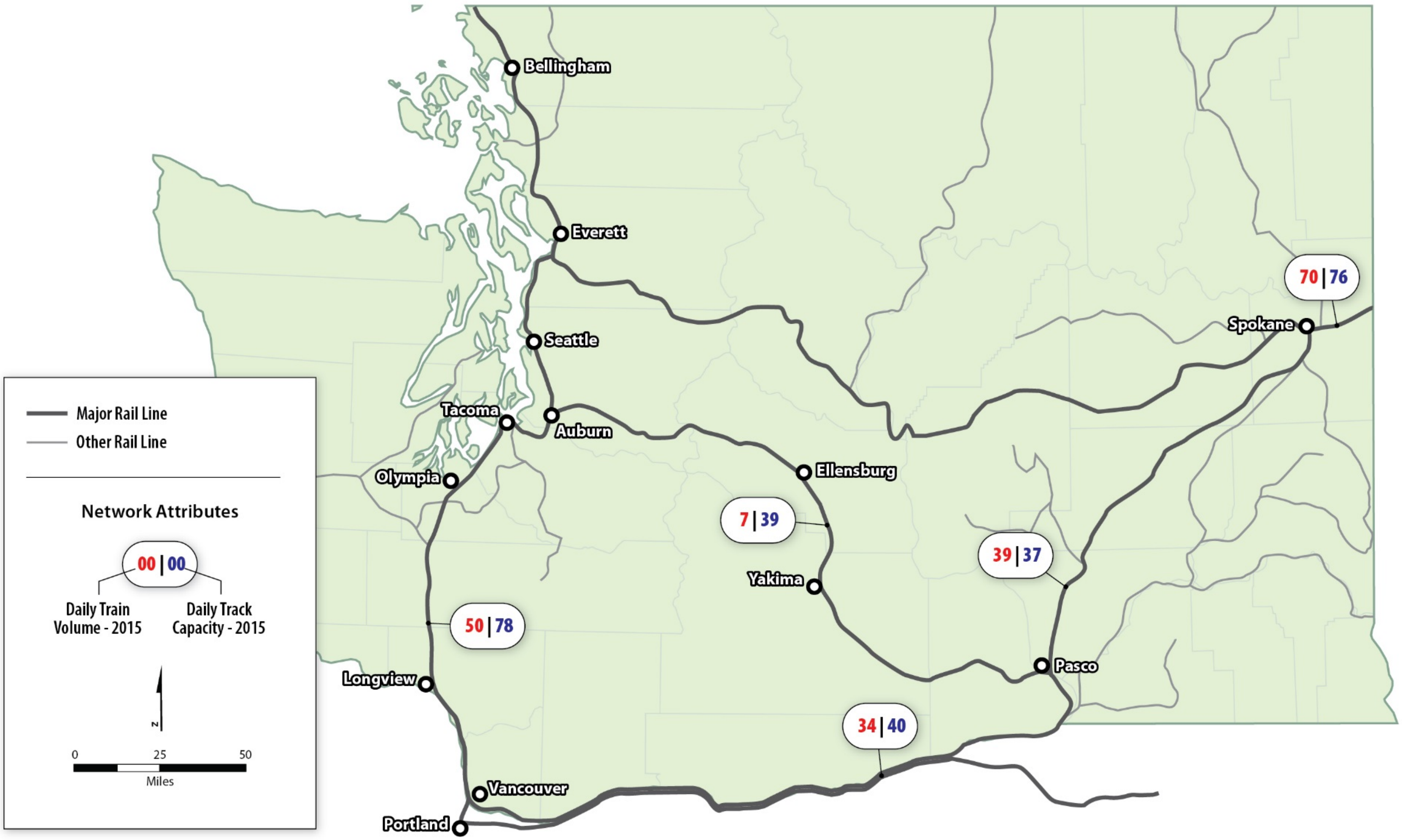
[a] Source: Washington State Department of Transportation 2014b, extrapolated to 2015.

[b] Source: Washington State Department of Transportation 2014b, extrapolated to 2015, and Cambridge Systematics 2007.

[c] Source: Washington State Department of Transportation 2014b; LVSW pers. comm.; Port of Longview pers. comm.

LVSW = Longview Switching Company; CTC = Centralized Traffic Control; TWC = Traffic Warrant Control; N/A = No projection available for route segment

Figure 5.1-3. Estimated Washington State Rail Network Daily Track Utilization in 2015



- **Idaho/Washington State Line–Spokane.** This segment covers 18.6 miles and is part of BNSF's Kootenai River Subdivision. It is a double track with CTC. Capacity is approximately 76 trains per day and volume is approximately 70 trains per day. All BNSF trains between the eastern part of BNSF's system and points in Washington State move over this segment. Train traffic includes intermodal, grain, coal and general manifest trains. Amtrak's Empire Builder passenger service between Chicago, Illinois; Seattle, Washington; and Portland, Oregon also uses this segment.
- **Spokane–Pasco.** This corridor covers 145.5 miles and is part of BNSF's Lakeside Subdivision. This line is mostly single track with CTC. Capacity is approximately 37 trains per day and volume is approximately 39 trains per day. Train traffic on this segment includes intermodal, grain, coal and general manifest trains. The Portland section of Amtrak's Empire Builder passenger service uses this segment. BNSF is currently making upgrades to this segment, including adding a second main line in some areas.
- **Pasco–Vancouver.** This segment covers 221.4 miles and is BNSF's Fallbridge Subdivision, also known as the Columbia River Gorge route. It is mostly single track with CTC. Capacity is approximately 40 trains per day and volume is approximately 34 trains per day. Train traffic on this route includes intermodal, grain, coal and manifest. The Portland section of Amtrak's Empire Builder passenger service also uses this route. BNSF uses directional operations on this segment, which increases capacity by running westbound loaded unit trains on this segment and eastbound empty unit trains via Stampede Pass.
- **Vancouver–Longview Junction.** This segment covers 34.8 miles of BNSF's Seattle Subdivision. It is double track with CTC. About 21 miles of this segment is in Cowlitz County. Capacity is approximately 78 trains per day and volume is approximately 50 trains per day. This line also carries all UP trains between Portland, Oregon and Tacoma. Traffic includes intermodal, grain, coal and other unit trains along with manifest trains. This section of the BNSF line is also a key route for passenger trains. Amtrak's Coast Starlight trains to and from California and Amtrak Cascades trains between Eugene, Oregon and Seattle, Washington use this segment.

  Scheduled to be completed by 2017, WSDOT is constructing 3.7 miles of a third main track on the BNSF Seattle Subdivision main line between Longview Junction and Kelso. The purpose of the third main track is to enable 2 trains to pass while a train is simultaneously moving into or out of the Longview Junction yard (Washington State Department of Transportation 2014a). This would reduce the potential for delays to passenger and freight trains running through the area.
- **Longview Junction–Auburn.** This segment includes 118.6 miles of BNSF's Seattle Subdivision. About 18 miles of this segment are in Cowlitz County. There are two main tracks and traffic control is CTC. Current capacity is approximately 78 trains per day and volume is about 50 trains per day. Traffic on this line includes intermodal, empty coal, and grain trains returning to the east and manifest trains. This segment is also a key section for passenger trains. Amtrak's Coast Starlight trains to/from California and Amtrak Cascades trains use this route as do Sound Transit Sounder commuter trains on the section between Tacoma and Auburn.
- **Auburn–Yakima.** This segment is known as BNSF's Stampede Pass route. The Auburn–Yakima segment covers 139.6 miles and makes up BNSF's Stampede Subdivision. The track structure is mostly single track and traffic control is mostly TWC with some segments of CTC. Current capacity is approximately 39 trains per day and volume is approximately 7 trains per day. Traffic volume consists largely of empty coal and grain trains. BNSF uses directional operations

on this segment, which increases capacity by running eastbound unit trains on this segment and westbound loaded unit trains via the Columbia River Gorge.

- **Yakima–Pasco.** This segment covers 89.4 miles. It makes up BNSF's Yakima Valley Subdivision. The track structure is mostly single track and traffic control is mostly TWC with some segments of CTC. Current capacity is approximately 39 trains per day and volume is approximately 7 trains per day. Traffic volume consists largely of empty coal and grain trains returning to the east and some manifest trains.

5.1.4.4 Main Line Routes Beyond Washington State

Proposed Action-related trains from the Powder River Basin operating on BNSF rail lines would move west to Huntley, Montana. From Huntley, Montana to Sandpoint, Idaho, BNSF typically operates coal and other trains over Montana Rail Link tracks. This route is mostly single track with CTC traffic control; however, some sections have two main tracks. From Sandpoint, Idaho, trains would move back to BNSF tracks and cross into Washington State moving toward Spokane. Capacity is approximately 30 to 75 trains per day, depending upon the specific location and track characteristics, and volume is 25 to 28 trains per day (Federal Railroad Administration 2012).

Proposed Action-related trains from the Uinta Basin and Powder River Basin operating on UP rail lines would travel through Pocatello and Boise, Idaho; then along the Oregon side of the Columbia River to the North Portland Junction. From North Portland Junction, UP trains would operate on BNSF tracks, crossing the Columbia River to Vancouver and heading north on the BNSF Seattle Subdivision to Longview Junction. This segment has mostly one main track with CTC or ABS. Capacity is approximately 18 to 75 trains per day, depending on the specific location and track characteristics, and volume is 8 to 16 trains per day.

5.1.5 Impacts

This section describes the potential direct and indirect impacts related to rail transportation that would result from construction and operation of the Proposed Action and No-Action Alternative.

LVSW 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. These upgrades would include adding ballast, replacing ties, and upgrading rail. These improvements would provide for safer operations and increased speed over the BNSF Spur and Reynolds Lead. LVSW proposes they would also install signals and upgrade the traffic control system to CTC and add an electric, remotely operated switch from the BNSF Spur to the Reynolds Lead. The signaling would add capacity, allowing trains to be spaced closer together and the electronic switch would eliminate the need for all loaded and empty trains (existing trains and Proposed Action-related trains) to stop while a train crew member operates the switch. Construction of these improvements would take approximately 6 months. Because these improvements are not certain, the impact analysis analyzes infrastructure with and without these planned improvements.

5.1.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action.

At full operation, Proposed Action-related trains would add 8 loaded and 8 empty coal trains per day (16 total trains per day) to the rail lines between the Powder River Basin or the Uinta Basin and the project area. Section 5.1.3.2, *Impact Analysis,* describes and Figure 5.1-1 illustrates the expected rail routes for Proposed Action-related trains.

Construction—Direct Impacts

The Reynolds Lead would be modified within the project area to accommodate unit train access to and from the coal export terminal. Because the project area is at the terminus of the Reynolds Lead, this construction would not affect existing rail traffic on the Reynolds Lead. Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, describes construction-related activities and scenarios to transport materials to the project area. Under the rail scenario, trains transporting construction materials would travel to and from the project area. The unloading and maneuvering of these trains during construction within the project area would not affect the operations of existing rail traffic on the Reynolds Lead.

Construction—Indirect Impacts

Construction of the Proposed Action would result in the following indirect impact on rail transportation.

Add Temporary Rail Traffic for Transport of Construction Materials

The Applicant proposes that approximately 2.1 million yards of rock would be needed for construction. This material would be transported to the project area by truck or rail, as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*. The Applicant estimates approximately two-thirds of the volume (1.4 million yards) would move during the first year of construction, assumed to be 2018. The Applicant has further proposed that moving materials by rail would require an estimated 350 loaded trains of 100 cars each, equivalent to 700 trains (loaded and empty) over the entire construction period. During the first year of construction, when two–thirds of the volume would be transported, this would amount to approximately 467 trains, or an average of 1.3 trains per day in 2018.

The baseline rail traffic from Longview Junction to the LVSW yard in 2018 is an average of 7 trains per day. The current capacity over these segments is approximately 16 trains per day. Baseline rail traffic and Proposed Action-related construction trains per would not exceed capacity of the Reynolds Lead and BNSF Spur.

This construction rail traffic would use BNSF main line routes in Washington State in 2018. Due to the low number of trains per day compared to existing rail traffic volumes and the daily variability of rail traffic volumes, Proposed Action-related construction trains would not have significant impacts on rail capacity and operations on BNSF main line routes.

Operations—Direct Impacts

During operations, 8 loaded trains would travel to the project area daily, and 8 empty trains would travel outbound from the project area daily. These trains would maneuver along the rail loop in the project area. Rail traffic operations within the project area would not affect rail traffic on the Reynolds Lead because rail operations would be limited to the project area.

Operations—Indirect Impacts

As described previously, LVSW has indicated plans 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. Because these improvements are not certain, the impact analysis analyzes infrastructure with and without these planned improvements.

Operation of the Proposed Action would result in the following indirect impacts on rail transportation.

Add Rail Traffic on the BNSF Spur and Reynolds Lead

Proposed Action-related loaded trains would move from Longview Junction to the project area, and the reverse, moving empty trains from the project area to Longview Junction. This movement would add rail traffic to the BNSF Spur and Reynolds Lead. The coal export terminal at full throughput in 2028, would receive an average of 8 loaded trains and return an average of 8 empty trains per day. Therefore, 16 Proposed Action-related trains per day would operate on the Reynolds Lead and BNSF Spur.

If LVSW does not make improvements to the Reynolds Lead and BNSF Spur, capacity of the Reynolds Lead and BNSF Spur would be approximately 16 trains per day. The baseline volume is an average of 7 trains per day on the BNSF Spur and 4 trains per day on the Reynolds Lead (2 existing trains and 2 trains with the No-Action Alternative, as described in Section 5.1.5.2, *No-Action Alternative*). Proposed Action-related trains would add 16 trains per day (8 loaded and 8 empty) on each of these segments for a total of 23 trains on the BNSF Spur and 20 trains on the Reynolds Lead. Without improvements to increase capacity, neither the Reynolds Lead nor BNSF Spur would have the capacity to handle baseline rail traffic and Proposed Action-related rail traffic. Without improvements to the Reynolds Lead and BNSF Spur, the Proposed Action would result in a significant adverse impact on rail traffic on the Reynolds Lead and BNSF Spur.

As described previously, LVSW has indicated they expect to expand capacity to meet projected volume from Proposed Action-related trains or any other action, consistent with typical U.S. railroad policy to accommodate freight traffic. LVSW has indicated that it would upgrade the traffic control technology on both the BNSF Spur and the Reynolds Lead from TWC to CTC. The proposed upgrade in traffic control technology would increase capacity on both segments from 16 trains per day to approximately 30 trains per day. This improvement would provide sufficient capacity to handle baseline rail traffic and Proposed Action-related rail traffic. However, this improvement is not currently funded or permitted.

In addition to CTC, LVSW indicated it would upgrade the track on the Reynolds Lead and BNSF Spur. Upgrades would include additional ballast, replacing ties, and upgrading the rail. These improvements would provide for a safer operation and allow for an increase in maximum speed from 10 mph to up to 25 mph on the Reynolds Lead. The speed limit on the BNSF Spur is influenced by the speed limit across the Cowlitz River Bridge, which would remain at 10 mph. LVSW would also install a remotely operated electric switch from the BNSF Spur to the Reynolds Lead to allow for continuous movement and more consistent operation. The electronic switch would eliminate the need for Proposed Action-related trains to stop while a train crew member operates the switch. While LVSW has planned for the capital investment, it has not begun work or applied for permits. LVSW would start the permit process and would make these investments once it was reasonably certain that the projected volume, from existing or future customers, would materialize.

Table 5.1-4 provides additional information on anticipated operations over the Reynolds Lead and BNSF Spur, including the average time for Proposed Action-related trains to cross each of the at-grade road/rail crossings with the existing track infrastructure and with the planned infrastructure improvements.

Table 5.1-4. BNSF Spur and Reynolds Lead At-Grade Crossing Detail for Proposed Action-Related Trains

	Dike Road	3rd Avenue	California Way	Oregon Way	Industrial Way
Current Track Infrastructure					
Estimated speed	10 mph	8 mph	8 mph	10 mph	10 mph
Estimated passing time	8 minutes	10 minutes	10 minutes	8 minutes	8 minutes
Planned Track Infrastructure					
Estimated speed	10 mph	15 mph	15 mph	20 mph	20 mph
Estimated passing time	8 minutes	5 minutes	5 minutes	4 minutes	4 minutes

Notes:
Source: ICF International and Hellerworx 2016
mph = miles per hour

Add Rail Traffic on the BNSF Main Line in Cowlitz County

The Proposed Action would add rail traffic on the BNSF main line to and from Longview Junction within Cowlitz County.

This segment has two main tracks with CTC. Projected 2028 capacity without improvements or operating changes is approximately 80 trains per day. Projected 2028 volume with Proposed Action-related BNSF trains to and from the Powder River Basin is 81 trains per day; therefore, the projected volume on this segment with Proposed Action-related trains would exceed capacity (80 trains per day).

If all 16 Proposed Action-related trains use the segment between Vancouver and Longview Junction (UP trains), the 2028 volume on this segment in Cowlitz County south of Longview Junction would be 89 trains daily and would exceed capacity without improvements (80 trains daily). This would represent a significant adverse impact on the BNSF main line in Cowlitz County. It is expected that BNSF and UP would make the necessary investments or operating changes to accommodate the growth in rail traffic, but it is unknown when these actions would be taken or permitted.

Add Rail Traffic on BNSF Main Line Routes in Washington State beyond Cowlitz County

The Proposed Action would add rail traffic to the BNSF main line routes in Washington State, as summarized in Table 5.1-5. Figure 5.1-4 illustrates the projected 2028 rail traffic volume and capacity on BNSF main line routes in Washington State with Proposed Action-related trains. The projected rail traffic assumes that directional running continues per existing BNSF operational policies, by routing westbound-loaded unit trains via Vancouver through the Columbia River Gorge, and eastbound empty unit trains via Stampede Pass.

Table 5.1-5. Infrastructure Capacity and Projected Rail Traffic

Route Segment	Railroad	Subdivision	Current Traffic Control System[a]	Current Main Tracks[a]	Projected 2028 Capacity (trains/day)[b]	Miles	Estimated Baseline 2015 (trains/day)[b,c]	Projected Baseline Trains 2028 (trains/ day) [b,c,e]	2028 with Proposed Action (trains/ day)	Projected 2028 Capacity Surplus (Deficit)[f]
Idaho/Washington State Line-Spokane	BNSF	Spokane	CTC	2	76	18.6	70	106	122	(46)
Spokane-Pasco	BNSF	Lakeside	CTC	1	38	145.5	39	56	72	(34)
Pasco-Vancouver	BNSF	Fallbridge	CTC	1	41	221.4	34	48	56	(15)
Vancouver-Longview Junction	BNSF	Seattle	CTC	2	80	34.8	50	73	81	(1)
Longview Junction-LVSW Yard (BNSF Spur)	BNSF	LVSW	TWC	1	16	2.1	7	7	23	(7)
LVSW Yard-Project Area (Reynolds Lead)	BNSF	LVSW	TWC	1	16	5.0	2	4	20	(4)
Longview Junction-Auburn	BNSF	Seattle	CTC	2	80	118.6	50	73	81	(1)
Auburn-Yakima	BNSF	Stampede	TWC	1	39	139.6	7	11	19	20
Yakima-Pasco	BNSF	Yakima Valley	TWC	1	39	89.4	7	11	19	20

Notes:

[a] Source Washington State Department of Transportation 2014b.

[b] Source Washington State Department of Transportation 2014b (without improvements), except LVSW rail line segments.

[c] Source: Federal Railroad Administration 2012; Wolter pers. comm.; Port of Longview pers. comm.

[e] Washington State Department of Transportation 2014b.

[f] Projected capacity surplus/deficit without infrastructure improvements or changes in operations. Shaded black values indicate a projected capacity deficit.

CTC = Centralized Traffic Control; TWC = Traffic Warrant Control

Figure 5.1-4. Projected Washington Rail Network Daily Track Utilization in 2028 with Proposed Action-Related Trains

The projected increase in rail traffic relative to capacity is described for segments in Washington State beyond Cowlitz County below.

- **Idaho/Washington State Line–Spokane**. All Proposed Action-related BNSF trains to and from the Powder River Basin would move over this segment. This segment has two main tracks with CTC. Projected 2028 capacity without improvements is 76 trains per day. The capacity concerns for this segment extend beyond Washington State to Sandpoint, Idaho. This potential constraint is identified in the *Washington State Rail Plan* as a key potential chokepoint.

  The projected volume in 2028 is 122 trains per day, including Proposed Action-related trains. The Proposed Action would add 16 trains to a segment that would exceed capacity under 2028 baseline conditions. Without improvements or operating changes, Proposed Action-related trains would contribute to congestion or delays on this segment, or the inability of BNSF to handle its rail traffic. It is expected that BNSF would make the necessary investments or operating changes to accommodate the growth in rail traffic, but it is unknown when these actions would be taken or permitted.

- **Spokane–Pasco**. All Proposed Action-related BNSF trains to and from the Powder River Basin would move over this segment. This segment has one main track and CTC. Projected 2028 capacity without improvements or operating changes is 38 trains per day. This potential constraint is identified in the *Washington State Rail Plan* as a key potential chokepoint.

  The projected volume in 2028 is 72 trains per day, including Proposed Action-related trains. The Proposed Action would add 16 trains to a segment that would exceed capacity under 2028 baseline conditions. Without improvements or operating changes, Proposed Action-related trains would contribute to congestion or delays on this segment, or the inability of BNSF to handle its rail traffic. It is expected that BNSF would make the necessary investments or operating changes to accommodate the growth in rail traffic, but it is unknown when these actions would be taken or permitted.

- **Pasco–Vancouver**. Loaded Proposed Action-related BNSF trains from the Power River Basin would move over this segment. The segment has one main track with CTC. Proposed Action capacity without improvements is 41 trains per day. This potential constraint is identified in the *Washington State Rail Plan* as a significant capacity concern.

  The projected volume in 2028 is 56 trains per day, including Proposed Action-related trains. The Proposed Action would add 8 trains to a segment that would exceed capacity under 2028 baseline conditions. Without improvements or operating changes, Proposed Action-related trains would contribute to congestion or delays on this segment, or the inability of BNSF to handle its rail traffic. It is expected that BNSF would make the necessary investments or operating changes to accommodate the growth in rail traffic, but it is unknown when these actions would be taken or permitted.

- **Vancouver–Longview Junction and Longview Junction–Auburn (outside Cowlitz County)**. This is the same segment described for Cowlitz County. This segment has two main tracks with CTC. Projected 2028 capacity without improvements or operating changes is approximately 80 trains per day. Projected 2028 volume with Proposed Action-related BNSF trains to and from the Powder River Basin is 81 trains per day; therefore, the projected volume on this segment with Proposed Action-related trains would exceed capacity (80 trains per day).

If all 16 Proposed Action-related trains use the segment between Vancouver and Longview Junction (UP trains), the 2028 volume on this segment would be 89 trains daily and would exceed capacity without improvements (80 trains daily). This would represent a significant adverse impact on the BNSF main line. It is expected that BNSF and UP would make the necessary investments or operating changes to accommodate the growth in rail traffic, but it is unknown when these actions would be taken or permitted.

- **Auburn–Yakima and Yakima–Pasco.** Empty Proposed Action-related BNSF trains returning to the Powder River Basin would move over these segments. With Proposed Action-related rail traffic, the projected rail traffic on these segments is 19 trains per day in 2028. Projected 2028 capacity is 39 trains per day so these segments would not exceed capacity with Proposed Action-related trains in 2028.

Add Rail Traffic on BNSF and UP Rail Routes Outside Washington State

The Proposed Action would add 8 loaded and 8 empty trains per day (16 trains) to existing rail traffic beyond Washington State. The current rail traffic on the BNSF main lines is approximately 25 to 28 trains per day and the capacity is approximately 30 to 75 trains per day, depending on location and track characteristics. The addition of 16 Proposed Action-related trains per day could result in rail traffic on some segments exceeding capacity if no capacity expansions were made. The current rail traffic on the UP route is approximately 8 to 16 trains per day and a capacity of 18 to 75 trains per day, depending on location and track characteristics. Proposed Action-related trains could also result in rail traffic exceeding capacity on some parts of the UP route if no capacity expansions or operating changes were implemented.

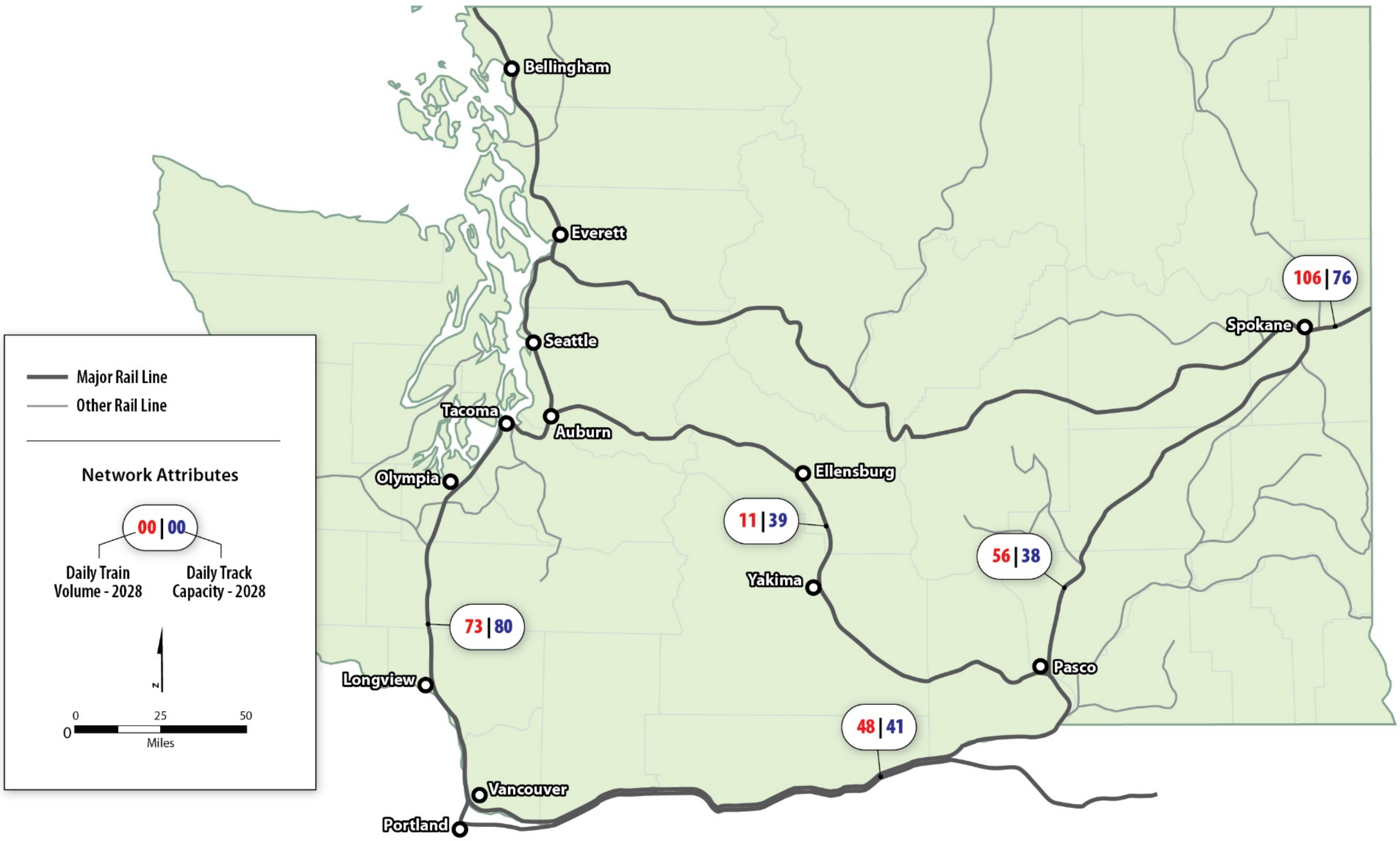
5.1.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the proposed coal export terminal. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

The Applicant's planned growth under the No-Action Alternative would require approximately 2 additional trains per day on the Reynolds Lead, BNSF Spur, and BNSF main line in Cowlitz County regardless of whether the coal export terminal is constructed. The existing infrastructure on the Reynolds Lead, BNSF Spur, and BNSF main line would provide sufficient capacity to handle the projected growth in baseline traffic and investments to increase capacity would not be necessary.

Some BNSF main line segments would exceed capacity in 2028 if BNSF does not make capital investments or operating changes to expand capacity. Projected 2028 baseline traffic volumes are included in Table 5.1-5 and illustrated in Figure 5.1-5.

Figure 5.1-5. Projected Washington Rail Network Daily Track Utilization, 2028 Baseline Conditions without Proposed Action–Related Trains



5.1.6 Required Permits

No permits related to rail transportation would be required for the Proposed Action.

5.1.7 Potential Mitigation Measures

This section describes the potential mitigation measures that would reduce impacts related to rail transportation from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and environmental compliance that are assumed as part of the Proposed Action. Impacts on vehicle safety at grade crossings and measures by the Applicant to mitigate such impacts are discussed in Section 5.3, *Vehicle Transportation*.

5.1.7.1 Applicant Mitigation

The Applicant will implement the following mitigation measures to mitigate impacts on rail transportation.

MM RT-1. Coordinate with LVSW about Operations on the Reynolds Lead and BNSF Spur.

To address potential impacts to rail capacity on the Reynolds Lead and BNSF Spur, the Applicant will coordinate with LVSW before each identified operational stage (Stage 1a, Stage 1b, and Stage 2) that will change average daily rail traffic on the Reynolds Lead and BNSF Spur. The Applicant will prepare a report to document the coordination with LVSW and changes to average daily rail traffic. The report will be submitted to LVSW and Cowlitz County at least 6 months before the change in average daily rail traffic.

MM RT-2. Coordinate with BNSF and UP about Operations on Main Line Routes.

To address potential impacts to rail capacity on main line routes in Washington State, the Applicant will coordinate with BNSF and UP before each identified operational stage (Stage 1a, Stage 1b, and Stage 2) that will change average daily rail traffic on main line routes in Washington State. The Applicant will prepare a report to document the coordination with BNSF and UP and changes to average daily rail traffic. The report will be submitted to BNSF, UP, and Cowlitz County at least 6 months before the change in average daily rail traffic.

Impacts on vehicle safety at grade crossings and measures by the Applicant to mitigate such impacts are discussed in Section 5.3, *Vehicle Transportation*.

5.1.7.2 Other Measures to Be Considered

The following measures should be considered by LVSW, BNSF, and UP to expand capacity to accommodate Proposed Action-related trains.

- **LVSW.** Consider improvements to track infrastructure or changes in operations to increase track capacity and service along the Reynolds Lead and BNSF Spur. This could include installing traffic control systems, installing a new switch from the BNSF Spur to Reynolds Lead, upgrading rail, adding new main track, or adding siding.

- **BNSF and UP (in Washington State).** Consider improvements to track infrastructure or changes in operations to increase track capacity. This could include upgrading main track, adding new main track, or extending or adding siding.
- **BNSF and UP (outside Washington State).** Consider improvements to track infrastructure or changes in operations to increase track capacity and service. This could include upgrading main track, adding new main track, extending or adding siding, or installing new traffic control systems.

Impacts on vehicle traffic delay and vehicle traffic safety at grade crossings and measures to mitigate such impacts are discussed in Section 5.3, *Vehicle Transportation*.

5.1.8 Unavoidable and Significant Adverse Environmental Impacts

Without improvements to increase capacity, the Reynolds Lead; BNSF Spur; and three segments on the BNSF main line routes in Washington State (Idaho/Washington State Line–Spokane, Spokane–Pasco, and Pasco–Vancouver) are not projected to have the capacity to handle the projected baseline rail traffic and Proposed Action-related rail traffic in 2028. BNSF could address capacity issues with capital improvements or operational changes, but it is unknown when these actions would be taken or permitted. Therefore, with existing infrastructure and using the methods to identify potential baseline rail traffic in 2028, the Proposed Action could result in a significant adverse environmental impact on rail transportation.

5.2 Rail Safety

Railroads provide transportation for passengers and a wide range of commercial goods, and support regional economic activity. Similar to other forms of transportation, rail traffic is subject to various regulatory requirements, including requirements for tracks, rail cars and locomotives, crew operations, inspection and maintenance, and methods and types of goods and services that can be transported. Rail safety for this analysis refers to train derailments and collisions that could lead to a loss of cargo.

This section assesses impacts on rail safety that could result from construction and operation of the Proposed Action and No-Action Alternative. This section describes the regulatory setting, presents historical and current rail safety conditions in the study area, and assesses potential rail safety impacts for the Proposed Action and No-Action Alternative. Section 5.3, *Vehicle Transportation*, addresses grade crossing safety related to vehicle transportation. This section also presents measures to mitigate impacts resulting from the Proposed Action and any remaining unavoidable and significant adverse impacts.

5.2.1 Regulatory Setting

Laws and regulations relevant to rail safety are summarized in Table 5.2-1. Regulations pertaining to grade crossings are presented in Section 5.3*, Vehicle Transportation.*

Table 5.2-1. Regulations, Statutes, and Guidelines for Rail Safety

Regulation, Statute, Guideline	Description
Federal	
Federal Railroad Safety Act of 1970	Gives FRA rulemaking authority over all areas of rail line safety. FRA has designated that state and local law enforcement agencies have jurisdiction over most aspects of highway/rail grade crossings, including warning devices and traffic law enforcement.
Highway Safety Act and the Federal Railroad Safety Act	Gives FHWA and FRA regulatory jurisdiction over safety at federal highway/rail grade crossings.
Federal Railroad Administration General Regulations (49 CFR 200–299)	Establishes railroad regulations, including safety requirements related to track, operations, and cars.
State	
Title 81, Transportation—Railroads, Employee Requirements and Regulations (RCW 81.40)	Establishes general requirements for railroad employee environment and working conditions, the minimum crew size for passenger trains, and requirements for flaggers.
Title 81, Transportation—Railroads, Crossings (RCW 81.53)	Establishes requirements and process for railroad construction and extensions that would cross any existing railroad or highway at grade and vice versa. Includes approval from the commission.

Regulation, Statute, Guideline	Description
Rail Companies—Clearances (WAC 480-60)	Establishes clearances for railroad companies operating in Washington State. Includes rules of practice and procedure, walkway clearances, side clearances, track clearances, side clearances, track clearances, and rules for operation of excess dimension loads.
Rail Companies—Operation (WAC 480-62)	Establishes operating procedures for railroad companies operating in Washington State.
Local	
No local regulation, statutes, or guidelines apply to rail safety.	

Notes:
FRA = Federal Railroad Administration; FHWA = Federal Highway Administration; CFR = Code of Federal Regulations; USC = United States Code; RCW = Revised Code of Washington; WAC = Washington Administrative Code

5.2.2 Study Area

The study area for direct impacts on rail safety is the project area. The study area for indirect impacts on rail safety is the expected rail routes of Proposed Action-related trains within Washington State, as illustrated in Figure 5.1-1 in Section 5.1, *Rail Transportation*.

5.2.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts on rail safety associated with the construction and operation of the Proposed Action and No-Action Alternative.

5.2.3.1 Information Sources

The following sources of information were used to identify the potential impacts of the Proposed Action and No-Action Alternative on rail safety in the study area.

Rail accident data from the Federal Railroad Administration (FRA)[1] were used as the basis for the analysis. While the Washington Utilities and Transportation Commission (WUTC) gathers information on accidents that occur in Washington State, WUTC does not have the corresponding data on train miles within the state for determining accidents per million train miles traveled.

A train accident for this analysis is defined as involving one or more railroads that have sustained combined track, equipment, and/or structural damage in excess of the reporting threshold. The FRA reporting threshold was $10,500 in 2015. Therefore, an accident includes a wide variety of incident types and severity and is not limited to collisions or derailments.

[1] The Federal Railroad Administration (FRA) was created by the U.S. Department of Transportation Act of 1966. It is one of ten agencies within the U.S. Department of Transportation concerned with intermodal transportation. FRA's mission is to enable the safe, reliable, and efficient movement of people and goods. FRA has established federal regulations pertaining to the safety of interstate commerce. These regulations set standards that must be observed by all railroads dealing with the interchange of railroad cars and equipment.

Existing and Projected Rail Traffic

- **Reynolds Lead and BNSF Spur.** Existing (2015) and projected (2028) rail traffic on the Reynolds Lead and BNSF Spur was based on estimates from the Longview Switching Company (LVSW) and field observations.
- **BNSF main line routes**. Existing (2015) and projected (2028) rail traffic for BNSF Railway Company (BNSF) main line routes within Washington State was based on estimates from the *Washington State Rail Plan* (Washington State Department of Transportation 2014a).

Proposed Action-Related Train Operations

- **Volumes.** Proposed Action-related rail traffic to the project area was provided by the Applicant, notably 8 loaded and 8 empty trains per day if the coal export terminal is constructed and operated at full terminal throughput in 2028.
- **Routes.** Routes to and from the project area within Washington State were based on existing BNSF operations and Washington State Department of Transportation documents including the *Washington State Rail Plan* and *Washington State Freight Mobility Plan* (Washington State Department of Transportation 2014b).[2] Figure 5.1-1 in Section 5.1, *Rail Transportation*, illustrates the expected routes for Proposed Action-related trains in Washington State.
- **Train parameters.** Train parameters including the number of rail cars were based on information provided by the Applicant and existing BNSF train operations.

Accident Rates

- **FRA data (2012–2014).** Accident rates were compiled from FRA data for 2012 to 2014.[3] Published literature was also used to identify derailment rates by track class.[4] Historically, accident rates (accidents per train mile) do not change dramatically from one year to the next, but generally trend downward over time because of improved control systems, communications, and inspection practices. The analysis used 3-year data to account for year-to-year variations. Typically, year-to-year accident rates are more consistent than year-to-year traffic volumes on any specific route, which may vary substantially as demands change.

5.2.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on rail safety.

Accident Frequency

Accident rates for BNSF, Union Pacific Railroad (UP), and all railroads were calculated using FRA data for the 3 most recent years of available data (Table 5.2-2). Specific train accident rates for BNSF

[2] In 2012, BNSF introduced a directional routing strategy to enhance existing capacity, which routes all westbound-loaded unit trains (including coal) from Pasco to Vancouver via the Columbia River Gorge. Empty unit bulk trains (including coal) generated north of Vancouver, including Cowlitz County, travel to Pasco and to points east via Stampede Pass.

[3] 2014 data were the most recent available data when the analysis was completed.

[4] As part of its jurisdiction, FRA categorizes all tracks into track classes, segregated by maximum speed limits for freight and passenger trains. FRA maintenance and inspection requirements vary by track class.

in Washington State were not available in FRA data. LVSW did not have any reported train accident data in the FRA database because there were no train accidents on the Reynolds Lead or BNSF Spur from 2012 to 2014.

Table 5.2-2. Nationwide Train Accident Rates

	Accident Rate per Million Train Miles		
Year	**All Railroads (Passenger and Freight Trains)**	**BNSF (Freight Trains)**	**UP (Freight Trains)**
2012	2.41	2.20	3.04
2013	2.43	2.11	3.02
2014	2.27	1.89	2.82

Notes:
Source: Federal Railroad Administration (2015).
BNSF = BNSF Railway Company; UP = Union Pacific Railroad

Because Proposed Action-related rail traffic in Washington State would be on BNSF routes, a rate of two accidents per million train miles was used for the analysis.

FRA track safety standards establish nine specific classes of track (Class 1 to Class 9). Class of track is based on standards for track structure, geometry, and inspection frequency. Each class of track has a maximum allowable operating speed for both freight and passenger trains. The higher the class of track, the greater the allowable track speed and the more stringent the track safety standards that apply. Accident rates have been shown to vary considerably by track class, with higher accident rates (i.e., yielding more accidents for a given number of train miles) occurring on lower track classes. However, lower track classes have lower maximum operating speeds, which can reduce the consequences of the accidents that occur.

Data on accident rates by track class were used to generate a base accident rate for each route segment. The Reynolds Lead and BNSF Spur are currently maintained in accordance with the Track Class 1 standard. LVSW has indicated plans to make improvements to the Reynolds Lead and BNSF Spur to upgrade to a Track Class 2 designation, as described in Section 5.1, *Rail Transportation*. The Reynolds Lead and BNSF Spur would be maintained as Track Class 1 if planned improvements are not made. This analysis conservatively assumed Track Class 3 for all BNSF main line routes in Washington State.

The predicted number of accidents per year was calculated by multiplying segment length by the number of trains per year, by the applicable accident rate; the number was then adjusted for track classification based on published accident data research by track class.

The predicted accident per year for a segment can be summarized as follows.

> *(Segment length) x (Number of trains) x (Accident rate for segment x) = Predicted accidents per year for segment x*

More information on these methods is provided in the *SEPA Rail Safety Technical Report* (ICF International 2016).

5.2.4 Existing Conditions

This section describes existing conditions in the study area related to rail safety that could be affected by the construction and operation of the Proposed Action and No-Action Alternative. Section 5.1*, Rail Transportation*, describes existing conditions for Proposed Action-related train routes in more detail.

Available data (Liu et al. 2012) indicate the average number of rail cars derailed on main line track (all classes and speeds) for 2001 through 2010 was 8.4 rail cars. The number of rail cars derailed on yard, siding, and industry track ranged from 4.3 to 5.7 rail cars.

5.2.4.1 Accidents in Cowlitz County

Based on FRA data, there were two accidents in Cowlitz County in 2014, and neither involved an injury or fatality. One incident was in a rail yard with no derailment and the other involved a derailment of 11 cars on main line track.

5.2.4.2 Accidents in Washington State

In Washington State, there were 36 accidents in 2014, two of which involved an injury. Thirteen accidents were on main line track, and the remainder were in rail yards or on industry track. Derailments (main line and industry track) involved between 0 and 11 rail cars.

5.2.5 Impacts

This section describes the potential direct and indirect impacts related to rail safety (train accidents) that would result from construction and operation of the Proposed Action and the No-Action Alternative.

5.2.5.1 Proposed Action

This section describes the potential impacts on rail safety that could occur in the study area as a result of construction and operation of the Proposed Action. Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, describes construction-related activities and scenarios for transporting materials to the project area. Under the rail scenario, an average of 1.3 construction trains would travel to and from the project area per day. Construction impacts are based on the peak construction period, assumed to be in 2018. Operations impacts are based on the maximum coal export terminal throughput capacity (up to 44 million metric tons per year), which would result in 8 loaded and 8 empty trains per day in 2028.

Construction—Direct Impacts

Any accidents in the project area would be related to construction in the project area and would not affect rail safety on the Reynolds Lead.

Construction—Indirect Impacts

Construction-related activities associated with the Proposed Action could result in indirect impacts on rail safety as described below. As explained in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives,* construction-related activities include demolishing existing structures and preparing the site, constructing the rail loop and dock, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

Increase the Potential for Train Accidents

According to the Applicant, construction materials could be delivered by rail. This would require an estimated 350 loaded trains of 100 cars each, and 350 empty trains of 100 cars each. It is anticipated two-thirds of the construction material would be transported during the first year of construction in 2018 (approximately 467 trains, an average of 1.3 trains per day). Construction trains would use the Reynolds Lead and BNSF Spur. Because the specific main line routes for Proposed Action-related construction trains are not known, the expected routes for Proposed Action-related trains in Washington State during operations was used to illustrate the possible range of accident frequencies.

The predicted accident frequencies during the peak year of construction are shown in Table 5.2-3. Proposed Action-related construction rail traffic would have a relatively small increase on predicted train accidents.

Table 5.2-3. 2018 Predicted Train Accidents during Peak Year of Construction

Route Segment	Length (miles)	Predicted Train Accidents[a]
Inbound Route (Loaded Trains)		
Idaho/Washington State Line-Spokane	18.6	0.03
Spokane-Pasco	145.5	0.27
Pasco-Vancouver	221.4	0.41
Vancouver-Longview Junction	34.8	0.07
Longview Junction-LVSW Yard (BNSF Spur)	2.1	0.01
LVSW Yard-Project Area (Reynolds Lead)	5.0	0.03
Outbound Route (Empty Trains)		
Project Area-LVSW Yard (Reynolds Lead)	5.0	0.03
LVSW Yard-Longview Junction (BNSF Spur)	2.1	0.01
Longview Junction-Auburn	118.6	0.22
Auburn-Yakima	139.6	0.26
Yakima-Pasco	89.4	0.17
Pasco-Spokane	145.5	0.27
Spokane-Idaho/Washington State Line	18.6	0.03

Notes:
[a] Accidents related to Proposed Action-related trains; these would be additive to baseline conditions.

Operations—Direct Impacts

During operations at full terminal capacity, 8 loaded trains would travel to the project area, and 8 empty trains would travel from the project area daily. These trains would maneuver along the rail loop in the project area. The predicted accident frequency within the project area was not analyzed because the rail loop is in an industrial facility.

Operations—Indirect Impacts

Based on current operations, BNSF loaded and empty Proposed Action-related trains would be expected to travel via the same route between the coal mines in the Powder River Basin in Montana and Wyoming, and Pasco, Washington.

- West of Pasco, loaded BNSF trains would be expected travel to the project area via the Columbia Gorge through Vancouver to Longview Junction, and travel along the BNSF Spur and Reynolds Lead to the project area.
- Empty BNSF trains would be expected to travel from the project area along the Reynolds Lead and BNSF Spur and return from Longview Junction via Stampede Pass route through Auburn and Yakima to Pasco.

Loaded and empty Proposed Action-related UP trains would be expected to move between Vancouver and Longview Junction in Washington State. Because UP operates over the same track that carries BNSF trains, no additional analysis was required for Proposed Action-related rail traffic in Washington State for UP trains.

Operation of the Proposed Action would result in the following indirect impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Increase the Potential for Train Accidents

The Proposed Action would increase the potential for train accidents by adding loaded and empty rail traffic on rail routes in Washington State. The predicted accident frequencies in 2028 are shown in Table 5.2-4.

The following summarizes the predicted accident frequencies.

- With track improvements to the Reynolds Lead and BNSF Spur (Track Class 2): The predicted number of accidents is 0.25 per year for loaded Proposed Action-related trains, and 0.25 accident per year for empty Proposed Action-related trains. Therefore, 1.0 accident for each type of train (loaded and empty) every 4 years is predicted. Proposed Action–related traffic would increase the predicted accident frequency on the Reynolds Lead and BNSF Spur from 0.11 accident per year to 0.61 accident per year for all rail traffic.
- Without track improvements to the Reynolds Lead and BNSF Spur (Track Class 1): Accident rates for Track Class 1 are more uncertain given the small percentage of train miles that occur on Track Class 1. Data sources group Excepted Track (Class X) and Track Class 1. Therefore, it is difficult to predict accident rates for Track Class 1, but data indicate the 2028 Proposed Action-related predicted train accidents per year in Table 5.2-4 would increase by a factor of approximately 1.5 to 3 without planned improvements to the Reynolds Lead and BNSF Spur.
- BNSF Main Line Routes (Track Class 3): The predicted number of accidents for loaded Proposed Action-related trains on BNSF main line varies between 0.22 accident per year to 2.59 accidents per year.

Table 5.2-4. 2028 Predicted Train Accidents per Year by Scenario[a]

Route Segment	Length (miles)	2028 Proposed Action-Related Trains[b]	2028 Baseline Conditions
Inbound Route (Loaded Trains)			
Idaho/Washington State Line–Spokane	18.6	0.22	2.88
Spokane–Pasco	145.5	1.70	11.90
Pasco–Vancouver	221.4	2.59	15.52
Vancouver–Longview Junction	34.8	0.41	3.71
Longview Junction–LVSW Yard (BNSF Spur)	2.1	0.07	0.06
LVSW Yard–Project Area (Reynolds Lead)	5.0	0.18	0.04
Outbound Route (Empty Trains)			
Project Area–LVSW Yard (Reynolds Lead)	5.0	0.18	0.04
LVSW Yard–Longview Junction (BNSF Spur)	2.1	0.07	0.06
Longview Junction-Auburn	118.6	1.39	12.64
Auburn–Yakima	139.6	1.63	2.24
Yakima–Pasco	89.4	1.04	1.44
Pasco–Spokane	145.5	1.70	11.90
Spokane–Idaho/Washington State Line	18.6	0.22	2.88

Notes:
[a] Assumes the Reynolds Lead and BNSF Spur would be improved to Class 2 standards, as indicated by LVSW. If the Reynolds Lead and BNSF Spur are not improved to Class 2 standards, the predicted train accidents per year would increase by a factor of approximately 1.5 to 3.
[b] Additive to the 2028 baseline conditions results.

Not every accident of a loaded Proposed Action-related train would result in a coal spill. As a result, a range of coal spill sizes could occur from accidents involving loaded Proposed Action-related trains. Coal spills on the Reynolds Lead or BNSF Spur would be expected to be smaller than on main line routes due to lower operating speeds. Impacts from coal spills on the natural environment are addressed in Chapter 4, Sections 4.5, *Water Quality,* 4.6, *Vegetation*, 4.7, *Fish,* and 4.8, *Wildlife*.

Cowlitz County Impacts

The predicted number of loaded Proposed Action-related train accidents in Cowlitz County (BNSF main line, BNSF Spur, and Reynolds Lead) is 0.46 per year, or approximately 1.0 accident every 2 years. The predicted number of empty Proposed Action-related train accidents is slightly higher (0.50 per year), due to the greater number of miles within Cowlitz County on the empty train route.

The baseline predicted number of accidents is approximately 4.30 per year. The number of predicted accidents per year would be 5.25 with Proposed Action-related trains (an increase of approximately 22%), which illustrates the relative contribution of Proposed Action-related trains to overall rail safety within Cowlitz County. Additional information is provided in the *SEPA Rail Safety Technical Report.*

Statewide Impacts

The predicted number of loaded train accidents related to the Proposed Action in Washington State (including Cowlitz County) is 5.16 per year. The predicted number of Proposed Action-related empty train accidents is 6.23 per year, due to the greater length of the empty train rail route.

Adding the train accidents from the inbound and outbound trains related to the Proposed Action to the total accident baseline would increase accidents from 50.43 accidents per year to 61.81 accidents per year. This means that within Washington State, the predicted increase in rail traffic accidents related to the Proposed Action is approximately 11.38 accidents per year (an increase of approximately 22% over the baseline).

5.2.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the proposed coal export terminal. The Applicant would continue with current and proposed future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

The No-Action Alternative would increase rail traffic by approximately 2 trains per day; therefore, the predicted number of accidents would be lower than the Proposed Action and higher than the baseline conditions (Table 5.2-4). Various types of rail cars would be needed for the range of expected cargoes. No-Action Alternative-related rail traffic would have various cargoes (mixed-load train). The potential for a mixed-load train derailment or accident on the Reynolds Lead and BNSF Spur would be lower than a unit train because mixed-load trains would not have as many rail cars as a unit train.

5.2.6 Required Permits

No permits related to rail safety would be required for the Proposed Action.

5.2.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to rail safety from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action.

5.2.7.1 Applicant Mitigation

The mitigation measures identified in Section 5.1, *Rail Transportation*, to mitigate impacts on rail transportation would also mitigate impacts on rail safety.

MM RT-1. Coordinate with LVSW about Operations on the Reynolds Lead and BNSF Spur.

To address potential impacts to rail capacity on the Reynolds Lead and BNSF Spur, the Applicant will coordinate with LVSW before each identified operational stage (Stage 1a, Stage 1b, and Stage 2) that will change average daily rail traffic on the Reynolds Lead and BNSF Spur. The Applicant will prepare a report to document the coordination with LVSW and changes to average daily rail traffic. The report will be submitted to LVSW and Cowlitz County at least 6 months before the change in average daily rail traffic.

MM RT-2. Coordinate with BNSF and UP about Operations on Main Line Routes.

To address potential impacts to rail capacity on main line routes in Washington State, the Applicant will coordinate with BNSF and UP before each identified operational stage (Stage 1a, Stage 1b, and Stage 2) that will change average daily rail traffic on main line routes in Washington State. The Applicant will prepare a report to document the coordination with BNSF and UP and changes to average daily rail traffic. The report will be submitted to BNSF, UP, and Cowlitz County at least 6 months before the change in average daily rail traffic.

Impacts on vehicle safety at grade crossings and measures by the Applicant to mitigate such impacts are discussed later in Section 5.3, *Vehicle Transportation*.

5.2.7.2 Other Measures to Be Considered

The following measure should be considered.

- LVSW should consider improvements to track infrastructure or changes in operations to increase track capacity and service along the Reynolds Lead and BNSF Spur. This could include installing traffic control systems, installing a new switch from the BNSF Spur to Reynolds Lead, upgrading rail, adding new main track, or adding siding. The improvements would benefit rail safety by upgrading the Reynolds Lead and BNSF Spur per Track Class 2 requirements, which would lower the expected accident rate.

5.2.8 Unavoidable and Significant Adverse Environmental Impacts

Proposed Action-related trains could increase the number of potential train accidents along in the rail routes in Cowlitz County and Washington State. BNSF and UP could address safety issues as they emerge using capital improvements or operational changes, but it is unknown when those actions would be taken or permitted. Therefore, the Proposed Action could result in a significant adverse impact on rail safety in Cowlitz County and Washington State.

5.3 Vehicle Transportation

Vehicles provide transportation for individuals to travel to work, school, public services, and for recreational and commercial purposes. Vehicles also are used for emergency response and for delivering commercial goods that support economic activity. Vehicle delays increase travel time for motorists and can affect quality of life, air quality, and economic growth.

This section describes vehicle transportation in the study area. It then describes impacts on vehicle transportation that could result from construction and operation of the Proposed Action and No-Action Alternative. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action and any remaining unavoidable and significant adverse impacts.

5.3.1 Regulatory Setting

Laws and regulations relevant to vehicle transportation are summarized in Table 5.3-1.

Table 5.3-1. Regulations, Statutes, and Guidelines for Vehicle Transportation

Regulation, Statute, Guideline	Description
Federal	
Federal Railroad Safety Act of 1970	Gives FRA rulemaking authority over all areas of rail line safety. FRA has designated that state and local law enforcement agencies have jurisdiction over most aspects of highway/rail grade crossings, including warning devices and traffic law enforcement.
Highway Safety Act and the Federal Railroad Safety Act	Gives FHWA and FRA regulatory jurisdiction over safety at federal highway/rail grade crossings.
Railroad-Highway Grade Crossing Handbook (Federal Highway Administration 2007); *Manual on Uniform Traffic Control Devices* (23 USC 109(d))	Guidance document on grade-crossing safety issues, including the selection and placement of warning devices and enforcement of traffic laws. Provides guidelines for traffic control devices that consider delay, roadway classification, average daily traffic, number of trains per day, and train speed at grade crossings.
State	
Washington State Department of Transportation, Design Manual M 22.01.10, November 2015, Chapter 1350, Railroad Grade Crossings	Sets forth requirements and guidance on the design and treatment of state highway-rail grade crossings.
Motor Vehicles, Rules of the Road (RCW 46.61.340)	Sets forth that train traffic has the right-of-way at grade crossings.
Washington Utilities and Transportation Commission	Inspects and issues violations for hazardous materials shipments; track, signal, and train control; and rail operations. WUTC also regulates the construction, closure, or modification of public railroad crossings. In addition, WUTC inspects and issues defect notices if a crossing does not meet minimum standards. However, WUTC has no jurisdiction over public crossings in first-class cities.[a]

Regulation, Statute, Guideline	Description
Local	
Longview Municipal Code 11.40.080 (Railroad Trains Not to Block Streets)	Prohibits trains from using any street or highway for a period of time longer than five minutes, except trains or cars in motion other than those engaged in switching activities.

Notes:
[a] Per RCW 35.01.01, a first-class city is a city with a population of 10,000 or more at the time of organization or reorganization that has adopted a charter.
FRA = Federal Railroad Administration; FHWA = Federal Highway Administration; USC = United States Code; RCW = Revised Code of Washington; WUTC = Washington Utilities and Transportation Commission

5.3.2 Study Area

The study area for direct impacts is the project area as shown in Figure 5.3-1. The study area for indirect impacts is active public and private at-grade crossings within Cowlitz County on the Reynolds Lead and BNSF Spur, and all at-grade public crossings on the BNSF main line. A review of selected at-grade crossings along the BNSF Railway Company (BNSF) main line in Washington State is also considered.

The following are the at-grade rail crossings along the Reynolds Lead and BNSF Spur in the study area. Figure 5.3-1 illustrates the location of these rail crossings.

- Project area access at 38th Avenue, south of Industrial Way (State Route [SR] 432)
- Weyerhaeuser access at Washington Way, south of Industrial Way
- Weyerhaeuser North Pacific Paper Corporation (NORPAC) access, south of Industrial Way
- Industrial Way, west of Oregon Way (SR 433)
- Oregon Way, north of the Industrial Way/Oregon Way intersection
- California Way, north of Industrial Way
- 3rd Avenue (SR 432), north of the 3rd Avenue/Industrial Way intersection
- Dike Road, south of Tennant Way

The following are the at-grade crossings along the BNSF main line in Cowlitz County. Figure 5.3-2 illustrates the locations of these rail crossings.

- Taylor Crane Road, west of Barnes Drive in Castle Rock
- Cowlitz Street, west of Pioneer Avenue in Castle Rock
- Cowlitz Gardens Road, west of Pacific Avenue in Kelso
- Mill Street, west of 1st Avenue in Kelso
- S River Road, west of Pacific Avenue in Kelso
- Toteff Road/Port Road in Kalama
- W Scott Avenue, east of Pekin Road in Woodland
- Davidson Avenue, east of Pekin Road in Woodland
- Whalen Road, east of Kuhnis Road in Woodland

Figure 5.3-1. Reynolds Lead and BNSF Spur Study Crossings

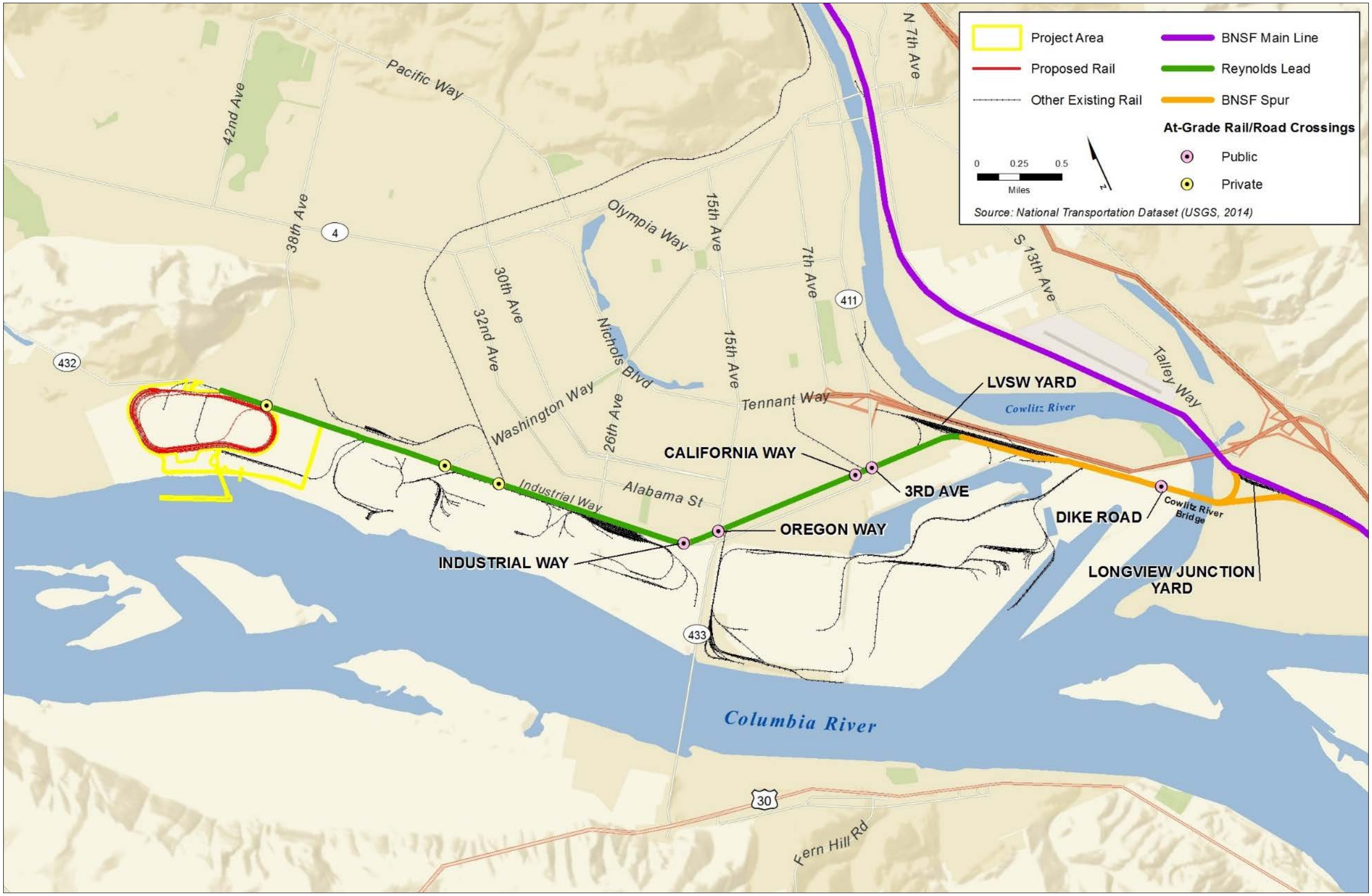


Figure 5.3-2. BNSF Main Line in Cowlitz County Study Crossings

A review of selected at-grade rail crossings identified by the Washington State Department of Transportation (WSDOT) on the routes for Proposed Action-related trains beyond Cowlitz County was also conducted. These statewide study crossings are at-grade state highway crossings or at-grade crossings near state highways.[1]

5.3.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts on vehicle transportation associated with the construction and operation of the Proposed Action and No-Action Alternative. For additional information, see the *SEPA Vehicle Transportation Technical Report* (ICF International and DKS Associates 2016).

5.3.3.1 Information Sources

The following sources of information were used to identify the potential impacts of the Proposed Action and No-Action Alternative on vehicle transportation in the study area.

- Data provided by the Washington Utilities and Transportation Commission (WUTC)
- U.S. Department of Transportation (USDOT) Grade Crossing Inventory, Federal Railroad Administration (FRA)
- *SR 432 Highway Improvements and Rail Realignment Study* (Cowlitz-Wahkiakum Council of Governments 2014)
- Traffic volume data provided in local studies
- Data and information provided by the Applicant

5.3.3.2 Impact Analysis

This section describes the methods used to evaluate the potential impacts on vehicle transportation associated with the construction and operation of the Proposed Action and No-Action Alternative.

The potential vehicle impacts addressed in this analysis include increases in average vehicle delay in a 24-hour period (average vehicle delay), increases in peak hour vehicle delay, increases in vehicle queuing, and changes to vehicle safety.[2] 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 identifying typical operations. Because freight trains do not operate on a schedule, the analysis analyzed the 24-hour average delay to represent the delay for the average driver. To analyze the highest potential vehicle delay impacts that could occur, an analysis of vehicle delay during the PM (afternoon) peak traffic hour was also completed.

Analysis Scenarios

The following scenarios were analyzed.

[1] Figure 5.3-6 in Section 5.3.5, *Impacts*, illustrates the statewide study crossings.

[2] Indicates changes to vehicle safety conditions at study crossings.

- **2018 No-Action**. This scenario represents conditions in 2018 without construction of the coal export terminal. This scenario includes activities currently ongoing and planned for the existing bulk materials terminal within the Applicant's leased area.
- **2018 Proposed Action Construction**. This scenario represents the construction year for the Proposed Action with the most construction vehicle traffic. It assumes the motor vehicle and train volumes from the 2018 No-Action scenario, but with the added traffic and rail growth related to construction of the Proposed Action. It also assumes the planned project area activities included in the 2018 No-Action scenario. This scenario considers two alternative assumptions: that construction materials would be delivered by truck (Truck Delivery), and construction materials would be delivered by rail (Rail Delivery), as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*.
- **2028 No-Action**. This scenario represents conditions without the coal export terminal in 2028. It includes the motor vehicle and train volumes from the 2018 No-Action scenario, but with added growth to represent 2028 conditions. It also assumes the planned bulk product terminal activities, and the potential future activities for the existing bulk product terminal.
- **2028 Proposed Action**. This scenario represents conditions during full operation of the coal export terminal in 2028. It includes the motor vehicle and train volumes from the 2028 No-Action scenario, but with the added traffic and train growth related to full operation of the coal export terminal. It also assumes the planned and potential bulk product terminal activities included in the 2028 No-Action scenario. This scenario considers two alternative assumptions: current track infrastructure along the Reynolds Lead and BNSF Spur, and planned track infrastructure improvements along the Reynolds Lead and BNSF Spur.

The *SR 432 Highway Improvements and Rail Realignment Study* completed in September 2014 (Cowlitz-Wahkiakum Council of Governments 2014) developed various design concepts for rail and highway improvements to improve safety, mobility, congestion, and freight capacity. The top concept that emerged from this study was a grade-separated intersection at Industrial Way (SR 432)/Oregon Way (SR 433). This project, called the Industrial Way/Oregon Way Intersection Project and led by Cowlitz County Public Works, is currently in the preliminary design and National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) environmental compliance 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. This project was not included in the vehicle transportation analysis because a preferred alternative for the intersection has not been identified. The other concepts identified in the *Highway Improvements and Rail Realignment Study* were not included in the vehicle transportation analysis because funding for implementation has not been secured.

Construction Impact Analysis

The Applicant has identified three construction-material-delivery scenarios: delivery by truck, rail, or barge.

- **Truck.** If material is delivered by truck, it is assumed that approximately 88,000 truck trips would be required over the construction period. Approximately 56,000 loaded trucks would be needed during the peak construction year.

- **Rail.** If material is delivered by rail, it is assumed that approximately 35,000 loaded rail cars would be required over the construction period. Approximately two-thirds of the rail trips would occur during the peak construction year.
- **Barge.** If material is delivered by barge, it is assumed that approximately 1,130 barge trips would be required over the construction period. Approximately two-thirds of the barge trips would occur during the peak construction year. Because the project area does not have an existing barge dock, the material would be off-loaded at an existing dock elsewhere on the Columbia River and transported to the project area by truck.

The analysis analyzed all three scenarios.[3]

The analysis of potential vehicle transportation impacts during the peak construction year is based primarily on information provided by the Applicant, as documented in the *SEPA Vehicle Transportation Technical Report*, including the following.

- The amount of construction material that would be delivered to the project area via truck or rail (applicable to all three construction material delivery scenarios).
- Daily and peak hour estimates of construction truck traffic to deliver materials (applicable to the truck delivery and barge delivery construction material delivery scenarios).
- Average number of daily construction trains (rail delivery construction material delivery scenario).
- Daily and peak hour construction worker vehicle traffic (applicable to all three construction material delivery scenarios).

Operations Impact Analysis

Full operations of the coal export terminal (up to 44 million metric tons per year) would add 16 new daily train trips (8 loaded and 8 empty), each an average of 6,844 feet long (approximately 1.3 miles).

Trip Generation and Trip Distribution

Based primarily on estimates provided by the Applicant, approximately 135 employees would be needed to operate the coal export terminal; 50% of the employees would exit and 30% would enter the project area during the PM peak hour.

Construction and operations traffic generated by the Proposed Action was distributed onto the transportation network based on current traffic patterns in the study area. For the construction materials delivered to the project area by truck, it is assumed that 75% of the trucks would arrive from the east using 3rd Avenue, and 25% from the south along Oregon Way. For the construction workers and terminal employees, it is assumed that 60% of the traffic would arrive from the north using Washington Way (35%) and Oregon Way (25%), 15% from the south along Oregon Way, 20% from the east along 3rd Avenue, and 5% from the west along Industrial Way.

[3] For the vehicle transportation analysis, the barge scenario is the same as the truck scenario because materials would be transferred from barge to truck and delivered to the project area by truck.

Baseline and Future Volumes

The following describes the baseline and future vehicular and train volumes.

Vehicles

Vehicle traffic count data were obtained from recent studies for 12 of the study crossings. Where recent traffic count data were unavailable, average daily traffic volumes were obtained from the FRA or WUTC databases and estimated PM peak hour traffic volumes were derived from the average daily traffic volumes. Hourly traffic volumes over 3 days were compared at select locations to identify a peak hour, which was identified as 4:00 p.m. to 5:00 p.m. The data also indicated that the PM peak hour (hereafter referred to as peak hour) represents approximately 10% of the daily traffic volumes. This factor was used to covert count data from peak hour to average daily traffic or vice versa.

Traffic volumes in 2018 and 2028 included a combination of background traffic, as well as growth associated with the Proposed Action. Year 2028 background traffic was estimated by developing a linear growth rate between existing and forecast traffic volumes in the immediate area. These data suggest that traffic volumes are forecast to increase at a rate of 2% annually. For comparison purposes, a 2% annual growth rate was applied to expand older count data to reflect baseline traffic conditions in the *SR 432 Highway Improvements and Rail Realignment Study* completed in September 2014 (Cowlitz-Wahkiakum Council of Governments 2014). Therefore, the 2% annual growth rate was applied to the collected count data to develop 2018 No-Action scenario traffic volumes, and to the 2018 No-Action scenario traffic volumes for 10 years to develop 2028 No-Action scenario traffic volumes. Table 5.3-2 illustrates the average daily traffic and peak hour count data for all study crossings.

Trains

The following describes the methods to estimate train volumes on the Reynolds Lead and BNSF Spur, and the BNSF main line in Cowlitz County.

Reynolds Lead and BNSF Spur

Section 5.1, *Rail Transportation*, describes methods to estimate the types, numbers, and speed of trains between the project area and Longview Junction in 2018 and 2028. As described in Section 5.1, *Rail Transportation*, Longview Switching Company plans to upgrade the Reynolds Lead and BNSF Spur as a separate action should it be warranted by increased rail traffic resulting from existing and future customers. Because these improvements are not certain, the vehicle transportation impact analysis analyzes both current track infrastructure and with planned track improvements.

Table 5.3-2. Motor Vehicle and Train Volumes at Study Crossings by Scenario

Crossing Name (USDOT Crossing ID)	Time Period	2018 No-Action Scenario		2018 Proposed Action Construction Truck Delivery) Scenario		2018 Proposed Action Construction (Rail Delivery) Scenario		2028 No-Action Scenario		2028 Proposed Action Scenario	
		Vehicle	Train	Vehicle	Train	Vehicle	Train	Vehicle	Train	Vehicle	Train
Reynolds Lead and BNSF Spur Study Crossings											
Project area access at 38th Avenue	Per Day	200	2.3	2,850	2.3	2,000	3.6	250	4.0	1,340	20.0
	Peak Hour	20	1	285	1	200	1	25	1	134	1 or 2
Weyerhaeuser access at Washington Way	Per Day	3,300	2.3	3,300	2.3	3,300	3.6	3,900	4.0	3,900	20.0
	Peak Hour	330	1	330	1	330	1	390	1	390	1 or 2
Weyerhaeuser NORPAC access	Per Day	650	2.3	650	2.3	650	3.6	800	4.0	800	20.0
	Peak Hour	65	1	65	1	65	1	80	1	80	1 or 2
Industrial Way-SR 432 (101806G)	Per Day	10,100	2.3	12,000	2.3	11,200	3.6	11,450	4.0	12,100	20.0
	Peak Hour	1,010	1	1,200	1	1,120	1	1,145	1	1,210	1 or 2
Oregon Way-SR 433 (101805A)	Per Day	15,200	2.3	15,650	2.3	15,650	3.6	18,500	4.0	18,770	20.0
	Peak Hour	1,520	1	1,565	1	1,565	1	1,850	1	1,877	1 or 2
California Way (101821J)	Per Day	4,050	2.3	4,050	2.3	4,050	3.6	4,800	4.0	4,800	20.0
	Peak Hour	405	1	405	1	405	1	480	1	480	1 or 2
3rd Avenue-SR 432 (101826T)	Per Day	16,850	2.3	17,850	2.3	17,200	3.6	20,500	4.0	20,720	20.0
	Peak Hour	1,685	1	1,785	1	1,720	1	2,050	1	2,072	1 or 2
Dike Road (101791U)	Per Day	950	7.1	950	7.1	950	8.4	1,100	7.1	1,100	23.1
	Peak Hour	95	1	95	1	95	1	110	1	110	1 or 2
BNSF Main Line in Cowlitz County Study Crossings											
Taylor Crane Road in Castle Rock (092481X)	Per Day	50	55.1	50	55.1	50	56.1	50	72.7	50	80.7
	Peak Hour	5	3.9	5	3.9	5	4.9	5	4.6	5	6.6
Cowlitz Street in Castle Rock (092476B)	Per Day	1,200	55.1	1,200	55.1	1,200	56.1	1,450	72.7	1,450	80.7
	Peak Hour	120	3.9	120	3.9	120	4.9	145	4.6	145	6.6

Crossing Name (USDOT Crossing ID)	Time Period	2018 No-Action Scenario		2018 Proposed Action Construction Truck Delivery) Scenario		2018 Proposed Action Construction (Rail Delivery) Scenario		2028 No-Action Scenario		2028 Proposed Action Scenario	
		Vehicle	**Train**	**Vehicle**	**Train**	**Vehicle**	**Train**	**Vehicle**	**Train**	**Vehicle**	**Train**
Cowlitz Gardens Road in Kelso (092466V)	Per Day	700	55.1	700	55.1	700	56.1	850	72.7	850	80.7
	Peak Hour	70	3.9	70	3.9	70	4.9	85	4.6	85	6.6
Mill Street in Kelso (092458D)	Per Day	2,550	55.1	2,550	55.1	2,550	56.1	3,000	72.7	3,000	80.7
	Peak Hour	255	3.9	255	3.9	255	4.9	300	4.6	300	6.6
S River Road in Kelso (092457W)	Per Day	1,850	55.1	1,850	55.1	1,850	56.1	2,200	72.7	2,200	80.7
	Peak Hour	185	3.9	185	3.9	185	4.9	220	4.6	220	6.6
Toteff Road/ Port Road in Kalama (092446J)	Per Day	1,200	55.1	1,200	55.1	1,200	56.1	1,450	72.7	1,450	80.7
	Peak Hour	120	3.9	120	3.9	120	4.9	145	4.6	145	6.6
W Scott Avenue in Woodland (092437K)	Per Day	2,650	55.1	2,650	55.1	2,650	56.1	3,100	72.7	3,100	80.7
	Peak Hour	265	3.9	265	3.9	265	4.9	310	4.6	310	6.6
Davidson Avenue in Woodland (092435W)	Per Day	2,000	55.1	2,000	55.1	2,000	56.1	2,350	72.7	2,350	80.7
	Peak Hour	200	4	200	3.9	200	4.9	235	4.6	235	6.6
Whalen Road in Woodland (092434P)	Per Day	1,550	55.1	1,550	55.1	1,550	56.1	1,800	72.7	1,800	80.7
	Peak Hour	155	3.9	155	3.9	155	4.9	180	4.6	180	6.6

Notes:
USDOT = U.S. Department of Transportation

Table 5.3-2 illustrates the assumed number of trains for each scenario in 2018 and 2028. In summary, Table 5.3-2 shows the following.

- The 2018 Proposed Action Construction (Rail Delivery) scenario would add an average of 1.3 train trips per day during the peak construction period at study crossings on the Reynolds Lead and BNSF Spur. It was assumed that one Proposed Action-related train could travel during the peak hour. The 2018 Construction (Truck Delivery) scenario would not add any trains to the Reynolds Lead or BNSF Spur.
- The 2028 Proposed Action scenario would add 16 trains per day to the Reynolds Lead and BNSF Spur. It was assumed that 1 Proposed Action-related train could travel during the peak hour with current track infrastructure on the Reynolds Lead and BNSF Spur, and up to 2 Proposed Action-related trains could travel during the peak hour with planned track infrastructure on the Reynolds Lead and BNSF Spur.

BNSF Main Line in Cowlitz County

Section 5.1, *Rail Transportation*, describes methods to estimate the types, numbers, and speed of trains on the BNSF main line in Cowlitz County in 2018 and 2028. Table 5.3-2 illustrates the assumed number of trains for each scenario in 2018 and 2028.

In summary the table states the following.

- The 2018 Proposed Action Construction (Rail Delivery) scenario would add an average of 0.65 Proposed Action-related train round trips per day at study crossings on the BNSF main line in Cowlitz County. It was assumed that one Proposed Action-related train could travel during the peak hour. The 2018 Construction (Truck Delivery) scenario would not add any trains to the BNSF main line in Cowlitz County.
- The 2028 Proposed Action scenario would add 8 Proposed Action-related trains per day at study crossings on the BNSF main line in Cowlitz County (loaded trains would arrive from the south and loaded trains would travel to the north). It was assumed that up to 2 Proposed Action-related trains could travel during the peak hour.

Railroad Crossing Performance Measures

The following performance measures were used to determine vehicle transportation impacts and are defined below.

- **Level of service impact:** A study crossing that would operate below level of service D under the Proposed Action that would not otherwise operate below level of service D under the No-Action scenario for the same year.
- **Queuing impact:** An estimated queue length that would extend from a study crossing that exceeds available storage length (to an adjacent intersection) under the Proposed Action that would not otherwise exceed the available storage length under the No-Action scenario from the same year.
- **Vehicle safety impact:** A study crossing that would have a predicted accident probability above 0.04 under the Proposed Action that would be at or below 0.04 under the No-Action Alternative.

The following section provides additional information on the performance measures.

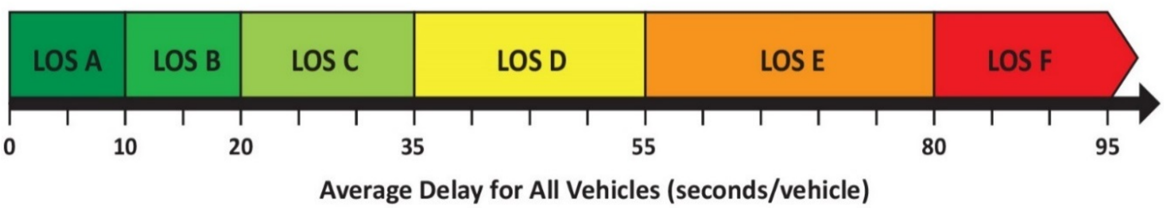
Vehicle Delay

The following describes vehicle delay measures, including level of service, and vehicle queuing.

Level of Service

Level of service represents a "report card" rating (A through F) based on the delay experienced by vehicles at an intersection, or in this case, a railroad crossing, as shown in Figure 5.3-3. Levels of service A, B, and C indicate conditions where traffic moves without significant delays. Levels of service D and E represent progressively worse operating conditions. Level of service F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity.

Figure 5.3-3. Level of Service



The Cities of Kelso (2015), Longview, and Woodland (2005) and WSDOT (2010) use a peak hour standard of level of service D or better.[4] The transportation element of the *City of Longview Comprehensive Plan* (December 2006) defines a capacity deficiency on arterial segments as a volume-to-capacity ratio of 0.85 or higher (representing a generalized level of service of D or worse). As a conservative approach, the level of service D standard was applied to all study crossings, regardless of the street functional classification or jurisdiction.

A vehicle level of service impact was defined as a study crossing that operates below level of service D under the Proposed Action that would not otherwise operate below level of service D under the No-Action scenario for the same year.

For the peak hour analysis, the traffic operating conditions at the study crossings were determined based on the *2000 Highway Capacity Manual* (Transportation Research Board 2000) methods for signalized intersections (the at-grade railroad crossings were assumed to be pretimed traffic signals). The average vehicle delay in the peak hour (in seconds) for a rail crossing was determined based on the peak hour number of trains, average train length, train speed, and peak hour traffic volume in both directions. This average vehicle delay in seconds per vehicle was then converted to the applicable level of service designation (Figure 5.3-3) to provide a qualitative measure of vehicle delay at study crossings during the peak hour for comparison with the No-Action scenario. Available signal timing information for the intersections adjacent to the rail crossings were incorporated into this analysis.

The same methods were used for the 24-hour vehicle delay analysis. The average delay per vehicle in a 24-hour period (in seconds) for a rail crossing was determined based on the average number of daily trains, average train length, train speed, and average daily traffic volumes in both directions. This average vehicle delay in seconds per vehicle was then converted to the applicable level of

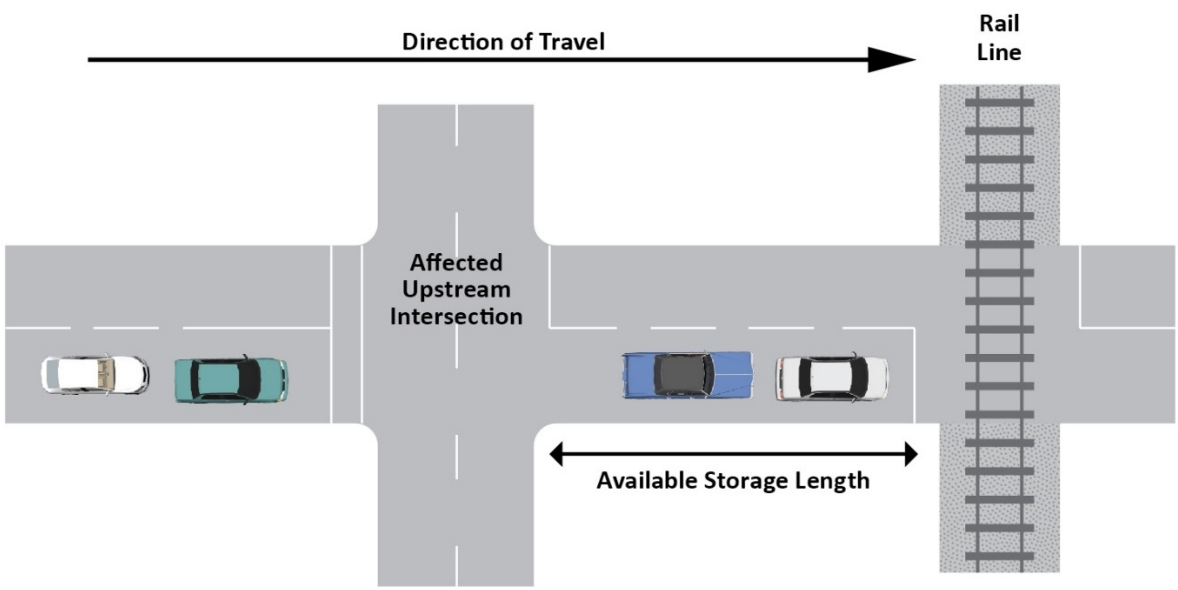
[4] Study crossings are also in the Cities of Castle Rock and Kalama. These cities have not adopted a peak hour standard.

service designation (Figure 5.3-3) to provide a qualitative measure of vehicle delay at study crossings in a 24-hour period for comparison with the No-Action scenario.

Vehicle Queuing

Each study grade crossing has a storage length to store vehicles when the crossing is blocked. The available storage length is the distance between the crossing and the next intersection (upstream intersection), as shown in Figure 5.3-4. As vehicles queue, the distance that vehicles extend back from the crossing while waiting at a blocked crossing increases.

Figure 5.3-4. Vehicle Queuing



Queuing analysis was conducted using SimTraffic™ 8, which estimates the 95th percentile vehicle queue lengths, or the queue length that would not be exceeded in 95% of the queues formed during the peak hour.

A vehicle queuing impact was defined as a queue that would extend from a study crossing that exceeds available storage length (to an adjacent intersection) under the Proposed Action that would not otherwise exceed the available storage under the No-Action scenario from the same year.

Vehicle Safety

An accident probability analysis was conducted for the study crossings in Cowlitz County and statewide crossings using the FRA GradeDec.Net web-based software, which estimates the predicted annual accident probability at a crossing in a year. The probability uses USDOT's Accident Prediction and Severity model. This model estimates accident probability based on numerous grade-crossing features available in FRA's nationwide inventory of at-grade crossings, including the type of crossing protection in place, historical accident data at the crossing, vehicle traffic volumes, the number of roadway lanes and train tracks, the number of trains per day, and train speed. Other physical factors that affect the probability of collisions at a crossing, such as available sight distance, are not direct inputs in this model. However, the accident history at these crossings would likely reflect these characteristics and such characteristics would not be affected by the Proposed Action, which would only alter the number of trains per day and vehicle traffic volumes (at some grade crossings). This analysis provides a frame of reference for crossings by estimating accident probability, but does not identify these crossings as unsafe.

Based on other applications of the model, a vehicle safety impact was defined as a study crossing that would have a predicted accident probability above 0.04 under the Proposed Action that would be at or below 0.04 under the No-Action scenario.

5.3.4 Existing Conditions

This section describes the existing environmental conditions in the study area related to vehicle transportation that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative.

5.3.4.1 Study Crossing Characteristics

Table 5.3-3 provides vehicle and train traffic information at the study crossings on the Reynolds Lead and BNSF Spur. This table also presents information for vehicle and train traffic at all nine public at-grade crossings on the BNSF main line in Cowlitz County. Roadway characteristics are also listed, including roadway functional classifications and number of lanes at the crossing. The following describes vehicle safety at study crossings and emergency service providers that would use the study crossings.

Vehicle Safety

Ten years of collision records (2003 to 2013) for the at-grade railroad crossings along the Reynolds Lead, BNSF Spur, and BNSF main line in Cowlitz County were obtained from FRA and WSDOT databases. The data identified one vehicle collision involving a train in the immediate study area, at the Washington Way crossing, just south of the Industrial Way intersection. The crossing is ungated, and located less than 50 feet from Industrial Way. The collision involved a vehicle stopped at the traffic signal, beyond the stop bar and on the track, getting struck by a train. The collision resulted in property damage only.

A collision involving a train also occurred at the Cowlitz Gardens Road crossing on the BNSF main line. This crossing is gated and located less than 75 feet from Pacific Avenue. The collision involved an inoperable vehicle stopped on the tracks, getting struck by a train. The collision resulted in property damage only.

Emergency Services

The Cowlitz 2 Fire & Rescue District, the Longview Fire Department, and American Medical Response (AMR) provide emergency medical services and fire protection for the project area. Figure 5.3-5 illustrates the location of fire stations in the vicinity of the project area.

Cowlitz 2 Fire & Rescue

Cowlitz 2 Fire & Rescue serves approximately 34,000 citizens in the City of Kelso and unincorporated Cowlitz County and responds to approximately 4,100 calls per year (Cowlitz 2 Fire & Rescue 2015).

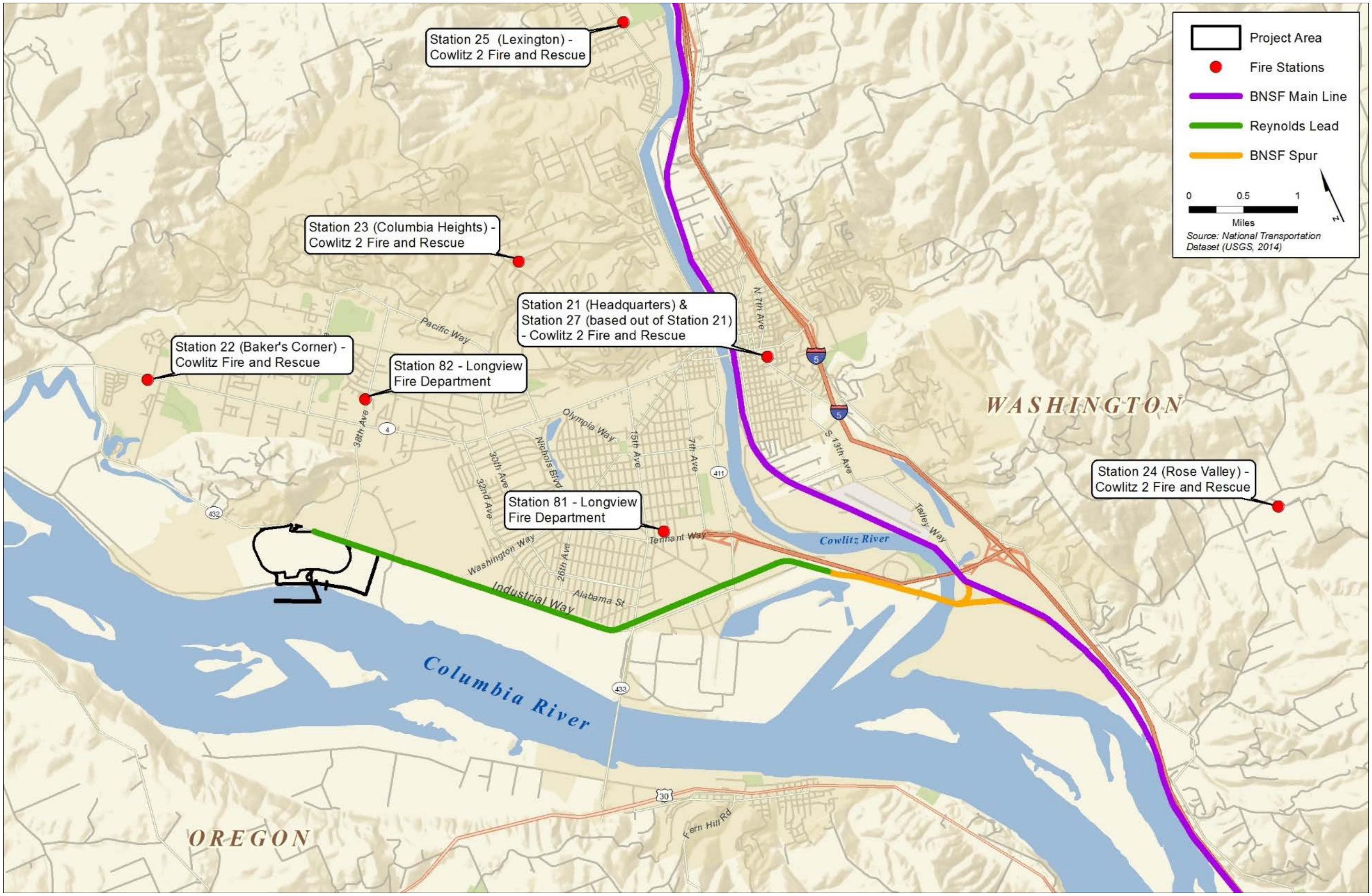
Table 5.3-3. Study Crossing Characteristics

	Roadway				Railroad (Trains)	
Crossing Name (USDOT Crossing ID)	**Estimated AADT**	**Functional Classification[a]**	**Lanes**	**Protection[b]**	**Crossings per Day**	**Average Speed (mph)[c]**
Reynolds Lead and BNSF Spur Study Crossings						
Project area access at 38th Avenue	200	Private	2	None	2.3	5 (freight)
Weyerhaeuser access at Washington Way	3,300	Private	4	None	2.3	8 (freight)
Weyerhaeuser NORPAC access	650	Private	2	None	2.3	10 (freight)
Industrial Way- SR 432 (101806G)	10,100	Principal Arterial	2	Overhead Lights	2.3	10 (freight)
Oregon Way- SR 433 (101805A)	15,200	Principal Arterial	4	Gates/ Overhead Lights	2.3	10 (freight)
California Way (101821J)	4,050	Minor Arterial	2	Overhead Lights	2.3	8 (freight)
3rd Avenue- SR 432 (101826T)	16,850	Principal Arterial	4	Gates/ Overhead Lights	2.3	8 (freight)
Dike Road (101791U)	950	Local	2	Overhead Lights	7.1	10 (freight)
BNSF Main Line in Cowlitz County Study Crossings						
Taylor Crane Road in Castle Rock (092481X)	50	Local	2	None	55.1	50 (freight); 50 (passenger)
Cowlitz Street in Castle Rock (092476B)	1,200	Minor Collector	2	Gates/ Overhead Lights	55.1	50 (freight); 50 (passenger)
Cowlitz Gardens Road in Kelso (092466V)	700	Local	2	Gates	55.1	60 (freight); 75 (passenger)
Mill Street in Kelso (092458D)	2,550	Local	2	Gates	55.1	40 (freight); 40 (passenger)
S River Road in Kelso (092457W)	1,850	Local	2	Gates	55.1	40 (freight); 40 (passenger)
Toteff Road/ Port Road in Kalama (092446J)	1,200	Local	2	Gates/ Overhead Lights	55.1	60 (freight); 79 (passenger)
W Scott Avenue in Woodland (092437K)	2,650	Minor Arterial	2	Gates	55.1	60 (freight); 75 (passenger)

	Roadway				Railroad (Trains)	
Crossing Name (USDOT Crossing ID)	**Estimated AADT**	**Functional Classification[a]**	**Lanes**	**Protection[b]**	**Crossings per Day**	**Average Speed (mph)[c]**
Davidson Avenue in Woodland (092435W)	2,000	Minor Arterial	2	Gates	55.1	60 (freight); 75 (passenger)
Whalen Road in Woodland (092434P)	1,550	Minor Arterial	2	Gates	55.1	60 (freight); 75 (passenger)

Notes:
[a] Source: City of Longview 2015; City of Kelso 2015; City of Castle Rock 2006; City of Woodland 2005.
[b] Source: Field observations.
[c] Source: ICF International and Hellerworx 2016 (for the Reynolds Lead and BNSF Spur study crossings) and Washington Utilities and Transportation Commission 2015 (for BNSF main line in Cowlitz County crossings).
USDOT = U.S. Department of Transportation; AADT = annual average daily traffic; mph = miles per hour

Figure 5.3-5. Emergency Services Providers



The district is staffed by approximately 120 full-time and volunteer members in five active fire stations, two of which are staffed with full-time emergency medical technicians (EMTs) and paramedic firefighters. Volunteer firefighter EMTs also respond on an on-call basis.

The district includes the following stations and equipment.

- **Station 21 (Headquarters for Cowlitz 2 Fire & Rescue).** Station 21 is staffed with 27 full-time personnel and includes a main response fire engine, a volunteer/reserve-ready fire engine, an advanced life support ambulance, and a reserve-ready advanced life support ambulance. This station includes three rotating shifts 24 hours a day, 7 days a week, 365 days a year. During each shift, at least eight personnel staff a variety of equipment.
- **Station 22 (Baker's Corner).** Station 22 is a volunteer station and includes a main response fire engine, a 3,000-gallon water supply, an emergency medical services (EMS)/wildland response vehicle, and an EMS response ambulance. This is an all-volunteer station that serves as crucial first response before additional help arrives.
- **Station 23 (Columbia Heights).** Station 23 is staffed full time by firefighter/EMT, firefighter/paramedic, and volunteer personnel and includes a main response fire engine, an EMS/wildland response vehicle, an advanced life support ambulance, a basic life support ambulance, and a hazardous materials response apparatus.
- **Station 24 (Rose Valley).** Station 24 is a volunteer station and includes a main response fire engine and an EMS/wildland response vehicle. This is an all-volunteer station that serves as crucial first response before additional help arrives.
- **Station 25 (Lexington).** Station 25 is a volunteer station and includes an initial response fire engine, a 2,000-gallon water supply, and an EMS/wildland response vehicle. This is an all-volunteer station that serves as crucial first response before additional help arrives.
- **Station 27 (Kelso).** Station 27 is a volunteer station and includes a main response fire engine and a 3,000-gallon water supply. This is an all-volunteer station that backs up personnel at Station 21 (Headquarters) when they are on calls.

Longview Fire Department

The Longview Fire Department serves approximately 36,000 citizens spread over 14.7 square miles of urban/suburban development. The department is staffed with 39 full-time EMT/firefighters, and four paramedic/firefighters. Paramedic transport service is provided within the City of Longview by AMR, a private provider. The Longview Fire Department responds to approximately 4,500 calls per year from two fire stations (City of Longview 2015).

The department includes the following stations and equipment.

- **Station 81.** Station 81 is located at 740 Commerce Avenue in Longview. A minimum of six line firefighters and one battalion chief are on duty 24 hours a day. The station includes an aerial ladder truck and a fire engine.
- **Station 82.** Station 82 is located at 2355 38th Avenue in Longview. It has a minimum of three line firefighters on duty 24 hours a day, with a maximum of five firefighters. The station primarily responds to the west end of Longview; however, it responds as backup to Station 81, as needed. The station includes one fire engine.

American Medical Response

AMR is a private ambulance company that provides emergency and nonemergency medical transport service for the study area. AMR staffs approximately 35 paramedics and EMTs, and handles an average of 7,500 calls annually (American Medical Response 2015). The medical transport vehicles are based out of a facility near the Cowlitz Highway intersection with Long Avenue.

5.3.4.2 Washington State

As described in Section 5.1, *Rail Transportation*, loaded Proposed Action-related BNSF trains from the Powder River Basin are expected to travel from the Idaho border east of Spokane to the project area in Cowlitz County, and return via Stampede Pass, Pasco, and Spokane. Loaded and empty UP trains to and from the Powder River Basin and Uinta Basin would travel north from Vancouver, Washington. WSDOT provided a list of statewide crossings of interest during the project's scoping process for crossings along the expected rail routes. These statewide study crossings are at-grade state highway crossings or at-grade crossings near state highways. Table 5.3-4 summarizes the existing conditions at these study crossings, including existing estimated annual average daily traffic, freight and passenger train speed, and estimated number of trains per day. Figure 5.3-6 illustrates the geographic location of these crossings.

5.3.5 Impacts

This section describes the potential direct and indirect impacts related to vehicle transportation that would result from construction and operation of the Proposed Action and No-Action Alternative. For more detailed information, see the *SEPA Vehicle Transportation Technical Report*.

5.3.5.1 Proposed Action

This section describes the potential impacts that could occur in the study areas as a result of construction and operation of the Proposed Action. During the peak year of construction, the Proposed Action would add an average 1.3 trains per day to the Reynolds Lead, BNSF Spur, and BNSF main line. The trains would be approximately 1.2 miles long (6,419 feet). At full operations, the Proposed Action would add 16 unit trains per day (8 loaded and 8 empty) to the Reynolds Lead, BNSF Spur, and BNSF main line. Each unit train would consist of 125 rail cars and 3 locomotives and be approximately 1.3 miles long (6,844 feet).

Construction—Direct Impacts

An estimated 180 peak hour motor vehicle trips are estimated as a result of peak construction activities with the rail delivery scenario, or an estimated 260 peak hour motor vehicle trips with the truck delivery scenario. These vehicles would access the project area via the private driveway opposite 38th Avenue or a new driveway on Industrial Way. Parking would be provided for construction workers in the Applicant's leased area. Vehicle trips within the project area would not impact vehicle transportation outside the project area.

Table 5.3-4. Existing Conditions at Statewide Study Crossings

#[a]	Road Crossing	USDOT/FRA Crossing ID[b]	Railroad Milepost[b]	Estimated 2015 AADT[c]	Freight Train Speed (mph)[b]	Passenger Train Speed (mph)[b]	Estimated 2015 Trains per Day[d]
Spokane County							
1	Idaho Road	066236B	53.4	2,650	60	70	70
2	McKinzey Road	066239W	56.2	2,600	60	79	70
3	Harvard Road	066240R	56.8	8,400	60	79	70
4	Barker Road	066244T	58.9	13,900	60	79	70
5	Flora Road	066245A	59.9	6,600	60	79	70
6	Pines Road-SR 27	066367E	62.9	29,700	60	79	70
7	University Road	066371U	64.0	2,450	60	79	70
8	Park Road	066377K	66.1	16,400	60	79	70
9	Pine Street	066315M	15.8	750	35	35	39
10	F Street/Cheney-Spangle	065970L	16.4	3,650	35	35	39
11	Cheney-Plaza Road	065971T	16.8	1,050	35	35	39
Adams County							
12	Paha Packard Road	089665U	74.2	100	60	79	39
13	Kahlotus Road	089670R	80.6	300	60	79	39
14	1st Street	089672E	81.8	500	50	60	39
15	Wilbur/City Road	089673L	82.1	550	50	60	39
Franklin County							
16	Eltopia Road W	089699N	129.1	350	60	79	39
17	Sagemoor Road	089700F	134.2	450	60	79	39
Benton County							
18	East 3rd Avenue	090031U	229.2	2,800	35	35	34
19	Dague Road-East 25th Avenue	090035W	227.5	800	60	60	34
20	Perkins Road	090036D	226.4	700	60	60	34
21	Bowles Road	090038S	225.7	2,450	60	60	34
22	Cochran Road	090039Y	225.0	100	60	60	34
23	Finley Road	090040T	224.5	3,100	60	60	34

#[a]	Road Crossing	USDOT/FRA Crossing ID[b]	Railroad Milepost[b]	Estimated 2015 AADT[c]	Freight Train Speed (mph)[b]	Passenger Train Speed (mph)[b]	Estimated 2015 Trains per Day[d]
24	Whitcomb Island	090061L	171.9	50	60	60	34
Klickitat County							
25	Maple Street	090169V	75.7	850	45	45	34
26	Walnut Street	090168N	75.5	1,400	45	45	34
27	South Dock Grade Road	090164L	74.2	100	55	60	34
Skamania County							
28	Indian Crossing	090159P	65.9	100	55	60	34
29	Home Valley Park	090155M	59.6	50	55	60	34
30	Cemetery Xing	090151K	54.7	50	N/A	N/A	34
31	Russell Avenue	090148C	53.9	350	20	20	34
32	Skamania Landing/Butler Rd	090135B	43.3	100	60	60	34
33	Walker/Skamania Landing	090134U	42.6	150	60	60	34
34	St Cloud Road	090133M	39.7	N/A	N/A	N/A	34
Lewis County							
35	SR 506-7th Street	092484T	77.8	1,400	50	75	50
36	Walnut Street (SR 505/603)	092493S	71.6	2,850	50	50	50
37	E Locust Street	092519S	54.2	2,800	40	40	50
38	Main Street	092520L	54.1	2,650	40	40	50
39	Maple Street	092521T	53.8	3,500	40	40	50
40	Big Hanaford Road	092524N	51.8	2,550	10	N/A	50

#[a]	Road Crossing	USDOT/FRA Crossing ID[b]	Railroad Milepost[b]	Estimated 2015 AADT[c]	Freight Train Speed (mph)[b]	Passenger Train Speed (mph)[b]	Estimated 2015 Trains per Day[d]
Yakima County							
41	Jones Road East	099178A	79.4	1,600	55	40	7
42	Indian Church	104523U	63.8	2,450	55	40	7
43	SR241/Reservation	104534G	52.2	2,850	55	40	7
44	Gulden Road	104536V	51.1	300	55	40	7

Notes:

[a] See Figure 5.3-6 for crossing location.

[b] Source: Washington Utilities Transportation Commission 2015.

[c] Source: Washington Utilities Transportation Commission 2015; Federal Railroad Administration 2015.

[d] Washington State Department of Transportation 2014. Linear extrapolation of 2010 and 2035 projected train traffic to 2015 volumes.

USDOT = U.S. Department of Transportation; FRA = Federal Railroad Administration; AADT = annual average daily traffic; mph = miles per hour; N/A = data not available

Figure 5.3-6. Statewide Study Crossings

Construction—Indirect Impacts

Construction of the Proposed Action would result in the following indirect impacts.

Cause Vehicle Delays from Rail Construction Traffic

The Rail Delivery scenario would add an average of 1.3 trains per day during the peak construction year. One Proposed Action-related construction train would take between 8 and 9 minutes to pass through the study crossings along the Reynolds Lead and BNSF Spur, and approximately 2 minutes along the BNSF main line.

The following describes the estimated average and peak hour vehicle delay during construction.

Average Vehicle Delay

All study crossings would operate at level of service A in 2018, indicating the low impact on average daily vehicle delay from Proposed Action-related construction trains at the public at-grade crossings on the Reynolds Lead, BNSF Spur, and BNSF main line in Cowlitz County.

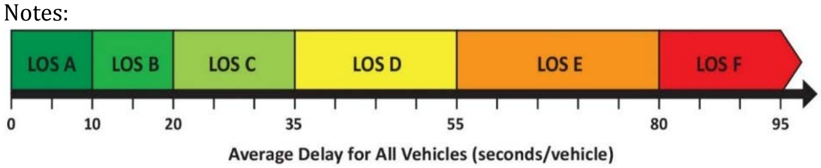
Peak Hour Vehicle Delay

Table 5.3-5 illustrates the estimated peak hour vehicle delay at the study crossings on the Reynolds Lead and BNSF Spur by scenario in 2018.

Table 5.3-5. Estimated Peak Hour Level of Service at Reynolds Lead and BNSF Spur Study Crossings in 2018 by Scenario

		Proposed Action Construction	
Crossing	**No-Action Scenario**	**Truck Delivery Scenario**	**Rail Delivery Scenario[a]**
Project Area Access at 38th Avenue	B	B	**F**
Weyerhaeuser Access at Washington Way	A	A	D
Weyerhaeuser NORPAC Access	A	A	C
Industrial Way	A	A	D
Oregon Way	A	A	D
California Way	A	A	**E**
3rd Avenue	B	B	**E**
Dike Road	C	C	C

Notes:



[a] The Proposed Action would result in this level of service only if a Proposed Action-related construction train travels during the peak hour. **Bolded, shaded gray** values indicate a vehicle level of service impact (a study crossing that operates below level of service D under the Proposed Action that would not otherwise operate below level of service D under the No-Action scenario for the same year).

Table 5.3-5 illustrates the following.

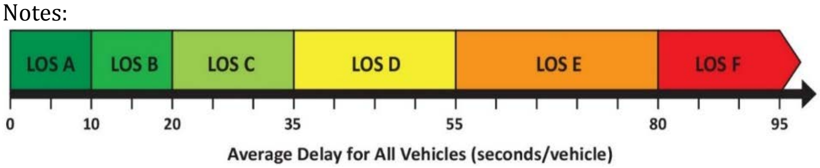
- The truck delivery scenario would have the same vehicle delay (level of service) as the No-Action scenario. The truck delivery scenario would not have a level of service impact at study crossings on the Reynolds Lead and BNSF Spur.
- If a Proposed Action-related construction train travels during the peak hour, three study crossings, one of which would access the project area, would operate below level of service D. The rail delivery scenario would result in a level of service impact at these three crossings on the Reynolds Lead if a Proposed Action-related construction train travels during the peak hour.

Table 5.3-6 illustrates the estimated peak hour vehicle delay at the BNSF main line study crossings in Cowlitz County by scenario.

Table 5.3-6. Estimated Peak Hour Level of Service at BNSF Main Line Study Crossings in 2018 by Scenario

		Proposed Action Construction	
Crossing	**No-Action Scenario**	**Truck Delivery Scenario**	**Rail Delivery Scenario[a]**
Taylor Crane Road (Castle Rock)	A	A	C
Cowlitz Street (Castle Rock)	A	A	C
Cowlitz Gardens (Kelso)	A	A	B
Mill Street (Kelso)	B	B	C
S River Road (Kelso)	B	B	C
Toteff Road/Port Road (Kalama)	A	A	B
W Scott Avenue (Woodland)	A	A	B
Davidson Avenue (Woodland)	A	A	B
Whalen Road (Woodland)	A	A	B

Notes:



[a] The Proposed Action would result in this level of service only if a Proposed Action-related construction train travels during the peak hour.

Table 5.3-6 illustrates the following.

- The truck delivery scenario would have the same vehicle delay (level of service) as the No-Action scenario. The truck delivery scenario would not have a level of service impact at study crossings on the BNSF main line in Cowlitz County.
- If a Proposed Action-related construction train travels during the peak hour, all study crossings would operate at a level of service C or better. The rail delivery scenario would not have a level of service impact at study crossings on the BNSF main line in Cowlitz County.

Queuing

Increased vehicle delay from trains blocking grade crossings can affect nearby intersections. As vehicles begin to queue while waiting for the crossing to open, increased roadway congestion can affect upstream intersections. Table 5.3-7 illustrates estimated 2018 peak hour queue lengths if a Proposed Action-related construction train travels during the peak hour. Table 5.3-7 also illustrates the queue length under the No-Action scenario for comparison.

Three queue lengths under the 2018 Proposed Action Construction (Rail Delivery) scenario would exceed the available storage length that would not be exceeded under the No-Action scenario if a Proposed Action-related construction train travels during the peak hour as described below.

- Vehicles traveling to Weyerhaeuser on Washington Way would queue on Washington Way at the Washington Way/Industrial Way intersection if a Proposed Action-related construction train travels during the peak hour. Because the queue would block the left-turn lane to Industrial Way that would not occur under the No-Action scenario, the rail delivery scenario would result in a queuing impact at this intersection.
- Vehicles traveling southbound on Oregon Way would queue on Oregon Way at the Reynolds Lead crossing of Oregon Way if a Proposed Action-related construction train travels during the peak hour. Because the queue length on Oregon Way would exceed the available storage length (extend to Alabama Street) that would not be exceeded under the No-Action scenario, the rail delivery scenario would result in a queuing impact at this crossing.
- On the BNSF main line, vehicles traveling westbound on S River Road would queue approximately 100 feet if a Proposed Action-related construction train travels during the peak hour, which is 40 feet more than the available storage length. Because the queue would exceed the available storage length that would not be exceeded under the No-Action scenario, the rail delivery scenario would result in a queuing impact at this crossing.

Cause Delay to Emergency Vehicle Response

As described in the vehicle delay analysis, average vehicle and peak hour delay would increase under the rail delivery scenario because trains transporting construction materials would operate on the Reynolds Lead, BNSF Spur, and BNSF main line. Total gate downtime is estimated to be up to 12 minutes longer per day at public crossings along the Reynolds Lead and BNSF Spur, and up to 2 minutes longer per day along the BNSF main line compared to the 2018 No-Action scenario. In a 24-hour period, the Proposed Action would increase the probability of an emergency response vehicle being delayed by 1% at study crossings along the Reynolds Lead, BNSF Spur, and BNSF main line.

The impact would depend on the location of the origin and destination of the response incident in relation to the at-grade crossings along the Reynolds Lead, BNSF Spur, and BNSF main line in Cowlitz County. The potential for a Proposed Action-related construction train to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the rail line and the availability of alternative routes if a Proposed Action-related construction train occupies the crossings at the time of the call.

Table 5.3-7. Estimated 2018 Peak Hour Vehicle Queue Lengths by Scenario[a]

Crossing Name	Road Movement[b]	2018 No-Action	2018 Truck	2018 Rail	Intersection Affected by Queue from Crossing	Intersection Movement[c]	2018 No-Action	2018 Truck	2018 Rail
		Estimated Crossing Queue Length (feet)					Estimated Intersection Queue Length (feet)		
Reynolds Lead and BNSF Spur Study Crossings									
Project Area Access at 38th Avenue	NB	40	1,960	2,480	Industrial Way/ 38th Avenue	WBL	20	20	20
	SB	20	20	20		EBR	20	20	20
Weyerhaeuser Access at Washington Way	NB	140	160	460	Industrial Way/ Washington Way	WBL	120	120	140
						EBR	40	40	40
	SB	120	120	160		SBT	60	60	160
Weyerhaeuser NORPAC Access	NB	60	60	140	Industrial Way/ NORPAC Access	WBL	20	20	20
	SB	20	20	20		EBR	20	20	20
Industrial Way	NB	360	360	420	Industrial Way/ Weyerhaeuser	EBL	140	140	240
	SB	280	360	1,220		NBT	240	240	300
Oregon Way	NB	660	640	2,460	Industrial Way/ Oregon Way	NBT	440	420	2,240
						EBL	180	240	240
						WBR	100	100	100
	SB	200	220	960	Oregon Way/ Alabama Street	EBR	N/A	N/A	120
						WBL			100
						SBT			260
California Way	NB	100	100	260	Industrial Way/ California Way	N/A	N/A	N/A	N/A
	SB	120	140	600					
3rd Avenue	NB	1,040	1,060	1,640	3rd Avenue/ Industrial Way	WBR	60	60	80
						NBT	640	660	1,240
					Industrial Way/ California Way	SBL	120	120	140
	SB	240	280	1,240		NBR	60	60	60
						EBT	400	420	1,000
Dike Road	NB	60	60	100	None	N/A	N/A	N/A	N/A
	SB	100	100	120					

Crossing Name	Road Movement[b]	2018 No-Action	2018 Truck	2018 Rail	Intersection Affected by Queue from Crossing	Intersection Movement[c]	2018 No-Action	2018 Truck	2018 Rail
		Estimated Crossing Queue Length (feet)					Estimated Intersection Queue Length (feet)		
BNSF Main Line in Cowlitz County Study Crossings									
Taylor Crane Road (Castle Rock)	EB	20	20	20	None	N/A	N/A	N/A	N/A
	WB	20	20	20					
Cowlitz Street (Castle Rock)	EB	40	40	40	None	N/A	N/A	N/A	N/A
	WB	40	40	60					
Cowlitz Gardens Road (Kelso)	EB	20	20	20	None	N/A	N/A	N/A	N/A
	WB	20	20	20					
Mill Street (Kelso)	EB	80	80	100	None	N/A	N/A	N/A	N/A
	WB	100	100	120					
S River Road (Kelso)	EB	40	40	80	Pacific Avenue/ S River Road	SBR	N/A	N/A	40
	WB	60	60	100		NBL			40
Toteff Road/Port Road (Kalama)	EB	40	40	40	None	N/A	N/A	N/A	N/A
	WB	40	40	60					
W Scott Avenue (Woodland)	EB	40	40	60	None	N/A	N/A	N/A	N/A
	WB	100	100	120					
Davidson Avenue (Woodland)	EB	60	60	60	None	N/A	N/A	N/A	N/A
	WB	40	40	40					
Whalen Road (Woodland)	EB	40	40	40	None	N/A	N/A	N/A	N/A
	WB	60	60	60					

Notes:

[a] Shaded gray values indicate a study crossing or intersection queue that exceeds available storage for the scenario. Shaded black values indicate a Proposed Action queuing impact.

[b] Roadway movement approaching the rail crossing; NB = northbound; SB = southbound; EB = eastbound; WB = westbound

[c] Movement at nearby intersection affected by queue from rail crossing; NBL = northbound left; NBR = northbound right; NBT = northbound through; SBL = southbound left; SBR = southbound right; SBT = southbound through; EBL= eastbound left; EBR= eastbound right; EBT= eastbound through; WBL= westbound left; WBR= westbound right; WBT= westbound through

Increase Predicted Accident Probability at Study Crossings

An accident probability analysis was conducted using the FRA GradeDec.Net web-based software. GradeDec.Net contains a predicted accident probability module based on the USDOT accident prediction and severity formula. The accident probability analysis found that none of the study crossings would have an accident probability above 0.04 with Proposed Action-related construction trains. The *SEPA Vehicle Transportation Technical Report* includes details for each crossing.

Operations—Direct Impacts

Approximately 135 employees would be needed to operate the coal export terminal in 2028. Operations would occur 24 hours per day, 7 days per week. Approximately 50% of the employee-related vehicle trips would exit the project area and 30% of the employee-related vehicle trips would enter the project area during the peak hour, which would result in 41 inbound and 68 outbound trips during the peak hour.

These vehicles would access the project area via the private driveway opposite 38th Avenue or at the existing driveway on Industrial Way approximately 0.5 mile west of the existing 38th Avenue driveway. Access roads in the project area would be designed to allow two-way traffic for standard vehicles. All roadways and parking areas would be designed and constructed to the standards appropriate for loading and capacity requirements. All regularly used roads accessing the buildings and facilities in the project area would be sealed with asphalt pavement. Paving would be designed to accommodate mobile equipment loadings. Surfacing of unpaved areas would be used to control soil erosion by wind and water.

Vehicle trips in the project area would not affect vehicle transportation outside the project area.

Operations—Indirect Impacts

All vehicle transportation impacts during operations would occur outside the project area and, therefore, are considered indirect impacts.

Cowlitz County Study Crossings

The Proposed Action would add 16 trains per day at study crossings along the Reynolds Lead and BNSF Spur. The Proposed Action would add 8 trains per day at study crossings along the BNSF main line in Cowlitz County (8 trains would travel from the south to Longview Junction and 8 trains would travel to the north from Longview Junction). One Proposed Action-related train could travel during the peak hour on the Reynolds Lead and BNSF Spur with current track infrastructure on the Reynolds Lead and BNSF Spur. Up to 2 Proposed Action-related trains could travel during the peak hour on the Reynolds Lead, BNSF Spur, and BNSF main line with planned track infrastructure.

This section presents vehicle delay impacts with current and planned track infrastructure on the Reynolds Lead and BNSF Spur. Planned track improvements would increase the average train speed from:

- 8 miles per hour (mph) to 10 mph at the Weyerhaeuser access crossing opposite Washington Way
- 10 mph to 15 mph at the Weyerhaeuser NORPAC access crossing

- 10 mph to 20 mph at the Industrial Way and Oregon Way crossings
- 8 mph to 15 mph at the California Way and 3rd Avenue crossings.

Improvements would not change average train speed at existing site access opposite 38th Avenue and Dike Road crossings.

Operation of the Proposed Action would result in the following indirect impacts.

Cause Vehicle Delays from Rail Traffic

The following describes the vehicle delay from Proposed Action-related trains.

A Proposed Action-related train would take between 8 and 10 minutes to pass through the public study crossings along the Reynolds Lead with current track infrastructure, and between 4 and 6 minutes with planned track infrastructure. Proposed Action-related trains would take about 8 minutes to cross Dike Road along the BNSF Spur, and around 2 minutes to pass through the study crossings along the BNSF main line. Overall, the 16 Proposed Action-related trains would increase the total gate downtime over 130 minutes during an average day for the public study crossings along the Reynolds Lead and BNSF Spur, and up to 20 minutes during an average day along the BNSF main line. The following describes the average and peak hour vehicle delay from Proposed Action-related trains.

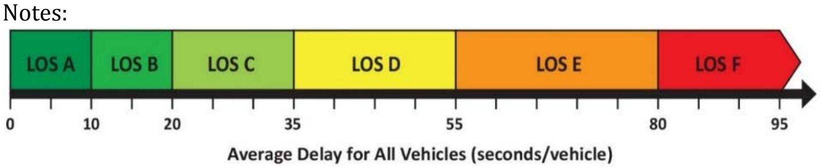
Average Vehicle Delay

Table 5.3-8 shows the estimated average delay per vehicle and level of service that would be experienced during a 24-hour period at each study crossing along the Reynolds Lead and BNSF Spur in 2028.

Table 5.3-8. Estimated 24-Hour Average Level of Service at Reynolds Lead and BNSF Lead Study Crossings in 2028 by Scenario[a]

		Proposed Action	
Crossing	**No-Action**	**Current Track Infrastructure**	**Planned Track Infrastructure**
Project Area Access at 38th Avenue	A	**F**	**F**
Weyerhaeuser Access at Washington Way	A	C	C
Weyerhaeuser NORPAC Access	A	C	B
Industrial Way	A	C	A
Oregon Way	A	C	A
California Way	A	D	B
3rd Avenue	A	D	B
Dike Road	A	C	C

Notes:



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

As shown, most study area crossings would operate at or above level of service D with current track infrastructure on the Reynolds Lead, and at or above level of service C with planned track infrastructure on the Reynolds Lead. The exception is at the access point to the project area opposite 38th Avenue, which would operate at level of service F. The Proposed Action would result in a level of service impact at the project area access.

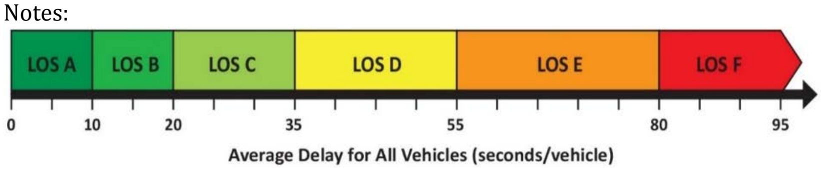
Table 5.3-9 shows the estimated average delay per vehicle and level of service that would be experienced during a 24-hour period at each study crossing along the BNSF main line in Cowlitz County.

On the BNSF main line in Cowlitz County, all study crossings would operate at a level of service A with Proposed Action-related trains, indicating a low impact on average daily vehicle delay from Proposed Action-related trains at the public at-grade crossings on the BNSF main line in Cowlitz County. Consequently, the Proposed Action would not result in a level of service impact at study crossings on the BNSF main line in Cowlitz County.

Table 5.3-9. Estimated 24-Hour Level of Service at BNSF Main Line Study Crossings in 2028 by Scenario

	Scenario	
Crossing	2028 No-Action	2028 Proposed Action
Taylor Crane Road (Castle Rock)	A	A
Cowlitz Street (Castle Rock)	A	A
Cowlitz Gardens (Kelso)	A	A
Mill Street (Kelso)	A	A
S River Road (Kelso)	A	A
Toteff Road/Port Road (Kalama)	A	A
W Scott Avenue (Woodland)	A	A
Davidson avenue (Woodland)	A	A
Whalen Road (Woodland)	A	A

Notes:



[a] The Proposed Action would result in this level of service only if two Proposed Action-related trains travel during the peak hour.

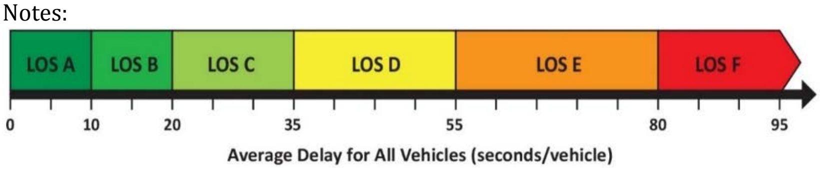
Peak Hour Vehicle Delay

Table 5.3-10 illustrates the estimated peak hour vehicle delay at the study crossings on the Reynolds Lead and BNSF Spur in 2028 by scenario. As shown, the increased rail activity associated with the Proposed Action would increase average delay per vehicle during the peak hour, with forecasted LOS dropping below D at six of the study crossings on the Reynolds Lead with existing track infrastructure.

Table 5.3-10. Estimated Peak Hour Level of Service at Reynolds Lead and BNSF Spur Study Crossings in 2028 by Scenario[a]

		Proposed Action		
Crossing	No-Action	Current Track Infrastructure: 1 Peak Hour Train	Planned Track Infrastructure: 1 Peak Hour Train	Planned Track Infrastructure: 2 Peak Hour Trains
Project Area Access at 38th Avenue	B	**F**	**F**	**F**
Weyerhaeuser Access at Washington Way	A	**E**	D	**E**
Weyerhaeuser NORPAC Access	A	D	B	C
Industrial Way (SR 432)	A	**E**	B	C
Oregon Way (SR 433)	A	**E**	B	C
California Way	A	**E**	C	D
3rd Avenue	B	**F**	C	**E**
Dike Road	C	D	D	**E**

Notes:



[a] The Proposed Action would result in this level of service only if a Proposed Action-related train travels during the peak hour. **Bolded, shaded gray** values indicate a vehicle delay impact (a study crossing that operates below level of service D under the Proposed Action that would not otherwise operate below level of service D under the No-Action scenario for the same year).

Table 5.3-10 illustrates the following.

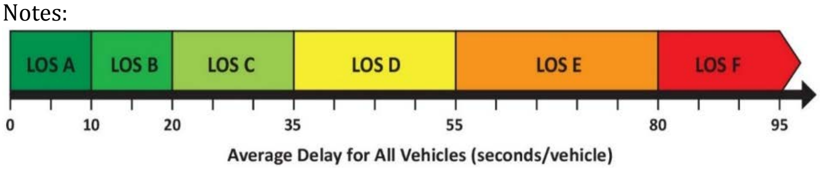
- If no improvements are made to the Reynolds Lead that would increase the average train speed from 10 mph to up to 25 mph and decrease gate downtime at the study crossings, the peak hour level of service would be below level of service D at six of the eight study crossings. The Proposed Action would result in a level of service impact at these six crossings if a Proposed Action-related train travels during the peak hour.
- If improvements are made to the Reynolds Lead, and one Proposed Action-related train travels during the peak hour, one study crossing (project area access at 38th Avenue) would operate below level of service D. The Proposed Action would result in a level of service impact at this crossing if a Proposed Action-related train travels during the peak hour.
- If improvements are made to the Reynolds Lead and 2 Proposed Action-related trains travel during the peak hour, four of the eight study crossings would operate below level of service D. The Proposed Action would result in a level of service impact at these four crossings if two Proposed Action-related trains travel during the peak hour.

Table 5.3-11 illustrates the estimated peak hour vehicle delay at the BNSF main line study crossings in Cowlitz County in 2028 by scenario. The peak hour level of service at two study crossings (Mill Street and S River Road in Kelso) on the BNSF main line in Cowlitz County would operate below level of service D in 2028 if 2 Proposed Action-related trains travel during the peak hour. The Proposed Action would result in a level of service impact at these two crossings if 2 Proposed Action-related trains travel during the peak hour.

Table 5.3-11. Estimated Peak Hour Level of Service at BNSF Main Line Study Crossings in 2028 by Scenario[a]

Crossing	No-Action	Proposed Action (2 Peak Hour Trains)
Taylor Crane Road (Castle Rock)	B	D
Cowlitz Street (Castle Rock)	C	D
Cowlitz Gardens (Kelso)	B	C
Mill Street (Kelso)	C	**E**
S River Road (Kelso)	C	**E**
Toteff Road/Port Road (Kalama)	B	C
W Scott Avenue (Woodland)	B	D
Davidson avenue (Woodland)	B	D
Whalen Road (Woodland)	B	D

Notes:



[a] The Proposed Action would result in this level of service only if two Proposed Action-related trains travel during the peak hour. **Bolded**, **shaded gray** values indicate a vehicle level of service impact (a study crossing that operates below level of service D under the Proposed Action that would not otherwise operate below level of service D under the No-Action scenario for the same year).

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 5.3-12 illustrates the estimated 2028 peak hour queue length if a Proposed Action-related train travels during the peak hour. While the Proposed Action-related trains would increase queue lengths at study area crossings, queue lengths would already be exceeded at all of these crossings except the southbound movement at Oregon Way.

Table 5.3-12 illustrates that estimated queue lengths with Proposed Action-related trains would be shorter with planned improvements to the Reynolds Lead because these improvements would allow Proposed Action-related trains to travel at higher speeds, which would decrease gate downtime at at-grade crossings. Two queue lengths would exceed the available storage length that would not be exceeded under the 2028 No-Action scenario:

- Vehicles traveling to Weyerhaeuser on Washington Way would queue on Washington Way at the Industrial Way intersection if a Proposed Action-related train passes during the peak hour. This queue would extend approximately 180 feet with planned infrastructure to the Reynolds Lead and block the left-turn lane to Industrial Way that would not be blocked under the 2028 No-Action scenario. The Proposed Action would result in a queueing impact at this intersection.

Table 5.3-12. Estimated Vehicle Queue Lengths—2028 Operations (Peak Hour)[a]

Crossing Name (USDOT Crossing ID)	Road Movement[b]	2028 No-Action	2028 Exist. Infras.	2028 Plan. Infras.	Intersection Affected by Queue from Crossing	Intersection Movement[c]	2028 No-Action	2028 Exist. Infras.	2028 Plan. Infras.
		Estimated Queue Length at Crossing (feet)					Estimated Queue Length at Intersection (feet)		
Study Crossings along the Reynolds Lead and BNSF Spur									
Project Area Access at 38th Avenue	NB	40	1,120	1,240	Industrial Way/ 38th Avenue	WBL	20	160	180
	SB	20	160	200		EBR	20	20	20
Weyerhaeuser Access at Washington Way	NB	280	760	480	Industrial Way/ Washington Way	WBL	120	180	140
						EBR	40	40	40
	SB	120	240	200		SBT	60	240	180
Weyerhaeuser NORPAC Access	NB	60	160	100	Industrial Way/ NORPAC Access	WBL	20	20	20
	SB	20	20	20		EBR	20	20	20
Industrial Way	NB	380	500	420	Industrial Way/ Weyerhaeuser	EBL	140	200	120
	SB	340	1,200	520		NBT	260	380	300
Oregon Way	NB	880	2,140	1,460	Industrial Way/ Oregon Way	NBT	660	1,920	1,220
						EBL	180	240	200
						WBR	100	100	100
	SB	440	1,580	800	Oregon Way/ Alabama Street	EBR	N/A	280	120
						WBL		560	100
						SBT		880	100
California Way	NB	100	240	180	Industrial Way/ California Way	N/A	N/A	N/A	N/A
	SB	160	660	380					
3rd Avenue	NB	1,400	1,720	600	3rd Avenue/ Industrial Way	WBR	60	120	80
						NBT	1,000	1,320	200
					Industrial Way/ California Way	SBL	120	120	N/A
	SB	340	1,740	820		NBR	80	80	
						EBT	760	1,080	
Dike Road	NB	60	80	100	None	N/A	N/A	N/A	N/A
	SB	100	120	140					

Crossing Name (USDOT Crossing ID)	Road Movement[b]	2028 No-Action	2028 Exist. Infras.	2028 Plan. Infras.	Intersection Affected by Queue from Crossing	Intersection Movement[c]	2028 No-Action	2028 Exist. Infras.	2028 Plan. Infras.
		Estimated Queue Length at Crossing (feet)					Estimated Queue Length at Intersection (feet)		
Public At-Grade Crossings along the BNSF Main Line in Cowlitz County									
Taylor Crane Road (Castle Rock)	EB	20	20	20	None	N/A	N/A	N/A	N/A
	WB	20	20	20					
Cowlitz Street (Castle Rock)	EB	40	60	60	None	N/A	N/A	N/A	N/A
	WB	80	80	80					
Cowlitz Gardens Road (Kelso)	EB	20	40	40	None	N/A	N/A	N/A	N/A
	WB	20	40	40					
Mill Street (Kelso)	EB	100	160	160	None	N/A	N/A	N/A	N/A
	WB	160	240	240					
S River Road (Kelso)	EB	80	120	120	Pacific Avenue/S River Road	SBR	60	100	100
	WB	120	180	180		NBL	40	40	40
Toteff Road/Port Road (Kalama)	EB	40	60	60	None	N/A	N/A	N/A	N/A
	WB	60	80	80					
W Scott Avenue (Woodland)	EB	60	100	100	None	N/A	N/A	N/A	N/A
	WB	140	200	200					
Davidson Avenue (Woodland)	EB	100	120	120	None	N/A	N/A	N/A	N/A
	WB	60	80	80					
Whalen Road (Woodland)	EB	60	60	60	None	N/A	N/A	N/A	N/A
	WB	80	80	80					

Notes:

[a] Shaded gray values indicate a study crossing or intersection with a queue that exceeds available storage for the scenario. Shaded black values indicate a Proposed Action-related impact.

[b] MVMT= Roadway movement approaching the rail crossing; NB = northbound; SB = southbound; EB = eastbound; WB = westbound

[c] MVMT= Movement at nearby intersection affected by queue from rail crossing; NBL = northbound left; NBR = northbound right; NBT = northbound through; SBL = southbound left; SBR = southbound right; SBT = southbound through; EBL = eastbound left; EBR = eastbound right; EBT = eastbound through; WBL = westbound left; WBR = westbound right; WBT = westbound through; N/A = data not available

- Vehicles traveling southbound on Oregon Way would queue on Oregon Way if a Proposed Action-related train passes during the peak hour. The queue would exceed available storage length that would not be exceeded under the 2028 No-Action scenario. The Proposed Action would result in a queueing impact at this crossing.

Cause Delay to Emergency Vehicle Response from Rail Traffic

As described in the vehicle delay analysis, average vehicle and peak hour delay would increase with the addition of Proposed Action-related trains because more trains would operate at study crossings. Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings if an emergency vehicle was blocked at a grade crossing occupied by a Proposed Action-related train.

Proposed Action-related trains would increase total gate downtime over 130 minutes during an average day at public study crossings along the Reynolds Lead and BNSF Spur, and up to 20 minutes during an average day at the study crossings along the BNSF main line.

In a 24-hour period, Proposed Action-related trains would increase the probability of emergency response vehicles being delayed by the following.

- 10% at study crossings along the Reynolds Lead and BNSF Spur with existing track infrastructure
- 5% at study crossings along the Reynolds Lead and BNSF Spur with planned track infrastructure
- 1% at study crossings along the BNSF main line in Cowlitz County

The impact would depend on the location of the origin and destination of the response incident in relation to the at-grade crossings along the Reynolds Lead, BNSF Spur, and BNSF main line in Cowlitz County. The potential for the Proposed Action-related trains to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the rail line and the availability of alternative routes if a Proposed Action-related train occupies the crossing at the time of the call.

Increase Predicted Accident Probability at Study Crossings

An accident probability analysis was conducted using the FRA GradeDec.Net web-based software. GradeDec.Net contains a predicted accident probability module based on the USDOT accident prediction and severity formula.

The predicted accident probability with existing crossing safety protection at the 3rd Avenue (SR 432) study crossing along the Reynolds Lead would be 0.026 accident per year under the No-Action Alternative, but 0.042 accidents under the Proposed Action. The Proposed Action would result in a vehicle safety impact at the 3rd Avenue crossing because the predicted accident probability would be above 0.04 accident per year with Proposed Action-related trains that would not be above 0.04 accident per year without Proposed Action-related trains. The predicted accident probability for all other study crossings (Reynolds Lead, BNSF Spur, and BNSF main line) would increase because the Proposed Action would increase rail traffic, but the predicted accident probability at all other study crossings would be below 0.04 accident per year. Additional information is provided in the *SEPA Vehicle Transportation Technical Report*.

Statewide Study Crossings

Increase Vehicle Delay on BNSF Main Line Routes beyond Cowlitz County

Table 5.3-13 shows the 2028 estimated baseline trains per day at selected statewide study crossings, and the estimated number of trains per day with Proposed Action-related trains in 2028. Figure 5.3-6 illustrates the rail routes and statewide study crossings.

Table 5.3-13. 2028 Conditions at Selected Crossings Outside of Cowlitz County

#[a]	Road Crossing	Freight Train Speed[b]	2015 Estimated Trains Per Day[c]	2028 Projected Baseline Trains Per Day[c]	2028 Projected Trains Per Day with Project	2028 Increase in Trains Per Day with Project
Spokane County						
1	Idaho Road	60	70	106	122	13%
2	McKinzey Road	60	70	106	122	13%
3	Harvard Road	60	70	106	122	13%
4	Barker Road	60	70	106	122	13%
5	Flora Road	60	70	106	122	13%
6	Pines Road-SR 27	60	70	106	122	13%
7	University Road	60	70	106	122	13%
8	Park Road	60	70	106	122	13%
9	Pine Street	35	39	56	72	22%
10	F Street/Cheney-Spangle	35	39	56	72	22%
11	Cheney-Plaza Road	35	39	56	72	22%
Adams County						
12	Paha Packard Road	60	39	56	72	22%
13	Kahlotus Road	60	39	56	72	22%
14	1st Street	50	39	56	72	22%
15	Wilbur/City Road	50	39	56	72	22%
Franklin County						
16	Eltopia Road W	60	39	56	72	22%
17	Sagemoor Road	60	39	56	72	22%
Benton County						
18	East 3rd Avenue	35	34	48	56	14%
19	Dague Road-East 25th Avenue	60	34	48	56	14%
20	Perkins Road	60	34	48	56	14%
21	Bowles Road	60	34	48	56	14%
22	Cochran Road	60	34	48	56	14%
23	Finley Road	60	34	48	56	14%
24	Whitcomb Island	60	34	48	56	14%

#[a]	Road Crossing	Freight Train Speed[b]	2015 Estimated Trains Per Day[c]	2028 Projected Baseline Trains Per Day[c]	2028 Projected Trains Per Day with Project	2028 Increase in Trains Per Day with Project
Klickitat County						
25	Maple Street	45	34	48	56	14%
26	Walnut Street	45	34	48	56	14%
27	South Dock Grade Road	55	34	48	56	14%
Skamania County						
28	Indian Crossing	55	34	48	56	14%
29	Home Valley Park	55	34	48	56	14%
30	Cemetery Xing	N/A	34	48	56	14%
31	Russell Avenue	20	34	48	56	14%
32	Skamania Landing/Butler Road	60	34	48	56	14%
33	Walker/Skamania Landing	60	34	48	56	14%
34	St Cloud Road	N/A	34	48	56	14%
Lewis County						
35	SR 506-7th Street	50	50	73	81	10%
36	Walnut Street – SR 505/603	50	50	73	81	10%
37	E Locust Street	40	50	73	81	10%
38	Main Street	40	50	73	81	10%
39	Maple Street	40	50	73	81	10%
40	Big Hanaford Road	10	50	73	81	10%
Yakima County						
41	Jones Road East	55	7	11	19	42%
42	Indian Church	55	7	11	19	42%
43	SR241/Reservation	55	7	11	19	42%
44	Gulden Road	55	7	11	19	42%

Notes:
[a] See Figure 5.3-6 for crossing location.
[b] Source: Washington Utilities Transportation Commission 2015.
[c] Washington State Department of Transportation 2014.
N/A = data not available

As shown in Table 5.3-13, the Proposed Action would add 16 trains per day to the crossings in Spokane, Adams, and Franklin Counties (between the Washington State-Idaho border east of Spokane and Pasco, Washington) and would increase daily rail traffic by approximately 13% and 22%, depending on location. Between Pasco and Cowlitz County (study crossings in Benton, Klickitat, and Skamania Counties), the Proposed Action would add 8 trains per day and increase daily rail traffic by approximately 14%. At the Lewis County study crossings, the Proposed Action would add 8 trains per day and increase daily rail traffic by approximately 10%, and between Auburn and Pasco (Yakima County study crossings), the Proposed Action would increase daily rail traffic by approximately 44%.

Vehicle delay at crossings would depend on the speed of the train, length of the train, the traffic volume at the crossing, and number of lanes at the crossing. The traffic volume at the crossing would vary depending on the time of day. Proposed Action-related trains would be approximately 1.3 miles long and would take the following approximate times to pass at study crossings (see Table 5.3-13 for freight train speeds at study crossings).[5]

- 10 mph: 8.5 minutes
- 20 mph: 4.75 minutes
- 30 mph: 3.25 minutes
- 40 mph: 2.75 minutes
- 50 mph: 2.25 minutes
- 60 mph: 2.0 minutes

Vehicle delay would increase between the Washington State-Idaho border and Cowlitz County because the Proposed Action would add 8 or 16 trains daily (depending on location) to existing BNSF rail routes as shown in Figure 5.3-6. Proposed Action-related trains would also be longer (approximately 1.3 miles long) than average BNSF freight train length (approximately 1.2 miles long). Vehicle delay at crossings would be higher if a Proposed Action-related train travels during a period with higher traffic volumes (such as the peak traffic hour) than a period with lower traffic volumes (such as at night).

Assuming Proposed Action-related trains travel at the same freight train speeds identified in Table 5.3-13, the five study crossings with the largest increase in daily vehicle delay compared to baseline 2028 conditions would be the following.

- Big Hanaford Road, Lewis County (8 Proposed Action-related trains daily, 10 mph)
- Pine Street, Spokane County (16 Proposed Action-related trains daily, 35 mph)
- F Street/Cheney-Spangle, Spokane County (16 Proposed Action-related trains daily, 35 mph)
- Cheney-Plaza Road, Spokane County (16 Proposed Action-related trains daily, 35 mph)
- Russel Avenue, Skamania County (8 Proposed Action-related trains daily, 20 mph)

When factoring in existing annual average daily traffic, the five study crossings with the largest increase in vehicle delay compared to the baseline 2028 conditions would be the following.

- Pines Road-SR 27, Spokane County (16 Proposed Action-related trains daily)
- Park Road, Spokane County (16 Proposed Action-related trains daily)
- Barker Road, Spokane County (16 Proposed Action-related trains daily)
- Harvard Road, Spokane County (16 Proposed Action-related trains daily)

[5] Assumes gate closing 30 seconds before train would pass through grade crossing and 12 seconds after the train passes the crossing.

- Flora Road, Spokane County (16 Proposed Action-related trains daily)

The combination of high annual average daily traffic and 16 Proposed Action-related trains per day would cause these study crossings to have the highest increase in vehicle delay per vehicle at study crossings.

Because the frequency of train traffic on BNSF routes would increase from Proposed Action-related trains, the probability of an increase in emergency response time at all at-grade crossings would also increase because at-grade crossings would be blocked more frequently. This impact would only occur if an emergency vehicle experienced a delay related to a Proposed Action-related train that would occur on average 8 or 16 times a day, depending on location. The potential for the Proposed Action-related train to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the rail line and the availability of alternative routes if a Proposed Action-related train occupies the crossing at the time of the emergency call.

Increase Predicted Accident Probability on BNSF Main Line Routes beyond Cowlitz County

The accident probability analysis was conducted for the statewide study crossings using the FRA GradeDec.Net web-based software, which estimates the predicted annual accident probability for at-grade crossings in a year. The accident probability was estimated to be above 0.04 accident per year with existing crossing safety protection at ten of the 44 statewide study crossings without Proposed Action-related trains.

Proposed Action-related trains would increase the accident probability at all at-grade crossings because 8 or 16 Proposed Action-related trains would pass at each crossing depending on location, and the Proposed Action would not change crossing protection at the study crossings. The accident probability analysis found that none of the statewide study crossings would have an accident probability above 0.04 with Proposed Action-related trains that would be at or below 0.04 under the No-Action Alternative in 2028. The *SEPA Vehicle Transportation Technical Report* includes details for each crossing.

5.3.5.2 No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the Proposed Action and impacts on vehicle transportation related to construction and operation of the Proposed Action would not occur. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses, including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

The following describes vehicle transportation conditions in 2018 and 2028. More detailed information is provided in the *SEPA Vehicle Transportation Technical Report*.

2018 Conditions

Vehicle transportation conditions in 2018 with the No-Action Alternative would be as follows.

- **Average vehicle delay.** All study crossings would operate at level of service A.

- **Peak hour vehicle delay.** All study crossings would operate level of service C or better.
- **Vehicle queuing.** Vehicle queues extending from six study crossings (all along the Reynolds Lead) would affect seven nearby intersections. Vehicle queues at these intersections would exceed the available storage length at four approaches. These queues could potentially block other movements at these intersections. No study crossings would exceed available storage length on the BNSF Spur and BNSF main line.
- **Vehicle safety.** Predicted accident probability was found to be below 0.04 accident per year with existing crossing safety protection at the study crossings.

2028 Conditions

The Applicant's planned growth would require approximately 2 additional trains per day on the Reynolds Lead and BNSF Spur by 2028 for approximately 4 trains per day. The following provides a summary of vehicle transportation conditions in 2018 with the No-Action Alternative:

- **Average vehicle delay.** All study crossings would operate at level of service A.
- **Peak hour vehicle delay.** Study crossings on the Reynolds Lead would operate at level of service A or B. Study crossings on the BNSF Spur and BNSF main line study crossings would operate at level of service B or C.
- **Vehicle queuing.** Vehicle queues extending from seven study crossings (six along the Reynolds Lead and one along the BNSF main line) would affect eight nearby intersections. Vehicle queues at these intersections would exceed the available storage length at four approaches. These queues could potentially block other movements at these intersections.
- **Vehicle safety.** Predicted accident probability was estimated to be below 0.04 accident per year with existing crossing safety protection at the study crossings.

5.3.6 Required Permits

No permits related to vehicle transportation would be required for the Proposed Action.

5.3.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to vehicle transportation from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action.

5.3.7.1 Voluntary Mitigation

The Applicant has committed to implementing the following measures to mitigate impacts on vehicle transportation.

- To mitigate vehicle delay impacts from increased rail traffic, before beginning operations, the Applicant will fund the implementation of an extension of the left-turn lane from Washington Way to Industrial Way at the Industrial Way/Washington Way intersection.

- To mitigate the safety impacts from increased rail traffic, before beginning operations, the Applicant will fund installation of crossing gates at the Reynolds Lead crossing of Industrial Way.

5.3.7.2 Applicant Mitigation

The Applicant will implement the following mitigation measures to mitigate vehicle transportation impacts.

MM VT-1. Notify Local Agencies about Operations on the Reynolds Lead and BNSF Spur.

To address vehicle delay impacts at grade crossings on the Reynolds Lead and BNSF Spur, the Applicant will notify Cowlitz County, City of Longview, Cowlitz Fire District, City of Rainier (Oregon), Port of Longview, and Cowlitz-Wahkiakum Council of Governments before each identified operational stage (Stage 1a, Stage 1b, and Stage 2) that will change average daily rail traffic on the Reynolds Lead and BNSF Spur. The Applicant will prepare a memorandum to document the changes to average daily rail traffic. The memorandum will be submitted to these agencies at least 6 months before the change in average daily rail traffic.

5.3.7.3 Other Measures to Be Considered

Other measures that could be implemented to mitigate impacts on vehicle transportation that occur as a result of project-related elements outside the control of the Applicant, include the following.

- To improve vehicle delay and safety, the Industrial Way/Oregon Way Intersection Project partners[6] should continue working to identify a preferred alternative to reduce vehicle delay and improve vehicle safety at the Industrial Way/Oregon Way intersection. Grade-separation of the intersection was recommended in the *SR 432 Highway Improvements and Rail Realignment Study* (Cowlitz-Wahkiakum Council of Governments 2014). These agencies should also continue to evaluate alternatives to reduce vehicle delay and improve vehicle safety at the other public at-grade crossings along the Reynolds Lead and BNSF Spur, including the concepts identified in the *SR 432 Highway Improvements and Rail Realignment Study*.
- Although the analysis of Proposed Action-related trains did not identify a vehicle safety impact at the California Way and Dike Road crossings, if determined to be necessary in the future, crossing gates should be considered at these two at-grade crossings to improve vehicle safety. Vehicle safety could be improved with crossing gates.

5.3.8 Unavoidable and Significant Adverse Environmental Impacts

Without planned track improvements to the Reynolds Lead and BNSF Spur, the following crossings would operate below level of service D if one Proposed Action-related train travels during the peak hour in 2028.

- Project area access opposite 38th Avenue
- Weyerhaeuser access opposite Washington Way

[6] The project partners include Cowlitz County, Cowlitz Economic Development Council, CWCOG, City of Longview, City of Kelso, and Port of Longview.

- Industrial Way
- Oregon Way
- California Way
- 3rd Avenue

With planned track improvements to the Reynolds Lead and BNSF Spur, the following crossings would operate below level of service D if two Proposed Action-related trains travel during the peak hour in 2028.

- Project area access opposite 38th Avenue
- Weyerhaeuser access opposite Washington Way
- 3rd Avenue
- Dike Road

On the BNSF main line in Cowlitz County, the following crossings would operate below level of service D if two Proposed Action-related trains travel during the peak hour in 2028.

- Mill Street
- South River Road

Increased gate downtime at these crossings would increase the probability of emergency response vehicles being delayed. The Proposed Action would also result in a vehicle safety impact at the 3rd Avenue crossing of the Reynolds Lead.

While improvements for rail infrastructure and road infrastructure have been proposed, it is unknown when these actions would be permitted and implemented. Therefore, the Proposed Action at full operations in 2028 could result in significant and adverse environmental impacts on vehicle transportation in Cowlitz County as described above.

5.4 Vessel Transportation

The Columbia River navigation channel provides passage for deep-draft vessels, such as those related to the Proposed Action, to various ports along its shoreline. Vessel transportation in this area also includes recreational boating, passenger and ferry operations, and commercial and tribal fishing.

This section describes vessel transportation and safety in the study area. It then describes impacts on vessel transportation that could result from construction and operation of the Proposed Action and under the No-Action Alternative. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action.

5.4.1 Regulatory Setting

Conventions, regulations, statutes, and guidelines relevant to vessel transportation are summarized in Table 5.4-1.

Table 5.4-1. Conventions, Regulations, Statutes, and Guidelines for Vessel Transportation

Convention, Regulation, Statute, Guideline	Description
International	
International Convention for the Safety of Life at Seas	Required safety standards for international ships for construction, navigation, life-saving, communications, and fire equipment.
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	International convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
International Ship and Port Facility Security Code	Security-related requirements for governments, port authorities, and shipping companies.
International Maritime Solid Bulk Cargoes Code	Procedures for bulk cargo carriers.
International Regulations for Preventing Collisions at Sea, 1972	Rules on safe navigation for vessels in international waters. Also referred to as 72 COLREGS.
Standards of Training, Certification, and Watchkeeping 1978 revised in 1995 and 2010	Standards for training, certification, and watchkeeping requirements for seafarers.
Federal	
Inland Navigational Rules Act of 1980 (Public Law 96-591) known as "Rules of the Road" (33 CFR 84-90)	Navigation rules for U.S. waters.
46 USC (Shipping) Chapter 33 (Inspection)	Consolidates the laws governing the inspection and certification of vessels by the U.S. Coast Guard.

Convention, Regulation, Statute, Guideline	Description
Ports and Waterways Safety Act of 1972 (33 USC 1221 et seq.)	Provides for the protection and "safe use" of a U.S. port (includes the marine environment, the navigation channel, and structures in, on, or immediately adjacent to the navigable waters) and for the protection against the degradation of the marine environment.
Maritime Transportation Security Act of 2002 (46 USC 701). Relevant regulations are 33 CFR 101 and 105.	Requirements for maritime security.
Maritime Transportation Act of 2004. Amended 311(a) and (j) of the Federal Water Pollution Control Act. Relevant regulations are 33 CFR 151, 155, and 160.	Requires cargo vessel owners or operators to prepare and submit oil discharge response plans.
Federal Water Pollution Control Act, as amended by Section 4202 of the Oil and Pollution Act of 1990 (33 USC 1321). Relevant regulations are the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) and 33 CFR 155.5010–5075.	Requires nontank vessels to prepare and submit oil or hazardous substance discharge response plans when operating on the navigable waters of the United States.
The Act to Prevent Pollution from Ships (33 USC 1901 et. seq.)	Implementing U.S. legislation for MARPOL and Annexes I and II.
Maritime Transportation Act of 2004; and the Coast Guard and Maritime Transportation Act of 2006	Requires cargo vessel owners or operators to prepare and submit oil or hazardous substance discharge response plans.
33 CFR 80-82	International Navigation Rules
33 CFR 84-90	Inland Navigation Rules
33 CFR, 46 CFR, and 49 CFR	These regulations incorporate international laws to which the United States is signatory as well as various classification society and industry technical standards governing the inspection, control, and pollution prevention requirements for vessels.
Washington State	
Washington State Bunkering Operations (WAC 317-40) (RCW 88.46.170)	Establishes minimum standards for safe bunkering (transfer of fuel to a vessel) operations.
Washington State Oil Spill Contingency Plan Requirements (WAC 173-182) (RCW 88.46, 90.56, and 90.48)	Requires that cargo vessels 300 or more gross tons be covered by a contingency plan for the containment and cleanup of oil.
Washington State Vessel Oil Transfer Advance Notice and Containment Requirements (WAC 173-184)	Requires facility or vessel operators who transfer oil to provide the state with a 24-hour advance notice of transfer.
Washington State Cargo Vessel Boarding and Inspection (WAC 317-31)	Cargo vessels 300 or more gross tons shall submit a notice of entry at least 24 hours before the vessel enters state waters and be subject to boarding and inspection by state inspectors to ensure compliance with accepted industry standards.

Convention, Regulation, Statute, Guideline	Description
Oregon State	
OAR 856-010-0003 through 0060 and 856-030-0000 through 0045 (Statutory Authority: ORS Title 58 Chapter 776).	Oregon State Board of Maritime Pilots Rules for pilotage of vessels in Oregon state waters, including the Columbia River.
Local	
There are no local laws and regulations relevant to vessel transportation.	

Notes:
SOLAS = Safety of Life at Seas; MARPOL = marine pollution; STCW = Standards of Training, Certification, and Watchkeeping; USC = United States Code; CFR = Code of Federal Regulations; WAC = Washington Administrative Code; OAR = Oregon Administrative Rule; ORS = Oregon Revised Statute

5.4.2 Study Area

The study area for direct impacts is the area surrounding the proposed docks (Docks 2 and 3) where vessel loading would occur. The study area for indirect impacts includes the waterways that would be used by, or could be affected by vessels calling at the project area. It includes the waters out to 3 nautical miles seaward of the mouth of the Columbia River, the Columbia River Bar, the Columbia River upstream to Vancouver, Washington,[1] and the Willamette River upstream to the Port of Portland.

5.4.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts on vessel transportation associated with the construction and operation of the Proposed Action and No-Action Alternative.

5.4.3.1 Information Sources

The following sources of information were used to define the existing conditions relevant to vessel transportation and identify the potential impacts of the Proposed Action and No-Action Alternative on vessel transportation in the study area.

Information for the vessel traffic analysis was obtained from stakeholder interviews and the following sources of information.

- Detailed vessel traffic data from the Columbia River Bar Pilots (Bar Pilots) included in the *Traffic and Transportation Resource Report* prepared for the Applicant (URS Corporation 2014) was validated during a meeting with the Bar Pilots. That report and other data obtained from the pilots are the basis for historical vessel traffic type and volumes. In addition, Washington State Department of Ecology (Ecology) Vessel Entries and Transits (VEAT) data were used for comparison with the Bar Pilot data.
- The Columbia River Pilots (River Pilots) representatives provided information on vessel traffic management within the Columbia River and vessel docking issues for the existing dock (Dock 1) at the project area.

[1] The Port of Vancouver is the furthest upstream port receiving large commercial vessels.

- Merchants Exchange of Portland, Oregon (PDXMEX), provided Automatic Identification System (AIS) data and a synopsis of its operations.
- Port of Portland provided information on the LOADMAX channel reporting and forecasting system.
- *Coast Pilot 7 (Pacific Coast: California, Oregon, Washington, Hawaii, and Pacific Islands)* (National Oceanic and Atmospheric Administration 2014) and the *Lower Columbia Region Harbor Safety Plan* (Lower Columbia Region Harbor Safety Committee 2013) provided information on the vessel transportation characteristics of the study area.
- The following sources were used as part of the risk analysis.
    - AIS data to establish baseline (2014) vessel types, sizes, routes, and transit frequencies between the Columbia River mouth and Longview.
    - Historical vessel incidents and severity, based on the U.S. Coast Guard (USCG) Marine Information for Safety and Law Enforcement (MISLE) database for 2001 to 2014.
    - Data on reported oil spills within the Columbia and Willamette Rivers from the following three databases for the period between January 1, 2004, and December 31, 2014[2]: USCG MISLE database, Ecology's Environmental Report Tracking System (ERTS) database, which records all incidents reported to the state, and Ecology's Spills Program Incident Information (SPIIS) database, which records spills reported to the state.
- Information also was collected during visits to the project area on October 14, 2014.

5.4.3.2 Impact Analysis

The following methods were used to identify the potential impacts of the Proposed Action and No-Action Alternative on vessel transportation.

For the purposes of this analysis, construction impacts were based on peak construction period and operations impacts were based on maximum coal export terminal throughput capacity (up to 44 million metric tons per year). The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on vessel transportation.

- The vessel transportation route, navigational considerations, historical and current vessel traffic patterns, and the systems in place to monitor and control vessel traffic along that route were described based on information gathered through the sources described in Section 5.4.3.1, *Information Sources*.
- Construction-related impacts were qualitatively assessed based on the relative increase in activity in and around the project area and the potential to disturb ongoing vessel transportation.
- Operations-related impacts at the project area (direct impacts) were qualitatively evaluated in terms of the increased potential for vessel-related incidents to occur.

[2] When the information from these three datasets were combined all duplicate entries were removed and only incidents with actual reported spills of petroleum or petroleum products were considered in the development of the baseline oil spill frequency for the study area.

- Operations-related impacts during vessel transit (indirect impacts) were evaluated both qualitatively and quantitatively to determine the potential for increased risks. Historical vessel incident data were evaluated to characterize the nature and magnitude of vessel incidents that have occurred on the Columbia River to the project area. This information was used to provide context for interpreting operational impacts.
- The potential for increased incidents (i.e., allisions[3] at the project area, collisions, groundings, and fire/explosions by Proposed Action-related vessels during transit) were modeled for existing conditions, the Proposed Action, and No-Action Alternative. The potential for allisions during transit was qualitatively assessed.
    - The incident frequencies were estimated using the Marine Accident Risk Calculation System (MARCS) model and were limited to the area evaluated in the study (DNV GL 2016).
    - The number of trips for non-Proposed Action-related vessels were derived from 2014 AIS data for all vessel types. An increase of 1% per year was applied to the 2014 AIS data through 2028 for the No-Action Alternative. The number of vessels under the Proposed Action was added to this total to determine the incremental increase in the likelihood of the modeled incidents occurring.
- To provide context for understanding the relative consequences of a collision, grounding or allision incident, a survey of USCG Marine Information for Safety and Law Enforcement (MISLE) database was conducted for years 2001 to 2014. This data coverage period was chosen because it covers over 99% of all reported collision, grounding, and allision incidents in the dataset. Data surveys were conducted for the national dataset and for the study area separately to test for differences in the distribution of incident severity between the two.
- Increased risks of bunker oil spills were addressed quantitatively and qualitatively.
    - The potential for a bunker oil spill to occur as the result of an incident was modeled using the Naval Architecture Package (NAPA model) (DNV GL 2016). Using Monte Carlo simulations, in accordance with International Maritime Organization Resolution MEPC.110(49)[4] – Probabilistic Methodology for Calculating Oil Outflow, the model estimates oil outflow volumes based on the number of damaged cargo tanks and interaction with tidal influences. Monte Carlo simulations were run for 50,000 damage cases to estimate the potential variability in impact and in oil outflow volumes.
    - The potential for releases to occur during bunkering was qualitatively assessed based on the relative increase in vessel traffic.
- Vessel activity in general also has the potential to result in impacts on other resources. Therefore, the relative increase in vessel activity to and from the project area was also described and qualitatively assessed to provide the basis for related analysis in other sections of this Draft EIS.

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[3] An allision occurs when a vessel strikes a fixed structure, such as a dock or a vessel at berth.

[4] The Marine Environment Protection Committee (MEPC) is a subsidiary body of the International Maritime Organization Council.

5.4.4 Existing Conditions

This section addresses the existing conditions related to vessel transportation and safety in the study area, including the natural and built environment, types and volumes of vessel traffic, vessel traffic management, vessel incident frequency and severity, and incident management and response systems.

5.4.4.1 Natural and Built Environment

This section describes the marine environment and facilities and other physical features relevant to marine navigation in the study area.

Marine Environment

Conditions of the marine environment in the study area that can affect vessel transportation include winds, longshore and tidal currents, river flows, swells and waves, and extreme weather (National Oceanic and Atmospheric Administration 2014). These elements are described below.

Conditions in the Pacific Ocean approaching the Columbia River can vary greatly depending on the time of year. Prevailing winds and seasonal patterns have the greatest effect on offshore conditions. Closer to the river system, longshore currents that generally flow to the north in winter and to the south in summer are a factor for vessel navigation, although not as much as tidal current and river flows near the river system. Offshore swells can vary more than several feet with the current flow and can result in breaking waves.

Average winter temperatures range from 35 to 49 degrees Fahrenheit (°F) near the mouth of the river and from 32 to 39°F near the upstream extent of the study area; while average summer temperatures are below 70 and 80°F, respectively. Snowfall is not common in the study area.

Although winds are strongest in late fall and winter, they seldom reach gale force along the Columbia River. The strongest winds are usually out of the south or southwest. Wind flow is generally from the east through southeast in winter, and wind speeds reach 17 knots or more about 5 to 10% of the time. Spring and summer typically have northwest and west wind patterns that often clash with river outflows. The volume of water flowing from the Columbia River and the force of impact with ocean conditions can combine to create daunting sea conditions. Nevertheless, summer winds generally remain light and have a cooling effect keeping average daytime temperatures nearly 10 degrees lower at Astoria than at Portland.

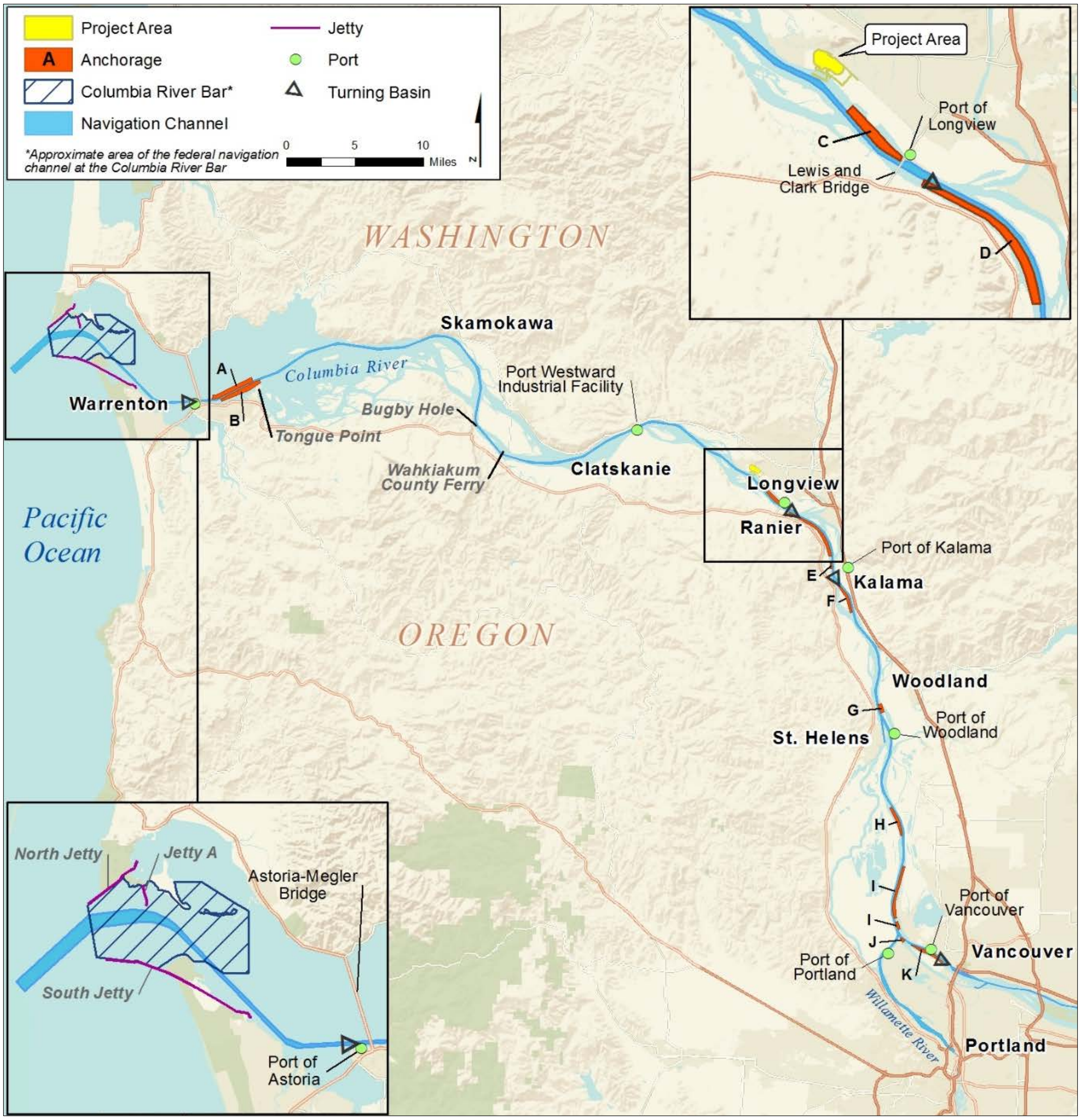
Fog is a hazard during late summer and fall with visibilities below 0.5 mile on 4 to 8 days per month on average.

River current always flows out, but with wide variations in flow rate and volume. The outflow from the Columbia River is a combination of tidal currents with river discharge. At times, currents reach a velocity of over 5 knots on the ebb; on the flood they seldom exceed a velocity of 4 knots.

Columbia River Bar

The Columbia River Bar is a system of bars and shoals just seaward of the mouth of the Columbia River (Figure 5.4-1). The bar is about 3 miles wide and 6 miles long. The bar is where the energy of the river's current dissipates into the Pacific Ocean, often as large standing waves (1 meter/3.28 feet or more) (Jordan pers. comm. B). The waves result from the bottom contours of the bar area as well as the mixing of fresh and saltwater and environmental conditions.

Figure 5.4-1. Ports, Anchorages, and other Features in the Study Area



Note: Letters correspond to anchorages described in Table 5.4-3.

Tide, current, swell, and wind—direction and velocity—all affect the bar conditions. Current velocity typically ranges from 4 to 7 knots westward into the predominantly westerly winds and ocean swells, creating significant disturbances of the water column and waves. There are two full tidal current ebb and flood cycles each day, and conditions at the bar can change drastically in a very short time period with the tidal flow. Worst-case conditions typically occur when onshore winds and tidal ebb combine with the river flow; when this happens, the effects can change unpredictably in a very short time as the tidal flow cycles (National Oceanic and Atmospheric Administration 2014).

Columbia River

The tidal range at the mouth of the Columbia River is approximately 5.6 feet with mean higher high water measured at 7.5 feet in 2013 (National Oceanic and Atmospheric Administration 2014). At Portland and Vancouver the tidal range is approximately 2.3 feet with mean higher high water measured at 8.7 feet in 2013 (NOAA tides and water levels station 9440083). The Columbia River experiences a mixed semidiurnal tide cycle. This means that there are two high and two low high tides of different size every lunar day. Moreover, the river flow combines with the tides to influence tidal heights. For example, during the spring when the river flow peaks, tidal height is increased by additional water flowing through the river. This phenomena is referred to as freshet (National Oceanic and Atmospheric Administration 2009).

Annual freshets have little effect on the tide range at the mouth of the Columbia River; however, at Portland and Vancouver they average about 12 feet with the highest known level of 33 feet at Portland. Typically tidal influence reaches as far as the Portland/Vancouver area. However, tidal effects can be felt to as much as 140 miles upriver under low-flow conditions (National Oceanic and Atmospheric Administration 2015).

The average annual flow for the Columbia River at Beaver Army Terminal near Quincy, Oregon,[5] is approximately 236,600 cubic feet per second (cfs).[6] The river's annual discharge rate fluctuates with precipitation and ranges from 63,600 cfs in a low water year to 864,000 cfs in a high water year (U.S. Geological Survey 2014). The flow is driven primarily by the outflow from the dams on the upper portion of the river, which varies with both snowmelt and rainfall.

Navigation Channel

The Oregon–Washington border follows the Columbia River (Figure 5.4-1). The navigation channel in the study area includes two projects operated by the U.S. Army Corps of Engineers (Corps): the Columbia and Lower Willamette River Project and the Mouth of the Columbia River Project. The navigation channel is described by the three following areas.

- **Mouth of the Columbia River.** The portion of the channel at the mouth of the Columbia River, referred to as the Columbia River Bar, is 6 miles long, extending 3 nautical miles[7] into the Pacific Ocean from the mouth of the river to 3 miles upriver. This segment of the channel varies from 2,000 feet wide and 55 feet deep to 640 feet wide and 48 feet deep. Waters in this area are considered treacherous and large vessels require a licensed pilot.[8] The Corps maintains three jetties at the mouth of the Columbia River (Figure 5.4-1) to keep the channel at the mouth of the river clear.

[5] Approximately 12 river miles downstream of the project area.

[6] 1 cfs = 448.8 gallons per minute.

[7] Offshore distances are recorded in terms of nautical miles and inshore distances and river distances are given in terms of statute miles.

[8] Oregon Administrative Rule 856-010-0060 exempts the following vessels from compulsory pilotage on the Columbia River Bar: (a) Foreign fishing vessels not more than 100 feet or 250 gross tons international; (b) Recreational vessels not more than 100 feet long.

- **Columbia River.** From the upriver extent of the bar (river mile 3) to Vancouver (river mile 106.5), the channel is generally maintained to a depth 43 feet and a width of 600 feet (U.S. Army Corps of Engineers 2015a).[9]
- **Willamette River.** Along the lower 11.6 miles of the Willamette River, the channel has a depth of 40 feet.

Traffic in the channel moves in a two-way pattern: one lane inbound and one lane outbound. Although some areas of the channel are dredged through rock, the banks consist primarily of loose, unconsolidated soils. However, there may be areas of submerged objects or rocky bottom.

Ports

Table 5.4-2 lists the ports in the study area with berthing for large vessels along with their locations and facilities. Figure 5.4-1 shows the locations of these ports.

Table 5.4-2. Port Facilities in the Study Area

Port	Location	Facilities
Port of Astoria, OR	RM 12	Three deep-draft berths; additional berths for small commercial fishing vessels and research vessels; two marinas and a boatyard; two anchorages
Port Westward Industrial Facility, near Clatskanie, OR	RM 53	One dock and one deep-water berth
Port of Longview, WA	RM 65	Eight marine terminals containing a total of eight berths
Port of Kalama, WA	RM 75	Seven marine terminals: two grain elevators, one general cargo dock, one barge dock, one liquid bulk facility, one lumber barge berth, and one deep-draft wharf
Port of Portland, OR	RM 100	Four marine terminals containing a total of 18 berths
Port of Vancouver, WA	RM 106.5	Four marine terminals containing a total of 13 berths

Notes:
RM = river mile

Anchorages and Turning Basins

This section describes anchorages and turning basins in the study area.

Vessels anchor within the Columbia River system for a variety of reasons, planned (e.g., to take on fuel, to wait for a berth) or unplanned (e.g., mechanical repairs, to wait for better weather conditions). In anticipation of this need, USCG has designated approximately 11 locations for vessels to anchor. Each location has specific characteristics with which vessel masters, crews, and pilots must be familiar. Designated anchorages, as identified by USCG and described in 33 CFR 110.228 (Columbia River, Oregon and Washington), are listed in Table 5.4-3 and depicted in Figure 5.4-1. Table 5.4-3 identifies the locations of the anchorages, the number and maximum size of vessels that can be accommodated, and whether stern buoys are provided to help prevent vessels from swinging while at anchorage.

[9] Near Vancouver, depth varies between 35 and 43 feet and width varies between 400 and 500 feet.

The Corps' regulations establish the operational rules for the anchorages, including a requirement that vessels desiring to anchor must contact the pilot office that manages the anchorage to request a position assignment. The Bar Pilots manage Astoria North and Astoria South anchorages. The River Pilots manage the anchorages upriver from Astoria. The rules also specify that no vessel may occupy a designated anchorage for more than 30 consecutive days without permission from the USCG Captain of the Port.

Table 5.4-3. Anchorages in the Study Area

ID[a]	Anchorage Name	River Miles	Range of Depth(s) (feet)	Maximum Vessel Size	Vessel Capacity	Stern Buoy?[b]
A	Astoria North[c]	14–17.8	24–45+	Panamax	6	No
B	Astoria South	15–18.2	20–45+	Handymax	4	No
C	Longview	64–66	29–40+	Handymax	5	No
D	Cottonwood Island	66.7–71.2	19–40+	Handymax	13	No
E	Prescott	72.1–72.5	52–65+	Panamax[e]	1	Yes (1)
F	Kalama	73.2–76.2	26–40+	Panamax	7	No
G	Woodland[d]	83.6–84.3	8–40+	<600 feet LOA	3	No
H	Henrici Bar[d]	91.6–93.9	22–33+	<600 feet LOA	8	No
I	Lower Vancouver	96.2–101.0	Minimum of 50	<600 feet LOA	14	No
J	Kelly Point	101.6–102.0	25–40+	Panamax	1	No
K	Upper Vancouver	102.6–105.2	35–50+	Panamax or larger	7	Yes (2)

Notes:
[a] Identification letter corresponds to letters in Figure 5.4-1.
[b] Number in parentheses reflects the number of stern buoys maintained at the anchorage.
[c] This anchorage is generally reserved for large and deeply laden vessels as determined by Columbia River Pilots.
[d] Remote and not currently in use.
Source: Lower Columbia Region Harbor Safety Committee 2013 and U.S. Army Corps of Engineers 2015
LOA = length overall

The Lower Vancouver and Upper Vancouver anchorages are the only anchorage areas maintained by the Corps as part of the Columbia River navigation channel. The other designated anchorages are at sites identified as naturally deep locations, although shoaling does occur to some extent and dredging is occasionally necessary.

Although the anchorages downstream of the project area (Astoria North and South) can accommodate deep-draft vessels, use by vessels with drafts of more than 28 feet at Astoria North and more than 26 feet at Astoria South are not recommended due to the probability of dragging anchor. However, a deep anchorage position at Astoria North, referred to as "The Hole," is normally kept vacant for deep-draft vessels in unusual situations or emergencies or for short-term anchoring

(Lower Columbia Region Harbor Safety Committee 2013). Bunkering[10] operations are normally permitted in all anchorages.

Four turning basins are located in the study area (Figure 5.4-1). Turning basins are generally wider areas along a channel dredged to the same depth as the channel where vessel masters and pilots have maneuvering room to turn vessels for the purposes of pointing the bow of the vessel in the direction of transit. Only the Longview turning basin, which is located at river mile 66.5 and encompasses the proposed berths at the project area, can accommodate Panamax-sized vessels.

Bridges

Two bridges cross the navigation channel at and downstream of the Longview area (Figure 5.4-1).

- Lewis and Clark Bridge crosses the Columbia River between Longview, Washington, and Rainier, Oregon. It has a vertical clearance of 187 feet and a horizontal clearance of 1,120 feet. This bridge is upstream from the project area, and Proposed Action-related vessels would not pass through this bridge under normal operations.
- Astoria-Megler Bridge crosses the Columbia River between Astoria, Oregon, just inland of the Port of Astoria, and Point Ellice, near Megler, Washington. It has a vertical clearance of 205 feet and a horizontal clearance of 1,070 feet.

Ferries

One ferry, the Wahkiakum County, Washington Ferry, crosses the navigation channel on the Columbia River between Puget Island, Washington and Westport, Oregon, at river mile 37.4 (Figure 5.4-1). It is the only ferry crossing downstream of the project area.

5.4.4.2 Vessel Traffic

Vessels transiting the study area include commercial cargo, fishing, and passenger vessels; recreational vessels; and service vessels (including tugs, pilot boats, and USCG vessels), as well as a small number of other vessels such as military ships, research vessels, and industrial construction vessels. The cargo vessels and large passenger vessels (cruise ships) are generally restricted to the navigation channel and maintain a predictable two-way traffic pattern (one lane inbound and one lane outbound). For the purposes of this EIS, cargo vessels (ships and barges) and cruise ships are referred to as *large commercial vessels*. The other vessels are generally not restricted to movement in the navigation channel. For the most part, these vessels are more agile and less predictable in their movements. Moreover, data sources and availability regarding these two broad categories of vessels differ. For these reasons, the following discussion of vessel traffic has been separated into two sections: Large Commercial Vessels and Other Vessels.

[10] The transfer of fuel onto a vessel.

Large Commercial Vessels

This section focuses on large commercial vessels calling at ports in the study area, primarily (over 99%) cargo vessels.[11] Cargo vessels comprise ships and barges carrying various cargo including dry bulk, automobiles, containers, bulk liquids, and other general cargo. Large commercial vessels comprise most deep-draft vessel traffic in the study area.[12]

The following sections describe types of large commercial vessels, types and amounts of cargo transported, and traffic volumes in the study area.

Vessel Types

The types of large commercial vessels in the study area are listed below by three broad categories: cargo ships, barges, and passenger cruise ships.

- Cargo ships
  - Dry bulk carriers carrying forest products and steel, ore, grain, potash, and other dry bulk cargoes
  - Container ships carrying containerized cargo
  - General cargo ships carrying steel, machinery, and other general cargo that is not containerized or bulk.
  - Tankers carrying bulk liquids
  - Automobile carriers
- Barges[13]
  - Tank barges (including articulated tug barges [ATBs][14]) carrying bulk liquids
  - Other cargo barges carrying dry bulk, containerized and other cargo
- Passenger cruise ships

[11] Cruise ships comprise less than 1% of large commercial vessel traffic in the study area. *Historical Traffic Volumes*, below, provides a detailed discussion of vessel traffic by vessel type over a recent 11-year period.

[12] A small number of deep-draft military ships and research vessels also transit the study area.

[13] A barge has no onboard propulsion; it is towed or pushed by one or more tugs.

[14] An articulated tug barge, or ATB, is a tank barge that is propelled and maneuvered by a high-powered tug positioned in a notch in its stern.

Table 5.4-4 presents typical specifications for these vessels and example images.

Table 5.4-4. Types of Large Commercial Vessels in the Study Area

Vessel Category	Vessel Types	Typical Vessel Specifications	Example Photos
Cargo ships	Dry bulk cargo ships (bulkers), container ships, general cargo ships, automobile carriers	**Dry bulk, container, and general cargo ships:** DWT: 50,000–80,000, Length: 650–965 feet Beam: 100- 106 feet Draft: 33–39.5 feet	 Bulk cargo ship (bulk carrier)
		Automobile Carriers: DWT: 18,638 Length 650 feet Bean: 105 feet Draft: 27 feet	 Automobile Carrier
		Container ships: DWT: 57,088 Length: 260 feet Beam: 33 feet Draft: 12.5 feet	 Container Ship

Vessel Category	Vessel Types	Typical Vessel Specifications	Example Photos
		Tankers DWT: 65,000–80,000 Length: 965 feet Beam: 106 feet Draft: 41 feet	 Tanker
Barges	Cargo barges including tank barges, dry cargo barges and container barges	Length: 132–286 feet Beam: 40–55 feet Draft: 8–17 feet DWT: N/A (Gross tons: 559–2,700)	 Dry cargo barge
Passenger cruise ships		Length: 560–965 feet Beam: 78–125 feet Draft: 18–29 feet DWT: 2,700–13,290	 Cruise ship

Notes:
DWT = deadweight tons; ATB = articulated tug barge
Photo sources: MarineTraffic.com except for tanker, worldmaritimenews.com; and dry cargo barge, Tidewater.com.

The vessels discussed in this section come in various sizes, as reflected by the ranges (e.g., width, draft) shown in Table 5.4-4. Cargo ships are categorized[15] by their capacity and dimensions. The

[15] These category names often reflect the canal through which the vessels are designed to travel.

vessel classes that can be accommodated in the study area are listed in Table 5.4-5 with their typical dimensions and cargo capacities.

Table 5.4-5. Vessel Classes in Use on the Columbia River Navigation Channel

Vessel Class	Deadweight (tons)	Length (feet)	Beam (feet)	Design Draft (feet)
Handymax	10,000–49,999	490–655	75–105	36–39
Panamax	50,000–79,999	965	106	39.5
Post-Panamax[a]	Over 80,000	965 or greater	106 or greater	39.5 or greater

Notes:
[a] The Post-Panamax class, also referred to as New Panamax, is a new vessel class that reflects the expanded Panama Canal dimensions.
Source: INTERCARGO 2015

Cargo Types and Tonnages

The cargo vessels described in this section transport a variety of cargo.

- Dry bulk, primarily grain (wheat and corn) and oilseeds (soybeans), as well as wood (logs and chips), potash, coal, and alumina
- Automobiles
- Containers
- General cargo, primarily iron and steel, machinery, and other general cargo that is not containerized or bulk
- Bulk liquids, primarily petroleum products

Table 5.4-6 presents the types and amounts of cargo transported along the Columbia River. The amounts and percentages in the table reflect average annual gross tonnage for the period 2004 to 2014, based on Bar Pilots' data (Jordan pers. comm. A). The primary growth areas in recent years have been in the dry bulk and automobile traffic.

Table 5.4-6. Cargo Types and Corresponding Average Annual Gross Tonnage (2004–2014)

Cargo Type	Gross Tonnage	Percentage[a] of Total Cargo Moved
Dry bulk	44,551,063	47.3
Automobiles	20,986,525	22.3
Containers	11,187,455	11.9
General cargo	7,447,913	7.9
Bulk liquid	4,127,333	4.4
Other[b]	5,912,903	6.3
	94,213,193[c]	100

Notes:
[a] Percentages refer to gross tonnage to better represent the approximate quantities of various commodities moved along the Columbia River.
[b] Miscellaneous gross tonnage accounting for vessel movements from one berth to another, passenger vessels, tugs, and empty barge movements.
[c] Numbers do not sum due to rounding.
Source: Bar Pilots data (Jordan pers. comm. A).

Tug Assistance

Cargo and cruise ships require tugs (generally a minimum of two) to provide assistance during docking and undocking, because these vessels lack adequate maneuverability at slower speeds. These vessels also may rely on tugs in emergency situations to assist, escort, and in some cases, provide fire suppression. Tug escorts on the Columbia River are generally engaged only in unusual conditions (e.g., electronic equipment issue that would prevent safe navigation or inoperable vessel propulsion system at normal power levels) that can be mitigated by the tug escort. Most likely an unusual condition that requires a tug escort would be in effect for all portions of the transit (from crossing the bar to the final destination).

Shaver Transportation Company and Olympic Tug and Barge, both based in Portland, provide tugs suitable for ship assists in the study area. Based on River Pilot (2014) guidelines, at least eight of Shaver's 12 study area tugs are suitable for assisting Panamax and Handymax ships; one or two of Olympic's four study area tugs are suitable.

Tugs also are used to tow and push barges between destinations in the study area for bunkering, fuel transport, and hauling cargo. The following companies provide barge towing in the study area: Bernert Barge Lines, Brusco, and Tidewater.

Vessel Speed and Travel Times

The vessels discussed in this section are primarily restricted to the navigation channel, in which traffic moves in two lanes: one lane inbound and one lane outbound. Their speeds generally range between 9 and 15 knots in the study area, with the slower speeds in that range occurring while passing port areas; still slower speeds of between 6 and 9 knots occur while passing through anchorages (DNV GL 2016).

Travel time across the bar, between the offshore Pilot Station and Tongue Point, takes approximately 2 hours in either direction. River transits depend on the study area terminal origination or destination. As an example, the travel time from Tongue Point to Longview is approximately 5 hours inbound (generally vessels in ballast[16]) and about 6 hours outbound (generally loaded vessels). Outbound transits generally take longer than inbound transits for two reasons: The majority of outbound vessels are loaded and, therefore, travel at reduced speeds and outbound transits are scheduled during high-tide conditions to maximize under-keel clearance[17] and thus usually are running against the force of a flood (incoming) tide.

Existing and Historical Vessel Traffic

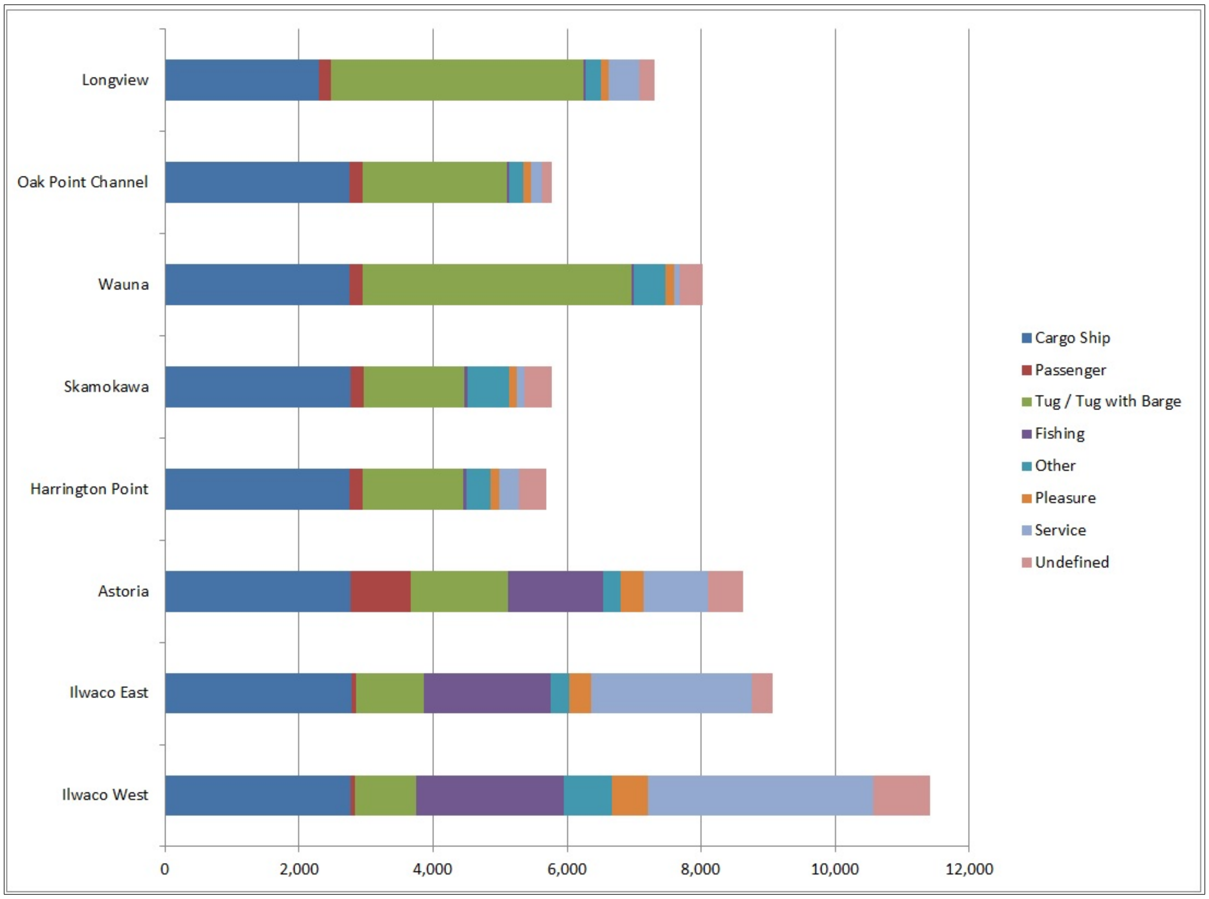
This section describes existing (2014) vessel activity and distribution in the study area and existing and historical traffic volumes over the past 11 years in the context of historical peak volumes prior to this period.

[16] Vessels *in ballast* are not loaded with cargo, but have had their tanks loaded with seawater to increase vessel stability; these vessels have less of a draft than when loaded.
[17] *Under-keel clearance* is the amount of space between the hull of the vessel and the bottom of the channel.

Existing Vessel Traffic and Distribution

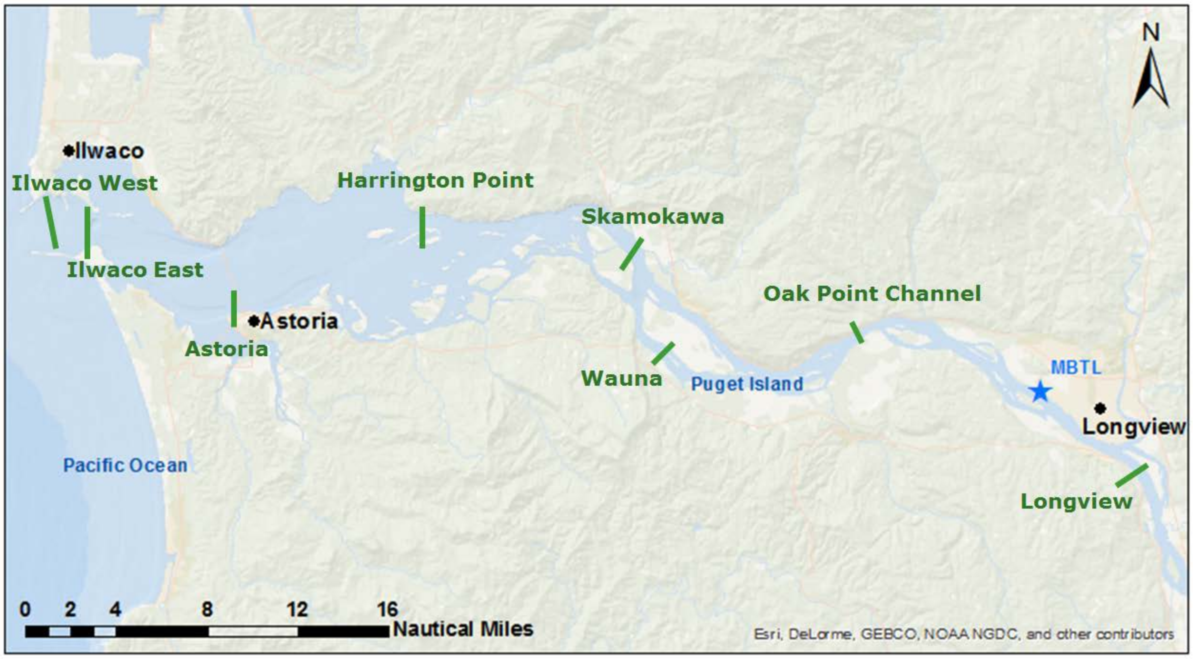
Figure 5.4-2 depicts activity by vessel type at eight cross sections (Figure 5.4-3) of the study area based on 2014 AIS data (DNV GL 2016). The categories shown in Figure 5.4-2 that apply to large commercial vessels are Cargo Ships, Passenger (cruise ships and other large commercial passenger vessels), and, Tug/Tug with Barge.[18] As shown in the figure, vessel activity is greatest near the mouth of the Columbia River. Much of this increased activity at these cross sections (Ilwaco West, Ilwaco East, and Astoria) is related to service and fishing vessel activity. Cargo ship activity remained fairly consistent across the eight cross sections.

Figure 5.4-2. Number of Transits per Location by Vessel Type (2014 AIS Data)



[18] Because barges do not have AIS receivers, barge numbers are captured as part of the tug data. The tug numbers include tugs traveling independently and tugs towing or pushing barges. Only the latter are considered large commercial vessels. The number of tug and barge units (cargo barges), including ATBs, entering and exiting the river are best represented by transits recorded for the Ilwaco locations; the increased tug activity in the upstream portions of the study area, especially near Longview and Wauna, likely represents tugs traveling independently to provide docking services and tugs shifting cargo barges between ports.

Figure 5.4-3. Vessel Data Location Points



Existing Port Activity

Characterizing existing port activity is another way to understand large commercial vessel activity. Types and uses of vessels calling at ports in the study area (Figure 5.4-1) are described below.

- Port of Astoria primarily receives cruise ships, loggers and other cargo vessels, and other types of vessels (e.g., USCG, pollution control, commercial fishing, and recreational vessels). The port reports approximately 230 vessel calls [19] at the Waterfront and Tongue Point berths in 2015 (McGrath pers. comm.).
- Port Westward Industrial Facility receives tankers and tank barges.
- Port of Longview receives cargo ships and barges transporting various types of general and bulk cargo, including steel, lumber, logs, grain, minerals, alumina, fertilizers, pulp, paper, wind energy components, and heavy-lift cargo. The port reported 222 vessel calls in 2015 with a 5-year average of 205 vessel calls per year (Hendriksen pers. comm.).
- Port of Kalama receives cargo ships and barges primarily transporting grain, but also liquid bulk chemicals and general cargo. The Port reported 205 vessel calls in 2014 (Port of Kalama 2015).
- Port of Portland receives cargo ships (mostly Handymax and Panamax) and barges, cruise ships, and other vessel types (e.g., other commercial passenger vessels, dredges, pollution control vessels, USCG). The cargo vessels transport all types of cargo. The port reported 513 and 352 vessel calls in 2014 and 2015, respectively (Myer pers. comm.).
- Port of Vancouver receives cargo ships (Handymax and Panamax) and barges transporting grain, scrap, steel, automobiles, petroleum products, other dry and liquid bulk cargo, and other

[19] A call represents a visit to a port terminal. A vessel call typically results in two vessel transits: one inbound and one outbound.

products. The port also receives commercial passenger vessels (not cruise ships) and dredges. The port reported 450 vessel calls per year in 2014 and 2015 (Ulgum pers. comm.).

Historical Traffic Volumes

This section describes historical commercial vessel traffic volumes in the study area. Table 5.4-7 shows annual transits[20] of large commercial vessels[21] in the study area over an 11-year period (2004 to 2014), based on Bar Pilots records of bar crossings (i.e., vessels entries to and exits from the Columbia River).

As shown in Table 5.4-7, traffic volumes were similar in 2004 and 2014, but have fluctuated within that time period. For comparison, the historical peak vessel traffic year recorded by the Bar Pilots is 1979 with 4,752 transits[22] (Jordan pers. comm. A). Approximately the same level occurred in 1988. In every other year from 1979 to 2000 the number of vessel transits was greater than or very close to 4,000. Since 2001, vessel transits have remained below these levels.

Table 5.4-7. Large Commercial Vessel[a] Transits[b] in the Study Area (2004–2014)

Year	Transits
2004	3,554
2005	3,436
2006	3,618
2007	3,858
2008	3,782
2009	2,926
2010	3,366
2011	3,162
2012	3,178
2013	3,448
2014	3,638

Notes:
[a] A small number (approximately 2% annually) of noncommercial vessels (e.g., military ships and research vessels) are reflected in these data.
[b] Transits recorded in the Bar Pilots data are generally equivalent to bar crossings, (i.e., entries to and exits from the river system); however, a small percentage (approximately 1% annually) reflect in-river vessel movements (e.g., for bunkering or anchorage).
Source: Bar Pilots records (Jordan pers. comm. A)

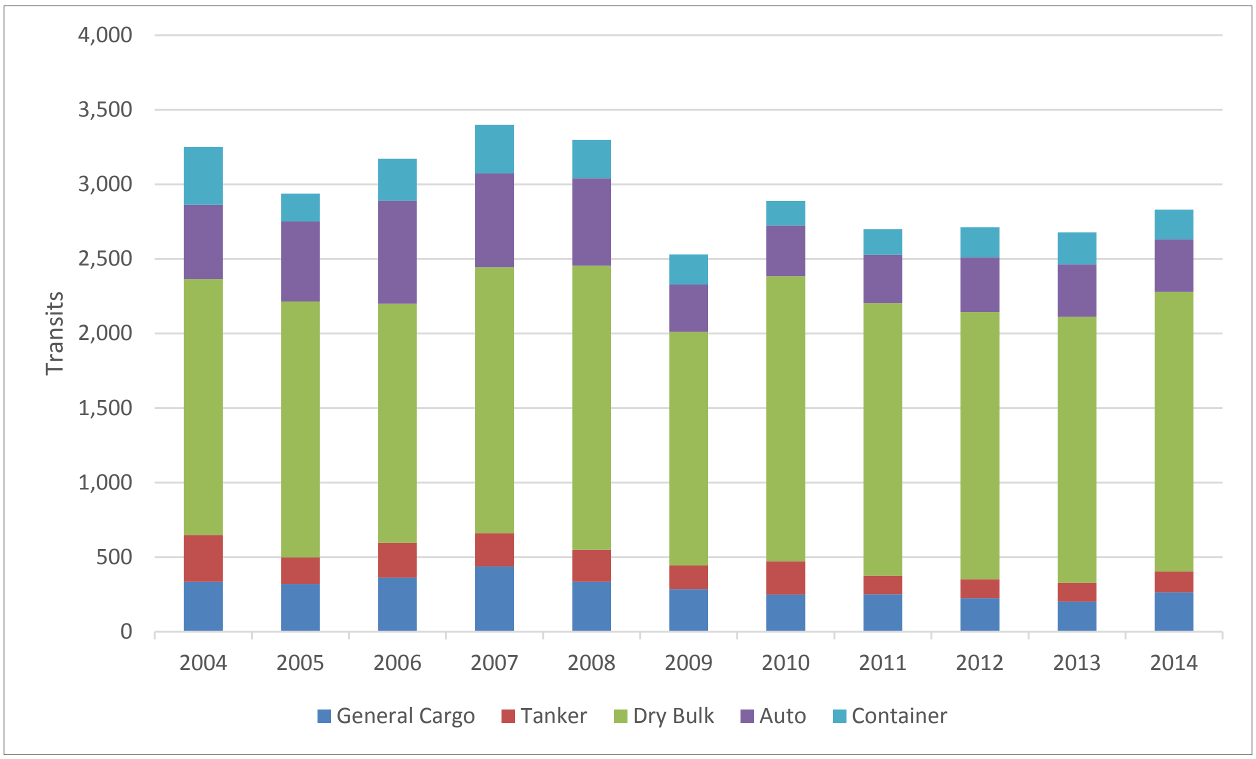
Although vessel traffic volumes have been considerably lower over the past 11 years compared to the earlier peak years, vessel sizes and total cargo tonnages have increased in recent years. The overall decrease in vessel traffic levels has been attributed to several factors. General economic conditions that affected industry levels nationally and worldwide have had commensurate impacts

[20] Bar Pilots record bar crossings or transits (i.e., entries to and exits from the river system); however, these data include a small percentage (approximately 1% annually) of in-river vessel movements (e.g., for bunkering or anchorage).
[21] The Bar Pilot data reflect a small number (approximately 2% annually) of non-commercial vessels (e.g., military ships and research vessels).
[22] The peak traffic year for the Columbia River reflected in the VEAT data is 1999 with 2,269 vessels calls or 4,538 transits (Washington State Department of Ecology 2014).

on regional activity, and thus, vessel traffic. On the other hand, the deepening of the Columbia River channel from 40 to 43 feet has allowed larger vessels with greater drafts to call at river ports, and vessels that previously had to be light-loaded to now be loaded to deeper drafts. This has resulted in the need for fewer, but larger, vessels to move a given volume of cargo; this is especially the case for the dry bulk cargo vessels that make up a high percentage of the river traffic (Krug and Myer pers. comm.; Amos pers. comm.; Jordan pers. comm. B). The changing nature of vessel design and the likely partial impact on vessel volumes within the study area is illustrative of the multiple factors that can impact vessel numbers over time.

Of the vessel transits recorded by the Bar Pilots (2004 to 2014), cargo ships constitute the largest percentage of vessel traffic in the study area (around 90% on average); while barges represent 3 to 10% and cruise ships less than 1%, on average. The remainder, approximately 3%, consists of a mixture of other vessel types.[23] These cargo ships can be broken down further into specific vessel types, based on the Bar Pilots records. Figure 5.4-4 shows transits by this vessel type within the cargo ship category. Dry cargo ship transits represent over half (between 50 and 60%) of the cargo ship traffic annually in the study area. The remainder (in descending order of magnitude) were automobile carriers, general cargo ships, container ships, and tankers.

Figure 5.4-4. Percentage of Annual Cargo Ships by Vessel/Cargo Type (2004–2014)



[23] Vessels categorized as *other* include vessels recorded in Bar Pilots data as miscellaneous (occasional military vessel, research vessels, industrial/marine construction, dredges), bunkers, shipyard, and shifts.

Vessel Traffic Management

Management of vessel traffic in the study area is primarily a real-time activity involving the pilots, vessel masters, and PDXMEX[24]. Large commercial vessel traffic along the navigation channel moves in a two-way pattern: one lane inbound and one lane outbound. This simplistic layout constitutes the foundation of the traffic management system. Oversight and active participation in the traffic management involves coordination of all river stakeholders, including USCG, Corps, Ecology, Oregon Department of Environmental Quality (ODEQ), pilots, shipping agents, terminal operators, tug operators, and other associations and services. Large commercial vessels traveling in the study area must adhere to international and inland rules (72 COLREGS and Rules of the Road, respectively), described in Section 5.4.1, *Regulatory Setting*. These rules are intended to facilitate safe maritime travel.

Pretransit Planning

Large commercial vessels are required to provide an advance Notice of Arrival[25] to USCG at least 96 hours before arrival at the bar in most cases, or upon departure from the last port of call for shorter voyages. This information is provided electronically and shared almost instantaneously with PDXMEX and the Bar Pilots and River Pilots.

Upon receipt of the Notice of Arrival a coordination process is initiated between the pilots and the shipping agent representing the vessel interests. The Bar Pilots and River Pilots work closely together and with PDXMEX during the pretransit scheduling. The pilots use information provided in the Notice of Arrival as well as weather conditions, pilot availability, tidal and river conditions, and anchorage and berth availability to determine scheduling.

For inbound vessels, tracking and coordination begins when the vessel is approximately 2 to 3 hours away from the pilot boarding station. Decisions on vessels crossing the bar movements are made by the Bar Pilots alone, although considerations affecting the Columbia River Pilots could result in delaying a vessel's transit.

The Bar Pilots coordinate closely with USCG on navigation conditions and safety. While only the USCG Captain of the Port (COTP) can close the bar to vessel traffic, the Bar Pilots can suspend traffic movements when the overall circumstances dictate. In assessing navigation conditions, the pilots consider if vessel crossing is safe, if the pilot can get on and off the vessel safely, and if the pilot boat or helicopter can return to base safely.

The Bar Pilots give the River Pilots a "window of opportunity" for getting an outbound vessel over the bar. The River Pilots then develop their transit plans to match that window. Transit planning for draft-constrained vessels varies with river flows. For example, during the low-water season, the

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[24] The Merchants Exchange of Portland (PDXMEX) is an information and communication center for ports and stakeholders along the Columbia River. It provides a monitoring system that allows users to locate vessels in the study area and operates a dispatch center that assists in coordinating with River and Bar Pilot dispatch centers to ensure proper vessel traffic management. PDXMEX is also a central point of contact for vessel agents, who provide necessary shore-side services for vessels.

[25] In addition to serving as an arrival notification the Notice of Arrival includes vital information about the vessel, voyage information (e.g., specifics about the five ports visited, name and telephone number of a 24-hour point of contact), cargo information, information about each crewmember and other people onboard, operational condition of equipment, and documentation specifics.

pilots can only count on having sufficient water under keel during one of the daily high tides. Outbound transit plans are developed at least 8 hours and as much as 24 hours in advance. Pilots operating draft-constrained vessels in the study area have to adjust the time of their transit to allow for at least 2 feet of under-keel clearance on the river plus expected squat[26] (Jordan pers. comm. B).

The decision to sail outbound is more critical than the decision to bring a vessel in. For outbound traffic, once the vessel starts downriver there is no place to stop or turn around unless the vessel is in extremis and requests to anchor; inbound vessels can stop before approaching the bar. Nevertheless, there is a point at which a vessel approaching the bar from sea or from the river is fully committed to the crossing. This is why pretransit planning is key to safe passage across the bar in either direction.

As discussed previously in the *Tug Assistance* section, tug escorts are generally only engaged on the Columbia River in unusual conditions that can be mitigated by the tug escort. Tug escorts in the study area are rare (Gill pers. comm.).

Pilotage

The vessels discussed in this section are required to use a licensed pilot in the study area. The Bar Pilots and River Pilots are highly trained mariners who are experts in vessel navigation and the characteristics of their respective portions of the waterway. They are responsible for safely maneuvering large commercial vessels in the study area with support of the vessel master's knowledge of their own vessel and how it maneuvers.

The Bar Pilots board inbound vessels outside the bar, at a predetermined site suitable for safe boarding, and are responsible for piloting the vessel to Tongue Point, near Astoria. At Tongue Point, the Bar Pilots disembark and the River Pilots board. The River Pilots guide the vessel to the terminal until it is safely moored. For departing vessels, the process is reversed.

Vessel size is a significant factor in transit planning. The River Pilots typically place just one pilot on each vessel, but in some circumstances, including vessels with a beam greater than 140 feet, two pilots are assigned.

As a standard practice, River Pilots avoid meeting and overtaking situations between large commercial vessels in the following areas of the river: Miller Sands (river miles 22 to 25), Skamokawa/Abernathy (river miles 28 to 34), Bugby Hole (river miles 39 to 40), Bunker Hill (river miles 55.5 to 56.5), and Longview Bridge (river miles 65 to 67). The Bar Pilots ensure that large commercial vessels do not pass each other on the bar.

If, at any time during the transit, it becomes necessary to anchor a commercial vessel for an unexpected reason, the USCG COTP is contacted and directs the vessel anchoring in consultation with the pilot and vessel master. The Columbia River Harbor Safety Plan Anchorage Guidelines provide details about the anchorages and potential hazards that could affect anchorage.

The River Pilots work with the tug companies providing tug services in the study area to ensure that appropriate tugs are available upon request. Tugs are assigned, primarily for docking assistance, based on the minimum bollard pull required for a particular vessel type or operation. Pilots

[26] *Vessel squat* is the tendency of a vessel to draw more water astern (behind or toward the rear of the vessel) when it is moving through a water body. The streamlines of return flow are sped up under the ship, causing a drop in pressure and of the ship, effectively, increasing draft.

requesting tug support also take into account other tug features such as type of propulsion, deck machinery, or number of propellers.

Pilotage Tools

Pilots use a variety of tools to manage traffic on the river. They rely mostly on Transview 32 (TV32), LOADMAX, AIS towers, and other aids for navigation to monitor real-time vessel traffic and data on current weather and tidal conditions. They carry Portable Pilot Units in conjunction with installed navigation equipment on vessels to access these tools. These tools are described below.

TV32[27] is a real-time, vessel traffic information and management system that portrays vessel movements and interactions on the river along with water depth, current flow information and updated bathymetry charts. It combines the following systems to provide extremely high spatial resolution accuracy: AIS, NOAA Nautical and Electronic Navigational Charts (ENC) Electronic Chart Display and Information System (ECDIS), NOAA Physical Oceanographic Real-Time System (PORTS[28]), and differential global positioning system (DGPS). TV32 allows pilots to accurately determine vessel meeting points to facilitate informed decision making regarding navigation, anchorage, and traffic coordination.

While operating, every pilot has access to the Corps' survey data that includes channel depths, the 43-foot contour, and cross-sections along with NOAA PORTS and LOADMAX data, as well as the vessel's own navigation system information displays. Using this information, pilots can predict vessel meeting points and display those locations when two ships are as much as 70 miles apart. The pilots can then adjust vessel speeds to ensure that the meetings take place in suitable locations and avoid the few places on the river where meeting situations must be avoided. The River Pilots also monitor shoaling developments and assess how those might affect transit plans. LOADMAX is a system of seven computer-connected PORTS gages along the Columbia River that measure real-time water levels. It produces daily email forecasts of river stage and velocity at 1-hour intervals, with a forecast horizon of 10 days. Pilots routinely use these data to time river transits.

The River Pilots have specifically credited AIS towers and virtual aids as important to their navigation. Pilots have two relay towers that allow them to see the entire length of the route and monitor traffic using the waterway. Aids to navigation allow vessels to identify and locate other vessels and increase situational awareness of hazards and route features that are not otherwise physically marked (or would require extra time and resources to mark). USCG is responsible for maintaining the aids to navigation systems on the Columbia River. The aids include a series of fixed and floating aids, which are visual (e.g., buoys, beacons, lights), aural (e.g., bells, fog signals), electronic or any combination.

[27] TV32 is considered to be a vital part of the Columbia River Vessel Traffic Information System (VTIS) consisting of the pilots, the PDXMEX, and the other electronic tools discussed in this section. A VTIS generally requires users to deliberately access information as opposed to a vessel traffic service, as in Puget Sound, which is centrally managed and manned to continuously receive and disseminate navigation safety information to vessel operators on the waterway.

[28] PORTS measures surface current speeds, water depth, and wind direction and speed. Data are transmitted and displayed on the TV32 interface every 6 minutes.

Other Vessels

The vessels discussed in this section include commercial fishing, recreational, smaller commercial passenger, and service vessels. These vessels are generally much smaller than the vessels discussed in the previous section and have different activity and transit patterns. Most can move about the river without being restricted to the navigation channel. Table 5.4-8 presents typical specifications for these vessels and example images.

Table 5.4-8. Other Vessel Types in the Study Area

Vessel Type	Typical Specifications	Example Image
Fishing vessels	Length: 20–180 feet Beam: 8–45 feet Draft: 3–15 feet	 Fishing (gillnetter) vessel
Other commercial passenger vessels: car ferries, inland passenger ships, passenger ferries	**Car ferry:** Length: 109.2 feet Breadth: 47.5 feet Draft: 6 feet **Other commercial passenger vessel:** Gross Tons: < 100 Length: 80–150 feet Beam: 30–40 feet Draft: 6–12 feet	 Car ferry "Oscar B"  River cruise vessel

Vessel Type	Typical Specifications	Example Image
Recreational vessels, including pleasure boats, yachts, sailing vessels	Length: 20–150 feet Beam: 8–40 feet Draft: 3–15 feet	 Pleasure craft
Service vessels Military (USCG), law enforcement, pilot vessels, Aids to Navigation vessels	U.S. Coast Guard vessels range in length from 22 feet to over 300 feet. **Vessel shown:** Length: 47 feet Beam: 14 feet	 U.S. Coast Guard search and rescue vessel
	Pilot vessel (shown): Length: 72 feet Beam: 20 feet Pollution control vessels: Length: 20–40 feet Beam: 6–20 feet	 Pilot vessel COLUMBIA

Vessel Type	Typical Specifications	Example Image
Tugs	Length: 50–150 feet Beam: 26–35 feet Draft: 9–16 feet	 General tug
Dredge vessels	**Vessel shown:** Length: 200 feet Beam: 58 feet Draft: 16 feet	 Dredge vessel YAQUINA

Notes:
Photo sources: MarineTraffic.com, except fishing (gillnetter) vessel, WDFW Image Gallery: car ferry “Oscar B,” Daily Astorian; search and rescue vessel, News Lincoln County.

Commercial Fishing

Columbia River

The Columbia River is divided into six commercial fishery management zones; of these, Zones 1 through 3, and a portion of Zone 4 occur in the study area (NOAA Fisheries 2016). The commercial fisheries in these zones are managed by the states of Oregon and Washington.

Within the study area, the Columbia River supports important commercial shad, anchovy, herring, smelt, and salmon fisheries. Commercial fishers deploy gillnets, tangle-nets, or seines depending on species, season, and zone. Anchovies and herring may be taken for commercial purposes at any time in the Columbia River seaward of the Astoria-Megler Bridge (Figure 5.4-1). Commercial salmon seasons and authorized fishing gear are shown in Table 5.4-9. Shad typically can be taken for commercial purposes from the study area zones during commercial salmon seasons with the same fishing gear authorized for the taking of salmon. The retention of green sturgeon and white sturgeon was prohibited in the Columbia River downstream of Bonneville Dam beginning in 2006 and 2014, respectively.

Table 5.4-9. Major Columbia River Commercial Salmon Fishery Seasons in the Study Area

Season[a]	Primary Species	Areas	Authorized Method/Gear
Winter (February–March)	Spring Chinook	Select Area Fisheries[b]	Gillnets and tangle-nets
Spring (April–June)	Spring Chinook	Select Area Fisheries[b] and Columbia River mainstem[c]	Gillnets and tangle-nets
Summer (June–July)[c]	Sockeye and Summer Chinook	Columbia mainstem and Select Area Fisheries[b]	Gillnets
Early Fall (August–mid-September)	Summer and Fall Chinook	Columbia River mainstem and Select Area Fisheries[b]	Gillnets
Late Fall (mid-September–mid-November)	Fall Chinook and Coho	Columbia River mainstem and Select Area Fisheries[b]	Gillnets, tangle nets, and experimental seines

Notes:
[a] Dates and areas subject to stock abundance and management decisions.
[b] Select Area Fisheries include Youngs Bay, Blind Slough/Knappa Slough, Tongue Point/South Channel, and Deep River.
[c] Columbia River mainstem areas include Zones 1 (Columbia River mouth) to 5 (Beacon Rock at RM 142).
Source: Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife 2015a (winter, spring and summer) and 2015b (fall fisheries).

Approximately 2,046,747 pounds of shad and salmon (Chinook, coho, pink, and sockeye) were harvested (160,821 landings) on the Columbia River in 2015; the late-fall salmon season accounted for approximately 85% of this total harvest, making the late-fall salmon season the busiest time of year for commercial fishing on the Lower Columbia River (Oregon Department of Fish and Wildlife 2015b).

Coastal, Nearshore, and Ocean Commercial Fishing

Several coastal, nearshore, and offshore open-ocean fisheries, including groundfish, halibut, salmon, albacore, pacific whiting, sardines, and shellfish (primarily Dungeness crab and pink shrimp) are present within or adjacent to the study area. However, activities in the study area range from harvesting to delivery to shore-based processors, depending on the fishery. Commercial fleets come and go from ports near the mouth of the Columbia River, making the river mouth the busiest part of the study area for commercial fishing vessel traffic, though numbers of operating vessels fluctuate by season and license by fishery. The Port of Astoria is home to three seafood processors (Port of Astoria 2016).

Tribal Fishing

The treaties of 1855 between the United States and individual tribal governments reserved tribal rights to fish, hunt, and gather traditional foods and medicines throughout ceded lands identified within the treaties. The Columbia River and its tributaries support a variety of tribal resources, including six species of salmon and Pacific lamprey, which have been a reliable and important source of food and trade items to tribes of the Columbia River Compact. The Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of Warm Springs, and Nez Perce Tribe are the tribes in the Columbia River Basin that have reserved rights to anadromous fish in treaties with the United States (Columbia River Inter-Tribal Fish Commission 2016). Zone 6, upstream of the study area from just downstream of Bonneville Dam to McNary Dam, is managed as an exclusive treaty commercial fishing zone. Tribal fishing resources are described in more detail in Chapter 3, Section 3.5, *Tribal Resources*.

Recreational Fishing and Boating

The Columbia and Willamette Rivers are popular areas for recreational boating (motorized and nonmotorized), fishing, and other recreational activities (Port of Portland 2010). Over 30 water access and boat launch sites along the Columbia and Willamette Rivers within the study area provide public and private river access for recreational boating and fishing.

The Columbia River is the most boated waterbody in the State of Oregon with 524,091 boat use days, followed by the Willamette River with 281,176 boat use days. Hayden Island, which is located on the Columbia River, between Vancouver, Washington, and Portland, Oregon, serves as a key location for recreational boaters traveling to different sections of the Columbia and Willamette Rivers. Marinas in the vicinity report that recreational boating is highest during summer months and that 100% of 3,600 boat slips on Hayden Island are leased between April and October (Port of Portland 2010). The Columbia River Water Trail is a designated area for canoes and kayaks that travels through the study area to the mouth of the river.

The Columbia and Willamette Rivers support numerous aquatic species including salmon, steelhead, small mouth bass, shad, and sturgeon fisheries. Greenling, rockfish, lingcod and perch are caught from the jetties, and flounder are common on sandy flats. Recreational fishing seasons vary by target species, but fishing occurs year-round for many species. Recreational catch and release fishing for green and white sturgeon is currently allowed year-round (Oregon Department of Fish and Wildlife 2015c). Warm-water game fish species season is also year-round in the study area (Oregon Department of Fish and Wildlife 2015c). The spring Chinook and steelhead fishery for the Columbia River may be open from January to March depending on fishery management decisions, and Chinook and coho salmon fishing season runs from August to December.

The spring Chinook fishery in the Hayden Island area of the Columbia River is extremely popular and fishing participation rates have increased over recent years. During the spring Chinook season, between 135,000 and 145,000 angler days are documented on this section of the Columbia River between March 1 and June 1 (Port of Portland 2010). Also, the area between the mouth of the river and Tongue Point, which includes Youngs Bay, is a popular area for recreational fishing year-round, (Oregon Department of Fish and Wildlife 2016). This area is popular especially during the fall Chinook and coho salmon season, which generally peaks in the last 2 weeks of August (Washington Department of Fish and Wildlife 2016).

Dungeness crabs are caught in the estuary and in nearshore and offshore areas beyond the mouth of the river, and razor clams are harvested along the ocean beaches north and south of the mouth of the river.

Commercial Passenger Vessels (Non-Cruise Ships)

Commercial passenger (non-cruise ship) vessels transit from one port to another within the Columbia River; they include a range of vessels up to 100 gross tons carrying from six to over 150 passengers. Examples of these vessels include the Portland Spirit and Columbia Gorge Sternwheeler, which provide dinner cruises and day trips, respectively, and the Waikiakum County ferry, the only ferry on the Lower Columbia River, which shuttles passengers and up to 12 cars back and forth between Puget Island, Washington and Westport, Oregon.[29]

Service Vessels

Service vessels, including military, law enforcement, search and rescue, pilot, pollution control, and tugs operate throughout the study area and could be found anywhere on the lower Columbia River at any time. The vessel types and activities are summarized below.

- USCG vessels in the study area consist of vessels stationed primarily at the Port of Astoria, Cape Disappointment, and Portland, Oregon. These vessels are used for search and rescue, maritime law enforcement, boating safety, Aids to Navigation, and homeland security.
- Oregon State Police and Washington State Police also operate vessels on the Columbia River to coordinate the enforcement of commercial fishery and sport angling regulations, and for special investigations. County governments along the Columbia River also staff full-time deputies assigned to patrol the waters of the Columbia River and conduct boat inspections. These local law enforcement vessels can be found operating within their respective jurisdictions of the Columbia River and its adjacent waterways.
- Pilot vessels are used to transport Bar and River Pilots to large vessels for pilotage duties described above in *Large Commercial Vessels, Vessel Traffic Management*. The Bar Pilots use one of two Pilot boats, the Astoria or the Columbia, both 72-feet long, for offshore transfers. [30] For transfers within the Columbia River, the River Pilots and the Bar Pilots use the Connor Foss, a 63-foot-by-17-foot aluminum vessel designed specifically for pilot transfers. The Bar Pilots make approximately 3,600 vessel crossings of the bar each year with vessels ranging from 100-foot tugs to 1,100-foot cargo ships. River Pilots pilot vessels upriver from Astoria including along 13 miles of the Willamette River from its confluence with the Columbia to the seawall in downtown Portland (Columbia River Pilots 2014).
- Three marine spill response vessels are staged in the study area at the Port of Astoria.
- Tugs operating in the study area include those towing or pushing barges from or to destinations beyond the study area and those from tug companies located along the Columbia River. The latter tug companies provide cargo barge movement services between ports along the river; move bunkers (fuel oil barges) to vessels requiring fuel; and provide docking, escort, and other assistance, as described above under *Large Commercial Vessels, Tug Assistance*.
- Dredges are used to maintain the navigation channel by removing excess sand, silt, and mud that naturally settles to the bottom and on the sides of the channel over time. Dredging operations are advertised to vessel operators transiting in the Columbia River and are conducted in such a manner as to generally not impede vessel traffic.

Recreational and Commercial Fishing Vessel Traffic Management

The USCG is the primary federal maritime law enforcement agency on the Columbia River. Oregon State Police and Oregon county law enforcement (Clatsop County Sheriff Marine Patrol) also patrol

[29] The Wahkiakum County Ferry is currently closed for repairs for an unspecified period of time.

[30] Embarking and disembarking of Columbia River Bar Pilots offshore can be by boat or helicopter. It is the individual pilot's choice whether to use the boat or helicopter for transfers offshore, with the helicopter being used about 70% of the time (Rodino pers. comm.:52).

on the Columbia River (Oregon.gov 2016). Vessels in these state and local law enforcement units are used to regulate recreational and fishing vessel traffic on the river in accordance with state and local laws.

The USCG boards commercial fishing vessels at sea to ensure compliance with safety equipment requirements required by the Commercial Fishing Industry Vessel Safety Act of 1988. The USCG auxiliary conducts dockside inspections of commercial fishing vessels to supplement the at sea boardings and educate fishermen on safety equipment and training requirements (Kemerer and Castrogiovanni 2008). USCG vessels participate with state and local law enforcement in joint operations on a periodic basis to manage vessel traffic and maintain recreational boater safety (U.S. Coast Guard 2016). For example, during the months of August and September each year, the Coast Guard Auxiliary, in conjunction with USCG Station Cape Disappointment, Clatsop County Sheriff's Office, and Oregon State Police, engage in a Recreational Boating Safety surge operation to educate and inform boaters participating in Columbia River recreational salmon season. USCG also hosts Operation Make Way, a yearly joint recreational boater education and enforcement campaign, to educate recreational boat users about the need to give way and stay clear of large commercial vessels operating within the Columbia and Willamette navigation channels. The program aligns with state's and counties' recreational boating safety missions.

5.4.4.3 Ship Casualty Survey

The information presented in this section is based on data obtained from the USCG MISLE database and covers all available data from 2001 through 2014. The data are collected for 26 vessel incident types and are not predictive of cargo vessel casualties. Three primary incident types—collision, allision, and a combination of grounding/set adrift—are representative of the navigational incidents that could occur and compare best to the results of the incident modeling (Table 5.4-10).

The database notes the severity of each incident and describes potential vessel damage. Table 5.4-11 presents the outcome distribution in three categories—total loss[31], damaged, and undamaged—for marine incidents that took place between the Columbia River mouth and the Port of Portland.

The results of these data survey are very similar to those from nationwide incidents in that approximately two-thirds of incidents resulted in no damage, one-third in some damage, and slightly less than 3% in total loss.

Table 5.4-10. Incident Severity by Incident Type for Study Area (Total Incidents, 2001–2014)

Damage Status	Total Loss (% of Total)	Damaged (% of Total)	Undamaged (% of Total)	Total
Allision	3 (5%)	24 (43%)	29 (52%)	56
Collision	1 (5%)	9 (47%)	9 (47%)	19
Grounding /Adrift	1 (1%)	16 (21%)	59 (78%)	76
Total[a]	**5 (3%)**	**49 (32%)**	**97 (64%)**	**151**

Notes:
a Total may not sum due to rounding.
Source: DNV GL 2016

[31] For the purposes of this analysis, *actual total loss*, *total constructive loss: salvaged*, and *total constructive loss: unsalvaged* were combined into a single *total loss* category.

Table 5.4-11. Outcome Distribution for All Incidents in the Study Area by Vessel Type (2001–2014)

Damage Status	Total Loss (%)	Damaged (%)	Undamaged (%)	Total (%)
Bulk Carrier	0%	2%	16%	18%
General Dry Cargo Ship	0%	1%	3%	4%
Ro-Ro Cargo Ship	0%	1%	1%	2%
Tank Ship	0%	0%	2%	2%
Barge	0%	2%	7%	9%
Passenger Ship	1%	8%	7%	15%
Towing Vessel	0%	7%	13%	20%
Fishing Vessel	2%	5%	13%	21%
Recreational	1%	3%	0%	3%
Military ship	0%	1%	0%	1%
Unspecified	0%	1%	3%	4%
Miscellaneous	0%	1%	0%	1%
Total[a]	**3%**	**32%**	**64%**	**100%**

Notes:
[a] Total may not sum due to rounding.
Source: DNV GL 2016

Table 5.4-10 shows that groundings were the most common type of incident, followed by allisions, then collisions. Although collisions represented less than 13% of total incidents during the survey period, they resulted in the highest severity outcomes, followed closely by allisions; groundings resulted in significantly less severe outcomes (78% of grounding resulted in no vessel damage). Table 5.4-11 presents the distribution of incident severity for all incidents by vessel type. The table shows that the higher severity events more typically involved smaller craft (e.g., fishing or recreational vessels).

5.4.4.4 Marine Oil Spill Survey

Vessel-related oil spills that occurred in the study area from 2004 to 2014 are presented in Table 5.4-12 by spill volume and incident type, based on MISLE, SPIIS, and ERTS data. Spill volumes per incident ranged from 0.1 gallon to 1,603 gallons. An average 15.6 oil spills per year occurred during the study period; of these, 84% had a volume of less than 10 gallons. As reflected in Table 5.4-12, most of the spills were not related to a vessel incident. Spills greater than 100 gallons occurred at a frequency of 0.4 per year or once every 2.2 years. The average size of these spills was approximately 630 gallons.

The vessel-related spill survey was largely confined to the specified time period (2004 to 2014) because this was the period of best overlap among all the datasets and because it provides a representation of present risk.

Table 5.4-12. Oil Spill Incident Count and Frequency—Lower Columbia River (2004–2014)

Incident Type	Oil Spill Incident Count by Spill Volume					Oil Spills per Year
	<1 gal gallon	1–10 gallons	10–100 gallons	>100 gallons	Total	
Allision	1	-	-	-	1	0.1
Capsize	1	-	-	-	1	0.1
Damage to the environment[a]	123	57	28	6	214	15.3
Grounding	-	-	1	-	1	0.1
Sinking	-	2	-	-	2	0.1
Total	**125**	**59**	**29**	**6**	**219**	**15.6**
Spills per year	**8.9**	**4.2**	**2.1**	**0.4**	**15.6**	

Notes:
[a] This category includes all other incident types and undetermined events including but not limited to those causing an oil sheen, which requires reporting under state law.

Larger-scale incidents involving the release of oil have occurred in previous years; however, these events predate legislation targeted at and largely successful in reducing the likelihood of oil spills from vessels or diminishing the impact of a spill should it occur, namely, the enforcement in U.S. waters of the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Oil Pollution Act of 1990. The latter brought about more stringent planning and spill-prevention activities than the previous U.S. legislation (the FWPCA as amended by the Clean Water Act), improved preparedness and response capability (public and private), and established a double hull requirement for tank vessels.

5.4.4.5 Incident Management and Response Systems

The National Contingency Plan, codified in 40 CFR 300, establishes federal on-scene coordinators for oil spills and hazardous material releases within the inland zone and coastal environments. The plan is the foundation document for state, regional, and local planning for pollution response and provides organizational focus for the related emergency situations that linked to oil spills such as vessel groundings, collisions, allisions, and fires.

USCG is the federal on-scene coordinator in the study area. In Washington State, Ecology is the designated state on-scene coordinator for spill response. The Washington Emergency Management Division functions in this role for natural disasters, and Washington State Patrol or state fire marshal for fires. The Washington State Emergency Response system is designed to provide coordinated state agency response, in cooperation with federal agencies for effective cleanup of oil or hazardous substance spills. Within Oregon, ODEQ is the lead agency for oil or hazardous material spills, the Oregon Office of Emergency Management coordinates support from other state agencies, and the state fire marshal provides hazardous materials/fire incident response coordination and support when a situation exceeds local response capabilities.

The Northwest Area Contingency Plan is the regional planning framework for oil and hazardous substance spill response in the states of Washington, Idaho, and Oregon. Representatives from the federal and state agencies listed above and local governments plan for spill response emergencies and implement response actions according to the plan when an incident occurs.

The plan includes but is not limited to the following elements.

- A description of the area covered by the plan, including the areas of special economic or environmental importance that might be damaged by a spill.
- Roles and responsibilities of an owner or operator and of federal, state, and local agencies in spill response and in mitigating or preventing a substantial threat of a discharge.
- A list of equipment (including firefighting equipment) and personnel available to respond to oil spills.
- Site-specific geographic response plans.

Geographic response plans, part of Northwest Area Contingency Plan, are tailored for specific shorelines and waterways. The main objectives of these plans are to identify sensitive resources at risk from oil spills and to direct initial response actions to sensitive resources.

In addition to the national and regional plans, the Lower Columbia Region Harbor Safety Committee maintains the Harbor Safety Plan, which includes incident management guidelines; emergency communications; notification requirements in case of an oil spill; steps to take in case of a vessel grounding, vessel collision, bridge allision, and mechanical or equipment failures.

All of these plans help coordinate response efforts by the responsible party (vessel owner/operator) and federal and state agencies.

Owners/operators of large commercial vessels are required to prepare and submit oil spill response plans under federal (33 CFR 155.5010-155.5075) and state requirements (WAC 173-182) to ensure that resources, including equipment, are in place for a spill of the vessel's fuel oil and of any oil carried as secondary cargo. Moreover, vessel owners/operators are required to retain an oil spill removal organization and a spill management team; this is often accomplished by contracting with cooperative organizations that specialize in oil spill response, such as the Marine Spill Response Organization and National Response Corporation.

Additionally, vessels owners/operators can obtain oil spill response and contingency planning coverage under the Maritime Fire Safety Association (MFSA) response plan, an umbrella plan for enrolled vessels entering the Columbia River.

The incident response system in the study area for vessels covered by the MFSA response plan is described below for oil spills, fires, and collisions and groundings.

- **Oil spill.** If an oil spill occurs in the study area, USCG, Ecology, and ODEQ—the federal and state on-scene coordinators—and the responsible party represent the Unified Command. The Unified Command coordinates responses, mitigation, and cleanup efforts for spills on the Lower Columbia River to protect public health and safety, response personnel, and the environment. (Maritime Fire and Safety Association 2013)
- **Shipboard fire.** Under the Federal Fire Prevention and Control Act of 1974, fire prevention remains a local and state responsibility (Northwest Area Committee 2015). The local fire jurisdiction is the first responder to a shipboard fire. If the incident is beyond the local jurisdiction's capacity, mutual aid resources[32] are requested. If local and mutual aid resources

[32] Local and state firefighting organizations enter into reciprocal agreements to provide mutual aid when a single jurisdiction's resources are overwhelmed.

are exhausted, the local fire chief requests assistance from the state emergency management office. With appropriate approvals, the state fire chief (Oregon) or state fire marshal mobilization coordinator (Washington) takes control over response (Office of State Fire Marshal 2015; Office of the State Fire Marshal, Washington State Patrol 2015). The USCG COTP acts as the federal on-scene coordinator, if a shipboard fire occurs outside a fire agency's jurisdiction but within the Sector Columbia River COTP zone, or if a vessel fire is treated as a search-and-rescue case (Northwest Area Committee 2015).

- **Collision and grounding incident response.** For collision and grounding incidents, the vessel operator immediately secures watertight closures and contacts the USCG COTP and Ecology. The USCG COTP may establish a communications schedule, request periodic vessel updates, and issue a safety marine information broadcast. In response to a collision, USCG response personnel and state investigators assess and supervise the incident and may form a Unified Command. Unified Command instructs responsible parties on separating joined vessels and moving vessels to anchorage. The USCG COTP works with the vessel operator and Unified Command to initiate pollution response, as necessary. In most cases, a surveyor is required to inspect damage and verify repairs. In response to a grounding, the objective is to refloat and minimize damage to the vessel and environment. When the vessel floats free, the responsible party will be required to activate the response plan to minimize any pollution threat.

5.4.5 Impacts

This section describes the potential direct and indirect impacts related to vessel transportation that would result from construction and operation of the Proposed Action and the No-Action Alternative.

5.4.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action. The Proposed Action would load an average of 70 vessels per month or 840 vessels per year, which would equate to 1,680 vessel transits in the Columbia River. Proposed Action-related cargo vessels would be required by federal and state law to meet vessel standards and plan requirements. These include structural, fire-fighting and personnel requirements as well as oil spill contingency and response plans as previously described.

Construction—Direct Impacts

Construction-related activities associated with the Proposed Action could result in direct impacts as described below. As explained in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives,* construction-related activities include demolishing existing structures and preparing the site, constructing the rail loop and dock, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

In-water dock construction (pile-driving, dredging, and general construction above water) would occur over a 6-month to 1-year period (Grette Associates, LLC 2014). For this work, barges would be located near Docks 2 and 3. The barges would be positioned outside of the navigation channel, so as to not impede vessels traveling within the channel. They would also be placed outside of the area used by vessels accessing Dock 1, so they would not affect these activities. Additional information on dredging and pile driving is included in Chapter 4, Section 4.5, *Water Quality*.

Construction—Indirect Impacts

Construction of the Proposed Action would result in the following indirect impacts. Construction-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

As described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*, the Applicant has identified three construction-material-delivery scenarios: delivery by truck, rail, or barge. If material is delivered by barge, it is assumed that approximately 1,130 barge trips would be required over the construction period. Approximately two-thirds of the barge trips would occur during the peak construction year, assumed to be 2018. Approximately 750 barge trips in the study area would be required during the peak construction year to deliver construction materials. Because the project area does not have an existing barge dock, the material would be off-loaded at an existing dock elsewhere on the Columbia River and transported to the project area by truck.

Barges are shallower in draft and could transit the Columbia River navigation channel during periods of low water to avoid interference with larger vessel traffic. Coordination would take place with the River Pilots prior to and during transit activity. Moreover, the construction barges would be transiting a portion of the navigation channel during construction in the vicinity of the project area and not the entire study area. Therefore, impacts on vessel traffic in the study area as a result of construction-related barge traffic would be low.

Operations—Direct Impacts

Operation of the Proposed Action would result in the following direct impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*. The Proposed Action would load 70 vessels per month or 840 vessels per year, which would equate to 1,680 vessel transits in the Columbia River.

Loading coal onto vessels for export is the only activity proposed for the new docks, Docks 2 and 3. Vessel loading would be performed using an electric-powered, single-traveling shiploader installed on Docks 2 and 3. Each shiploader would have an average capacity of 6,500 metric tons per hour (Millennium Bulk Terminals—Longview 2013). At maximum throughput, an average of 70 vessels per month (an average of over two per day) would be loaded at Docks 2 and 3. The berths for Docks 2 and 3 are expected to be occupied by Proposed Action-related vessels 365 days per year.

River Pilots would pilot the incoming and outgoing vessels (from Astoria inland and vice versa) and direct docking and undocking maneuvers. At least two tugs would be used to assist with docking and undocking maneuvers for each arriving and departing Proposed Action-related vessel. Therefore, at least two tugs would be active in the vicinity of the docks four times per day on average. The pilot would determine the appropriate size and horsepower of the tugs depending on factors such as the size of the vessel, the weather conditions, and the currents at the time of maneuvers.

Docks 2 and 3 would be designed to accommodate dry bulk cargo ships with maximum dimensions 830 feet long and 130 feet wide. They would, therefore, accommodate standard Panamax vessels and the somewhat smaller Handymax vessels. The berths at Docks 2 and 3 would be 43 feet deep, which is the depth at which the Columbia River navigation channel is maintained (U.S. Army Corps of Engineers 2015a).

The expected fleet mix is 80% Panamax and 20% Handymax vessels. Table 5.4-13 contains the size and dimensions of these types of vessels assumed for the risk analysis.

Table 5.4-13. Vessel Sizes and Dimensions for Panamax and Handymax Vessels Assumed in the Risk Analysis

Vessel Class[a]	Deadweight (tons)	Length Overall (meters)	Beam (meters)	Draft (meters)
Handymax	46,101	183	32.3	11.0
Panamax	68,541	225	32.2	13.3

Notes:
[a] These specifications chosen to represent the size and dimensions for Panamax and Handymax vessels are representative of an "average-sized" Panamax vessel and an average-sized Handymax vessel.
Source: DNV GL 2016: I-4.

Operations impacts related to the Proposed Action are based on the following assumptions.

- The River Pilots indicate (Gill pers. comm.) that they anticipate turning the ships at the project area in loaded condition (i.e., in preparation for departure, as opposed to turning downstream upon arrival).[33] Thus, inbound ships would approach Docks 2 and 3 in ballast (headed upstream), maneuver out of the navigation channel toward the dock, and align parallel to the dock, docking with the assistance of tugs.
- Pilots estimate that operations at the project area (Docks 2 and 3) would require the two assisting tugs to have bollard pull ratings of at least 30 tons operating ahead and at least 22.5 tons operating astern. Those tugs would be in the 3,000-to-4,000-horsepower range (Gill pers. comm.). Pilots would determine if tugs are needed.
- A typical departure of a loaded vessel off the dock (with the assistance of the tugs) would involve moving the bow out into the channel flow, while keeping the stern near the dock to give the pilot accurate positioning of the vessel during the turn, and rotating in the bend widener portion of the channel until it is aligned in the channel and moving downstream. The width of the channel at this point is approximately 1,200 feet, which provides a turning area approximately 1.6 times the length of the vessel.
- Currently, maneuvering a vessel to the existing berth (Dock 1) can be challenging upstream of the project area due to the strong current outflow from the bank (Amos pers. comm.). Pilots expect that conditions for the proposed docks (Docks 2 and 3) would be the same as they are at Dock 1 (Gill pers. comm.). Pilots would be aware of this issue and would consider it during planning and operations.

Should an accident occur during operations, it would most likely be attributable to one or more of the following situations.

- Increased risk of a vessel emergency while at the dock.
- Increased risk of an oil spill while at the dock.
- Increased risk of a vessel allision while at the dock.

[33] Currents in the river at the project area are typically directed downriver or ebbing due to the river flow overriding the tidal currents. It is more efficient and safer to dock the ship heading into the current using the forward power of the engines which is stronger than the vessel's backing power. When the loaded vessel leaves the dock with the bow pointing upstream, the currents assist the vessel turning in the channel by pushing the bow around and downstream.

Increase the Risk of a Vessel Emergency while at the Dock

Coal in any form, is a combustible material, making it susceptible to a variety of ignition scenarios. Coal fires during transfer and loading operations are typically caused by one of two sources of ignition: the coal itself (self-ignition) and the conveyor belt used in the transport of coal (e.g., over-heating due to damaged bearings, roller, belt slip). Safety requirements prohibit open flames near coal loading operations.

A fire in the vessel's machinery spaces or accommodation areas is a potential emergency scenario that could occur at the dock. Vessel design standards, fire equipment requirements, and crew training would be required to prevent or to facilitate rapid response to a vessel emergency while at the dock. All of these standards and requirements are implemented in accordance with SOLAS in foreign and domestic cargo vessels (and codified in U.S. regulations) and enforced by USCG.

A bulk carrier such as the Proposed Action-related vessels would have the following fire prevention and response features.

- Structural fire protection, including certain bulkheads constructed to prevent the passage of flame and smoke for one hour. Other bulkheads must be constructed of incombustible materials. Current regulations require that risk of fire hazards be eliminated as much as possible in other construction features of the vessel (46 CFR 92).
- Structural insulation around compartments containing the emergency source of power (such as the ship's service generators). Other approved materials capable of preventing an excessive temperature rise in the space may also be used to eliminate the spread of a fire that originates in this type of compartment (46 CFR 92).
- Fire pumps, hydrants, hoses, and nozzles for the purposes of onboard firefighting. In addition, certain spaces must have approved hand-portable fire extinguishers and semiportable fire extinguishing systems (46 CFR 95).
- Officers and crewmembers with a basic level of training that includes fire prevention and firefighting (U.S. Coast Guard 2014).

Within the hold of a vessel, coal can be susceptible to ignition due primarily to self-heating and/or the creation and subsequent ignition of certain gases, including methane and hydrogen. Fire detection systems including carbon monoxide detection and infrared scanning would be in place to monitor and minimize the potential for onboard coal fires. Additionally, manual scanning by workers would enhance built-in mechanical-detection systems. Automated fire-suppression systems that are activated in the early stages of fire development are critical to reducing the potential for flame spread. These typically include water sprinklers combined with a fire extinguishing agent such as wetting agents or foam. Therefore, an onboard emergency is unlikely to affect resources other than the vessel itself.

Increase the Risk of an Oil Spill while at the Dock

The potential for an operational oil spill at the dock would occur primarily as the result of bunkering (i.e., a ship receiving fuel while at the dock). The Applicant has committed to not allowing vessel bunkering from barges or tanker trucks at Docks 2 or 3; therefore, there would be no increased risks of oil spills at docks associated with oil transfers. The risks that might occur during transit are addressed under *Operations—Indirect Impacts*.

Increase the Risk of a Vessel Allision at the Dock

An allision occurs when a vessel strikes a fixed structure, such as a Proposed Action-related vessel striking the proposed docks at the project area or another vessel striking a Proposed Action-related vessel at berth.

As stated, pilots sometimes experience difficulties getting a ship to the berth at the existing Dock 1, located just upstream of proposed Docks 2 and 3. Information about maneuvering challenges at Docks 2 and 3 cannot be collected and evaluated until the docks are built and vessel maneuvers take place at the project area. Nevertheless, the pilots' experience at nearby Dock 1 in the Applicant's leased area introduces a certain level of uncertainty associated with the aggregate influence of currents and river flow at Docks 2 and 3. A potential outcome when there are strong currents in the vicinity of the dock during vessel maneuvers is an allision. An allision may also occur if there were a loss of steering or loss of propulsion during transit or maneuvering at the dock. Despite the uncertainty associated with vessel maneuvers at the dock, the likelihood of a vessel allision is lessened due to the presence of tug power while docking and undocking.

Risk of allision could also involve another vessel striking a Proposed Action-related vessel while the Proposed Action-related vessel was at berth. As noted in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, several ports are located upstream of the project area and other vessels traveling to and from those locations would pass the project area. Based on incident modeling (DNV GL 2016), the likelihood of an allision under the Proposed Action is once in 39 years. However, as noted in Section 5.4.4.3, *Ship Casualty Survey*, the magnitude of an incident has been shown to vary from little or no damage to greater consequence events. To provide some historical context, between 2001 and 2014, 5% of allisions resulted in substantial consequences, such as total vessel loss, and all of these events involved fishing vessels only.[34]

Operations—Indirect Impacts

All large commercial vessel traffic bound for Longview or ports further upriver, including the Port of Portland and Port of Vancouver, pass the project area. Transiting Proposed Action-related vessels could affect or be affected by other vessel movements in the study area. Moreover, increased vessel traffic could result in changes in wake patterns, increased propeller wake, and increased underwater noise, and vessel emissions that could affect other environmental resources. These impacts are addressed in Chapter 4, Section 4.5, *Water Quality*, and Sections 5.5, *Noise and Vibration,* and 5.6, *Air Quality*. Impacts on the vessel transportation system and related environmental resources along the Columbia River navigation channel due to vessel operations are considered to be indirect impacts.

Increase the Risk of Vessel Incidents during Transit

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. Table 5.4-14 compares large commercial vessel traffic under existing

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

conditions (based on 2014 AIS data), the No-Action Alternative (2028), and with the Proposed Action (2028).

Table 5.4-14. Existing and Projected Large Commercial Vessel Traffic in the Lower Columbia River

Condition	Vessel Transits[a] per Year
Existing Conditions (2014)	3,862
No-Action Alternative (2028)	4,440
Proposed Action (2028)	6,120

Notes:

[a] Transit numbers differ slightly from those presented in Table 5.4-7 in the discussion of historical vessel traffic volumes (Section 5.4.4.2, *Vessel Traffic*). The 2004–2014 historical volumes presented in that table are based on Bar Pilot data, whereas the transits presented here, which were the basis for the DNV GL (2016) risk assessment, are based on AIS data. The variance is a result of different recording methods and vessel type designations of the data sources.

Source: Based on 2014 AIS data for Cargo/Carrier, Tanker, Tug, and Passenger vessel types; a projected growth rate of 1% was applied to the 2014 transits to obtain the 2028 vessel transits under the No-Action Alternative; and proposed vessel transits (1,680) were added to the no-action transits to obtain transits with the Proposed Action.

For the purposes of incident modeling, the baseline traffic year of 2014 was selected to represent relatively recent traffic conditions on the river. As discussed in Section 5.4.4.2, *Vessel Traffic*, historically, vessel traffic on the river has reached higher numbers than represented by the 2014 datum.

The incidents evaluated in the modeling include allision, collision, grounding (powered or drift), and fire/explosion, because they are most likely to result in substantial consequences if they occur (Section 5.4.4.3, *Ship Casualty Survey*). The incident modeling results presented below considered the interaction between Proposed Action-related vessels and other large commercial vessels using the channel, as well as smaller vessels (e.g., recreational boats or commercial fishing vessels) not limited to the channel. The potential increase in these risks are discussed below.

Increase the Risk of a Vessel Allision (with a Fixed Object) during Transit

For vessels outbound from the project area, no fixed structures or waterfront facilities are close to the edge of the channel until the Port Westward dock at river mile 53 (Figure 5.4-1) and after that a small barge terminal dock at river mile 36. Thereafter, there are no facilities or structures until reaching the Port of Astoria, and those structures are well clear of the channel. The Astoria-Megler Bridge is the next structure encountered, and once past that, the remaining structures are the jetties at the entrance of the river.[35] Due to the minimal impediments to vessel traffic within the navigation channel, the likelihood of a Proposed Action-related vessel alliding with a fixed structure while in transit is low and was not quantitatively evaluated in the risk assessment (DNV GL 2016). As shown in Table 5.4-10, 56 vessel allisions occurred in the study

[35] Since they are piloted, large commercial vessels have an advantage over fishing and recreational vessels because pilots are specifically trained to keep a large commercial vessel from alliding with a known object in the navigation route, including a bridge. There was an allision at the Astoria-Megler Bridge that involved a piloted vessel approximately 30 years ago. Since this incident, Bar Pilots have implemented risk reduction measures to reduce the probability of allisions at the bridge; they avoid meeting other piloted vessels at the bridge, observe weather and river current conditions, and review weather forecasts before transiting under the bridge (DNV GL 2016: 69).

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% resulted in total loss (all fishing vessels). Therefore, although there would be an increase in risks compared to existing conditions, the overall risk of a Proposed Action-related vessel resulting in an allision to or from the project area would be low.

Increase the Risk of Other Incidents during Transit

Increased risks associated with the Proposed Action also include the potential for collisions, groundings, or fires/explosions. While a collision may seem like a more likely incident scenario in the two-lane channel, the vessel casualty data (Table 5.4-10) and incident modeling results (Table 5.4-15) show that groundings, specifically powered groundings, are more likely under all traffic scenarios.

As presented in Table 5.4-15, the Proposed Action would increase the potential for incidents compared to both existing condition (2014) and the No-Action Alternative (2028) due primarily to the increase in the number of vessels associated with the Proposed Action relative to the other conditions. It should be noted that the consequences of a modeled incident can vary greatly from no damage to total loss and that the 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. For example, of the 151 reported incidents that occurred in the study area from 2001 through 2014 (Table 5.4-10), 64% resulted in no damage, 32% resulted in damage, and 3% resulted in total loss.

Table 5.4-15. Predicted Incident Frequencies per Year in the Study Area

	Incident Frequency				
Scenario	**Predicted Collision**	**Predicted Powered Grounding**	**Predicted Drift Grounding**	**Predicted Fire/ Explosion**	**Total**
Existing Conditions (2014)	1.94	11.8	2.8	0.0032	16.6
No Action (2028) Conditions	2.53	13.6	3.3	0.0037	19.4
Proposed Action (2028) Conditions	2.91	14.4	3.6	0.0040	22.2

Notes:
Source: DNV GL 2016

Additionally, the incident frequencies predicted for existing conditions are representative of a single year (2014). While this year accounts for higher vessel traffic compared to the previous few years, it does not account for the wide variation in vessel traffic that has occurred prior to the recession or the historical highs for traffic on the Columbia River. Further, because the Proposed Action would ramp up over time, comparing the addition of 840 vessels to existing conditions is a conservative approach. Therefore, it is important to also consider how the No-Action Alternative would compare to existing conditions and how the Proposed Action would compare to the No-Action Alternative. As shown in Table 5.4-15, a relative increase in the likelihood of all incident types would occur over time unrelated to the Proposed Action.

Collisions

In general, the River Pilots and Bar Pilots avoid overtaking situations where one vessel passes another from behind. Thus, the primary potential collision scenario is an inbound vessel meeting an outbound vessel. The River Pilots have identified specific points on the river where conditions are not suitable for vessels to pass each other, and they carefully manage transits to avoid two vessels meeting in those locations and instead manage the vessel transits so if they do need to pass each other, it is at a safe area. Avoidance of these areas was taken into consideration in calculating incident frequencies (i.e., estimating the likelihood of a collision due to the Proposed Action) in the incident modeling.

The most likely collision scenarios are bow-to-bow and side-to-side contact involving two large commercial vessels transiting the navigation channel. Bow-to-side is a possibility, but the channel width and the sizes of the vessels would make it more of a glancing impact rather than a straight ahead "T" impact.

Bow-to-bow contact is generally viewed as the easiest type of collision to avoid because the target area is small and either vessel can act independently to avoid it. Also, a vessel's bow is its strongest structural point and bow-to-bow collisions would not be expected to result in cargo hold damage or fuel oil release. In addition, the hydrodynamic interaction between ships meeting causes the bows to be pushed away from each other as they approach.

Side-to-side or a glancing bow-to-side collision could result in damage to the hull, but the likelihood of catastrophic damage is relatively low. For dry cargo vessels—including bulk carriers—it is likely that little if any coal cargo would be released into the water in the event of an angle of impact less than 22.5 degrees (DNV GL 2016). For tank vessels—including ATBs carrying oil in bulk—the risk of an oil spill cannot be ruled out; however, modern tank vessel design standards, including double hull construction of tankers, significantly reduce that potential.

As noted in Section 5.4.4.2, *Vessel Traffic*, *Other Vessels*, the Columbia and Willamette Rivers provide important fisheries for commercial, tribal, and recreational purposes. Although these smaller vessels are not restricted to the navigation channel, they often cross the river to access various locations in the study area. Particularly during periods of high fishing activity, there would be an increased chance for a vessel incident to occur. However, in general, because these smaller vessels are not restricted to the channel and must by law yield to oncoming large commercial vessels, the potential for a collision between a smaller vessel and a Proposed Action-related vessel would be low. Although it is not possible to predict the types of vessels that might be involved in a future incident, the incident modeling does show a very small increase in the potential for collisions involving fishing (0.04 incident per year) and recreational (0.01 incident per year).

Groundings

The River Pilots noted that there are few areas where waterway conditions create a substantial chance for an accidental grounding to occur. For example, during periods of low water (generally between September and November) pilots give adequate consideration to under-keel clearance to avoid touching bottom. They also noted that the nature of the river channel is such that there is a bank cushion effect that helps to keep vessels away from the channel edges.[36] (Amos pers. comm.)

Fires, Explosions, and Other Emergencies

Equipment failure affecting power or steering while the vessel is underway could lead to loss of control of a vessel. A fire in the vessel's machinery spaces or accommodation areas is also a potential emergency scenario. For any of these situations the vessel master would do what is necessary to protect the safety of the crew first and avoid damage to the vessel second. A prudent action would be to remove the vessel from the navigation channel to a "safe haven," a location where appropriate actions can be taken by the vessel crew without compounding the emergency by involving another vessel or structure. Safe haven opportunities on the river are minimal. Marine terminals at the port areas and designated anchorages are the only places where vessels can stop to manage an emergency. Two anchorages at Astoria can accommodate five deep-draft vessels, at most, depending on their sizes. There are no other anchorage areas until reaching Longview (past the project area). Once a loaded vessel gets underway inbound to or outbound from the Longview area, it is committed to completing the planned transit.[37]

Nothing prevents a vessel's master from anchoring anywhere in the river under emergency conditions; however, there is no way to predict how successful such an action might be in stopping the vessel. Anchoring effectiveness is dependent on factors such as the nature and condition of the waterway bottom, water depth, and vessel speed at the time of the anchoring. Risks include the potential for the anchor to damage the vessel if the water is not sufficiently deep. The vessel's location in or near the channel could also hamper or endanger other vessels depending on its location at the time. Dropping an anchor or anchors in an attempt to stop a vessel would be done only if other control measures failed. Opportunities for these emergency measures would be discussed as part of the pretransit planning between the master and the pilot.

In an emergency, a vessel could anchor in the channel at some locations; however, that presents significant risks for the vessel regarding the narrow channel and most likely would block virtually all other traffic. The likelihood of a vessel emergency causing a collision is low. Safe haven limitations (described above) mean that vessel transit would not begin until everyone involved is satisfied that the vessel is fully capable of completing the transit.

Although a vessel emergency increases the likelihood of indirect impacts on the Columbia River waterway, the likelihood of such an emergency occurring is very small. As shown in Table 5.4-15, the likelihood of fires and explosions is substantially lower than any other type of incident considered in the risk assessment. If such an emergency were to occur, the presence of a qualified vessel master and the pilot, in addition to crew training, vessel design, and equipment help minimize the harmful impact on human safety and environment.

[36] When the vessel is near to the bank, the water is forced between the narrowing gap between the vessel's bow and the bank. This water tends to create a "cushion" that pushes the vessel away from the bank.

[37] A number of potential sites for additional anchorages are being discussed by the waterway stakeholders; however, they generally are shallow water sites. Reportedly, the discussions include the possibility of the Corps maintaining those areas as part of the navigation channel. Provision of additional stern buoys is also being considered.

Increase the Risk of a Bunker Oil Spill during Transit or at Anchorages

Risks of oil spills involving diesel or heavy fuel oil during transit could occur as the result of an incident or during bunkering transfers at locations other than the dock. The Applicant has committed to not allowing vessel bunkering from barges or tanker trucks at Docks 2 or 3. If an incident occurred that resulted in an impact, there is a possibility that a fuel tank could be damaged and fuel spilled. Oil spills could also occur during bunkering at anchorages within the study area. In general, the risks of spills would increase under the Proposed Action due to an increase in the number of vessels calling at the project area and the resultant increase to overall vessel traffic in the study area. To provide additional information about the relative likelihood of various sized oil spills, the risk assessment also quantitatively evaluated the incremental increase in risks of a spill (in the event of a collision or grounding) due to the Proposed Action.

Tables 5.4-16 and 5.4-17 present the likelihood (in example return periods[38]) of representative spill sizes that could occur as the result of the modeled increased risk of collisions or groundings, respectively.

Table 5.4-16. Example Bunker Oil Spill Volumes and Frequencies due to Collisions Related to the Proposed Action (2028 and 2038)

Return Period (years)[a]		
2028	**2038**	**Oil Spill Volume (gallons)**
341	224	20,900 or less
581	381	59,300 or less
676	444	107,400 or less
3,748	2,461	166,500 or less

Notes:
[a] Frequency of collisions in 2038 is higher compared to 2028 due to an increase in the overall vessel traffic in the study area.
Source: DNV GL 2016

Table 5.4-17. Example Bunker Oil Spill Volumes and Frequencies due to Groundings Related to the Proposed Action (2028 and 2038)

Return Period (years)[a]	Oil Spill Volume (gallons)
140	5,700 or less
182	10,700 or less
403	39,700 or less
4,299	45,800 or less

Notes:
[a] Grounding frequencies do not vary from 2028 to 2038 since the number of project vessels remains at 840 in both years.
Source: DNV GL 2016

As shown in the tables, the likelihood of bunker oil spills from a vessel incident is relatively low with the most likely scenarios occurring in the range of once every 224 years for collisions (2038 traffic levels) and once every 140 years for groundings (2028 or 2038 traffic levels). As

[38] Estimated period of time between occurrences of an event.

noted in Section 5.4.4.4, *Marine Oils Spill Survey*, spills that have historically occurred in the study area are much smaller than the quantities indicated in Tables 5.4-16 and 5.4-17 and have ranged from 0.1 gallon to 1,603 gallons.[39] The average number of oil spills within this same timeframe (2004 to 2014) is 15.6 spills per year 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.

The reason that the potential spill sizes modeled for the Proposed Action are larger is because the spill scenarios presented above are associated with large-scale vessel incidents: collisions or groundings. For such an incident to result in a release of bunker oil, the energy involved in the initial incident must be great enough to puncture the vessel's tanks. Increases in the types of oil spills of a scale more similar to those that have occurred over the last 10 or so years would also be expected under the Proposed Action somewhat commensurate with the relative increase in vessel traffic. Expansion of the casualty survey to a longer (beyond 11 years) timeframe, would include more unlikely events of a larger scale more in line with those addressed by the incident modeling.

An amendment to MARPOL Annex that went into force in 2007, included a new regulation 12A on oil fuel tank protection. That regulation applies to any ship that has an aggregate oil fuel capacity of 785 cubic yards (3,774 barrels [158,508 gallons] of oil equivalent) or more and was contracted for on or after August 1, 2007; or had a keel laying date on or after February 1, 2008; or was delivered on or after August 1, 2010. 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. It requires consideration of general safety aspects, including maintenance and inspection needs, when approving the vessel's design and construction. These improvements have helped to reduce the extent of releases in the event of a vessel incident.

Increased vessel traffic associated with the Proposed Action also has the potential to result in increased risk of oil spills during bunkering activities. Causes of oil spills during bunkering transfers include overflow of the tank, parting of the hose due to mooring fault, operator error in connecting the hose, failure of the hose or pipework, and failure of bunker tanks. Experience from insurance claims (Gard 2002) is that most bunker spills result from an overflow of the bunker tank due to carelessness or negligence, either on the part of those supplying the bunkers, or those on board the vessel receiving them. The main safeguards against the occurrence of bunker spills are use of bunkering best practices. Best practices include attentive tank-level monitoring and valve alignment, use of bunkering procedures and checklists, and the supervision of the bunkering operation by a qualified person in charge.[40] Standard/ABS (2012) lists the main features of such procedures.

The consequences of a spill of heavy fuel oil into the marine environment are in general considered to be more severe than for other fuels, although this may depend on the sensitivity of

[39] Data presented in Section 5.4.4.4, *Marine Oil Spill Survey*, include all reported vessel-related spills from 2004 to 2014, not just those caused by vessel incidents such as groundings and collisions.

[40] *Bunkering Best Practices: A Reference Manual for Safe Bunkering Operations in Washington State* (Washington State Department of Ecology 2014) and Bunkering Guidelines in *Lower Columbia Region Harbor Safety Plan* (January 2013). These references provide extensive guidelines related to winds, sea states, mooring equipment, tug availability, and regulatory requirements to provide for safe, spill-free bunkering operations.

the local environment to acute toxicity (DNV 2011). Undoubtedly, spills of heavy fuel oil will be more persistent, taking longer to weather naturally and being more difficult to clean up. The average cleanup costs per metric ton of oil spilled have been estimated as more than seven times higher for heavy fuel oil[41] than for diesel (Etkin 2000).

There were nine oil spills during refueling of large cargo vessels that occurred in the study area from 2004 to 2014. Spills of oil cargoes are better documented than spills from bunkering. Therefore, previous risk analyses (e.g., DNV 2011) have assumed the frequency of spills during bunkering is the same as during transfer of liquid cargoes: 1.8 by 10^{-4} (one spill every 5,555 years) per bunkering operation for spills exceeding 1 metric ton (7.3 barrels or 308 gallons). The frequency of smaller spills is likely to be much greater. This implies that the annual likelihood depends on the number of bunkering operations. If the ship bunkers 10 times per year, the likelihood of a spill of 1 metric ton or more would be 1.8 by 10^{-3} per year, or approximately 1 chance in 500 per year. Although it is not possible to predict the number of vessels that may bunker or where they would bunker, the risks of a spill during transfer would slightly increase due to the increase in vessel trips under the Proposed Action.

Increase Vessel Activity

Increased vessel traffic associated with the Proposed Action would also have the potential to result in other impacts from increased activity, vessel wake, propeller wash, underwater noise and vibration, and vessel emissions. The potential impacts on cultural resources, water quality, and fish are addressed in Chapter 3, Section 3.4, *Cultural Resources*, and Chapter 4, Sections 4.2, *Surface Water and Floodplains*, 4.5, *Water Quality*, 4.6, *Vegetation*, 4.7, *Fish*, and 4.8, *Wildlife*, respectively. These vessel-related impacts are particularly complex and depend on a variety of interrelated factors, including but not limited to, distance of the channel from the shoreline, depth of the intervening riverbed, placement and size of dredged materials, the presence of particularly sensitive species, the speed and size of the vessels, the prevailing river and tidal currents, and otherwise naturally occurring wave action. Many of these factors are regulated by the federal government, including dredging activities, the placement of dredged spoils, and vessel traffic management in the study area. In general, the increase in deep-draft vessels associated with the Proposed Action would result in the increased potential for vessel-related impacts to occur.

5.4.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement. No new docks would be built under the No-Action Alternative.

The No-Action Alternative would increase vessel traffic by approximately 6 vessels per year to and from the project area. In addition, vessel traffic in the study area in general would continue to increase over time. As assumed for the incident modeling, large commercial vessel traffic would

[41] Heavy fuel oil is used in marine main diesel engines. It is a residue from crude oil refining and because of its properties, heavy fuel oil is required be stored and used at a high temperature.

increase over the 20-year analysis period and at full build-out would reach approximately 2,200 vessel trips per year. Therefore, there would be an increase in the number of incidents likely to occur compared to existing conditions unrelated to the Proposed Action.

Due to the variable nature of vessel traffic volume in ports in general (attributed to market fluctuations, changes in port infrastructure, and vessel design modifications) vessel traffic management will be an ongoing challenge for federal (USCG and Corps) and state agencies (Ecology and ODEQ), local coastal jurisdictions, the Bar Pilots and River Pilots, maritime associations (such as PDXMEX and MFSA), and private interests even without implementing the Proposed Action. The Columbia River VTIS and the Lower Columbia Region Harbor Safety Committee are both part of a system that functions to adapt the processes currently in place in the Columbia River to changes in the nature and the volume of vessel traffic.[42]

AIS is required on large commercial vessels, vessels over 65 feet, and passenger vessels.[43] AIS technology ensures that basic identification and movement information for all large commercial vessels is available to government agencies, cooperative public/private associations, port managers, and pilots with the most basic computer equipment and an internet (or wireless) connection. AIS technology has improved the situational awareness of all mariners and plays a major role in the operation of the Lower Columbia Region vessel traffic management system.

The 64th Washington State Legislature passed House Bill 1449 focused on current regulatory programs covering the over-land and over-water transportation of oil. One of the bill provisions (Section 11) required (contingent on funding) that Ecology complete an evaluation and assessment of vessel traffic management and vessel traffic safety within and near the Columbia River mouth. The bill stipulated a date for submittal to the legislature of December 15, 2017, with a final evaluation to be completed by June 30, 2018. The evaluation and assessment must include (but is not limited to) an assessment and evaluation of the following.

(a) The need for tug escorts for oil tankers, articulated tug barges, and other towed waterborne vessels or barges;

(b) Best achievable protection; and

(c) Required tug capabilities to ensure safe escort of vessels within and near the mouth of the Columbia River.

These systems and studies are in place regardless of the Proposed Action and would help to further reduce risks related to the anticipated increases in vessel traffic.

5.4.6 Required Permits

No permits related to vessel transportation would be required for the Proposed Action.

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[42] The Lower Columbia Region Harbor Safety Committee consists of federal, state, and local government representatives, port employees, vessel and facility operators, vessel agents, spill response cooperatives, and any other stakeholders that meet on a regular basis to exchange information, plan for contingencies, and review current operating procedures in light of any recent incidents. The *Lower Columbia Region Harbor Safety Plan* includes regularly revised guidelines on current traffic management practices and procedures for port users and is available via the Harbor Safety Committee's website (http://www.lcrhsc.org/).

[43] Carriage of AIS applicability can be found in 33 CFR 64.01 and 164.46. In general, the following vessels are required to carry AIS: self-propelled vessels of 1,600 or more gross tons, a self-propelled vessel of 65 feet or more in length engaged in commercial service (such as fishing vessels), a towing vessel of 26 feet or more in length, dredges, and passenger vessels certificated to carry more than 150 passengers.

5.4.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to vessel transportation from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action

5.4.7.1 Applicant Mitigation

The Applicant will implement the following mitigation measures.

MM VS-1. **Attend Lower Columbia River Harbor Safety Committee Meeting**. The Applicant will attend at least one Lower Columbia River Harbor Safety Committee meeting per year before beginning operations and every year during operations. The Applicant will provide notification of attendance to Cowlitz County.

MM VS-2. Notify if Bunkering at Docks Occurs. The risk of an oil spill at Docks 2 and 3 would primarily be during bunkering (refueling) operations. The Applicant has committed to no bunkering at Docks 2 and 3. If this changes and bunkering is proposed at Docks 2 and 3, the Applicant will notify Cowlitz County and Ecology who will determine if additional environmental review is required before bunkering operations are conducted.

5.4.7.2 Other Measures to be Considered

It is recommend that the Applicant participate in regular Lower Columbia River Harbor Safety Committee public meetings.

5.4.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the mitigation measures would reduce impacts related to vessel transportation. If an incident such as a collision or allision occurred, the impacts could be significant, depending on the nature and location of the incident, the weather conditions at the time, and whether any oil is discharged. Although the likelihood of a serious incident is very low, there are no mitigation measures that can completely eliminate the possibility of an incident or the resulting impacts.

5.5 Noise and Vibration

Sound is a fundamental component of daily life. When sounds are perceived as desired, beneficial, or otherwise pleasing, they are typically considered as having a positive effect on daily life. When sounds are perceived as unpleasant, unwanted, or disturbingly loud, they are considered noise. Noise may interfere with a broad range of human activities such as communication or sleep. Noise disturbance varies depending on the conditions and on the particular land uses and activities near the sound source and the sensitivity of those land uses.

Vibration is motion described in terms of displacement, velocity, or acceleration. People are usually sensitive to perceptible vibration. An increase in noise or vibration can affect the peacefulness, serenity, and sacredness of residential, commercial, recreational, and cultural locations.

This section describes noise and vibration in the study area. It then describes noise and vibration impacts that could result from construction and operation of the Proposed Action and No-Action Alternative. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action and any remaining unavoidable and significant adverse impacts.

5.5.1 Regulatory Setting

Laws and regulations relevant to noise and vibration are summarized in Table 5.5-1.

Table 5.5-1. Regulations, Statutes, and Guidelines for Noise and Vibration

Regulation, Statute, Guideline	Description
Federal	
Noise Control Act of 1972 (42 USC 4910)	Protects the health and welfare of U.S. citizens from the growing risk of noise pollution, primarily from transportation vehicles, machinery, and other commerce products. Increases coordination between federal researchers and noise-control activities; establishes noise emission standards; and presents noise emission and reduction information to the public.
Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)	Provides procedures and guidance for analyzing the level of noise and vibration, assessing the resulting impacts, and determining possible mitigation for most federally funded transit projects.
Federal Railroad Administration High-Speed Ground Transportation Noise and Vibration Impact Assessment (October 2012)	Provides guidance and methods for the assessment of potential noise and vibration impacts resulting from proposed high-speed ground transportation projects (Federal Railroad Administration 2012).
U.S. Environmental Protection Agency Railroad Noise Emission Standards (40 CFR 201)	Established final noise emission standards for surface carriers engaged in interstate commerce by railroad. This rulemaking is pursuant to Section 17 of the Noise Control Act of 1972 (U.S. Environmental Protection Agency 2014).

Regulation, Statute, Guideline	Description
FRA Railroad Noise Emission Compliance Regulations (49 CFR 210)	These regulations indicate the minimum compliance regulations necessary to enforce EPA's Railroad Noise Emission Standards.
FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR 222 and 229)	Requires the sounding of locomotive horns at public highway rail grade crossings. Considers the allowance of Quiet Zones when the increased risk is mitigated with supplementary grade crossing safety measures.
State	
Washington Administrative Code Chapter 173-60 (Maximum Environmental Noise Levels)	Establishes maximum environmental noise levels. However, noise from surface carriers engaged in interstate commerce by railroad are exempt from these regulations.
Local	
Cowlitz County Code (CCC 10.25) (Nuisance Noises)	Regulates excessive intermittent noise that interferes with the use, value and enjoyment of property and which pose a hazard to the public health, safety, and welfare.

Notes:
USC = United States Code; FRA = Federal Railroad Administration; FTA = Federal Transit Administration; CFR = Code of Federal Regulations; EPA = U.S. Environmental Protection Agency

5.5.2 Study Area

The study area for noise and vibration direct impacts is within 1 mile of the project area. The study area for noise and vibration indirect impacts is the area within 1 mile from the centerline on the Reynolds Lead and BNSF Spur between Longview Junction and the project area. Figure 5.5-1 illustrates the combined study area. An assessment of potential noise indirect impacts is also included for the rail routes in Washington State for Proposed Action-related trains and Proposed Action-related vessel traffic along the Columbia River between the project area and 3 nautical miles offshore.

5.5.3 Methods

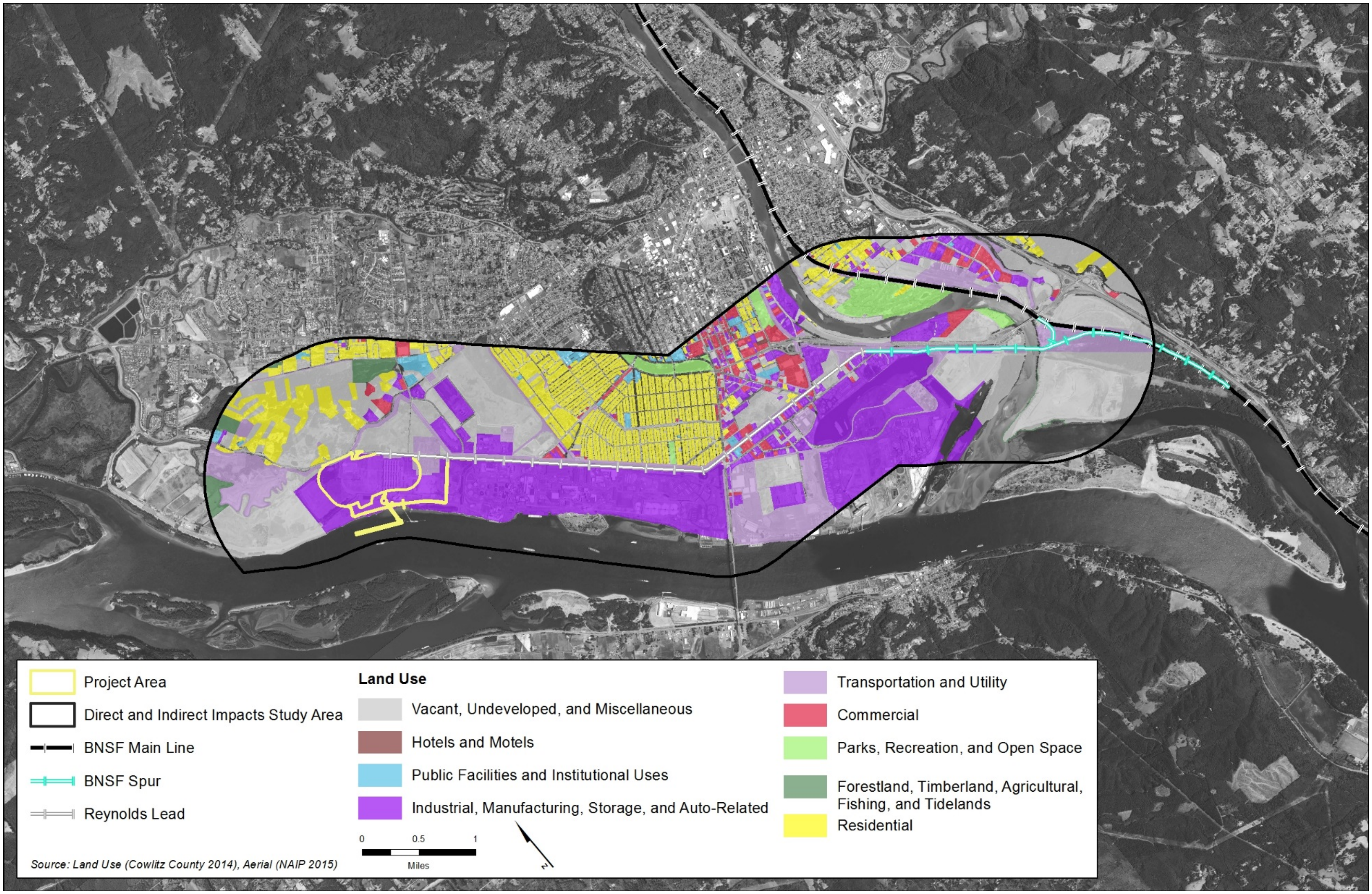
This section describes the sources of information and methods used to evaluate the potential noise and vibration impacts associated with the construction and operation of the Proposed Action and No-Action Alternative. Methods for field surveys conducted in the study area are also provided.

5.5.3.1 Information Sources

The following sources of information were used to evaluate noise and vibration impacts.

- Information provided by the Applicant, including project design features and a list of typical construction and operation equipment.
- Lists of typical construction and operation equipment from reference projects and typical corresponding noise and vibration levels.
- Existing and future-year rail traffic estimates for the Reynolds Lead and BNSF Spur provided by the Longview Switching Company (LVSW) and the Applicant.
- Data on locomotive and train noise levels.
- Ambient noise monitoring data collected during field surveys in the study area.

Figure 5.5-1. Noise and Vibration Study Area



5.5.3.2 Field Surveys

Field surveys were performed from October 28 through November 10, 2014, and from January 11 through 16, 2015, to measure existing outdoor sound levels (ambient noise levels) at representative noise-sensitive receptors. Figure 5.5-2 illustrates the locations of noise-sensitive receptors in the study area that include residential and institutional receptors such as schools and churches. The surveys focused on locations in the study areas where noise-sensitive receptors could be exposed to noise from Proposed Action-related activities. Short-term (10-minute) and long-term (24-hour) sound-level meters were set up for measurements at selected noise-sensitive receptors as shown in Figure 5.5-3.

Four sound-level meters were deployed October 27, 2014, then relocated November 2, 2014, providing at least 6 full days of data collected at each of the eight long-term ambient noise survey locations shown in Figure 5.5-3. The meters were mounted on utility poles with the microphone approximately 10 feet above the ground surface. Short-term measurements were conducted during the same time period as the long-term survey. The microphone of the short-term equipment was located 5 feet above ground surface and the noise level was measured and recorded for a period of 10 minutes at each short-term survey location. Figure 5.5-3 illustrates the short-term ambient noise survey locations.

The *SEPA Noise and Vibration Technical Report* (ICF International and Wilson Ihrig 2016) provides additional information on the methods used to obtain existing ambient noise levels.

5.5.3.3 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on noise and vibration.

Construction

The Applicant has identified three construction scenarios.

- **Truck.** If material is delivered by truck, it is assumed that approximately 88,000 truck trips would be required over the construction period. Approximately 56,000 loaded trucks would be needed during the peak construction year.
- **Rail.** If material is delivered by rail, it is assumed that approximately 35,000 loaded rail cars would be required over the construction period. Approximately two-thirds of the rail trips would occur during the peak construction year.
- **Barge.** If material is delivered by barge, it is assumed that approximately 1,130 barge trips would be required over the construction period. Approximately two-thirds of the barge trips would occur during the peak construction year. Because the project area does not have an existing barge dock, the material would be off-loaded at an existing dock elsewhere on the Columbia River.

The methods for analyzing noise and vibration impacts related to construction are described in this subsection. The *SEPA Noise and Vibration Technical Report* provides additional information on the methods to analyze potential impacts.

Figure 5.5-2. Noise-Sensitive Land Uses in the Study Area

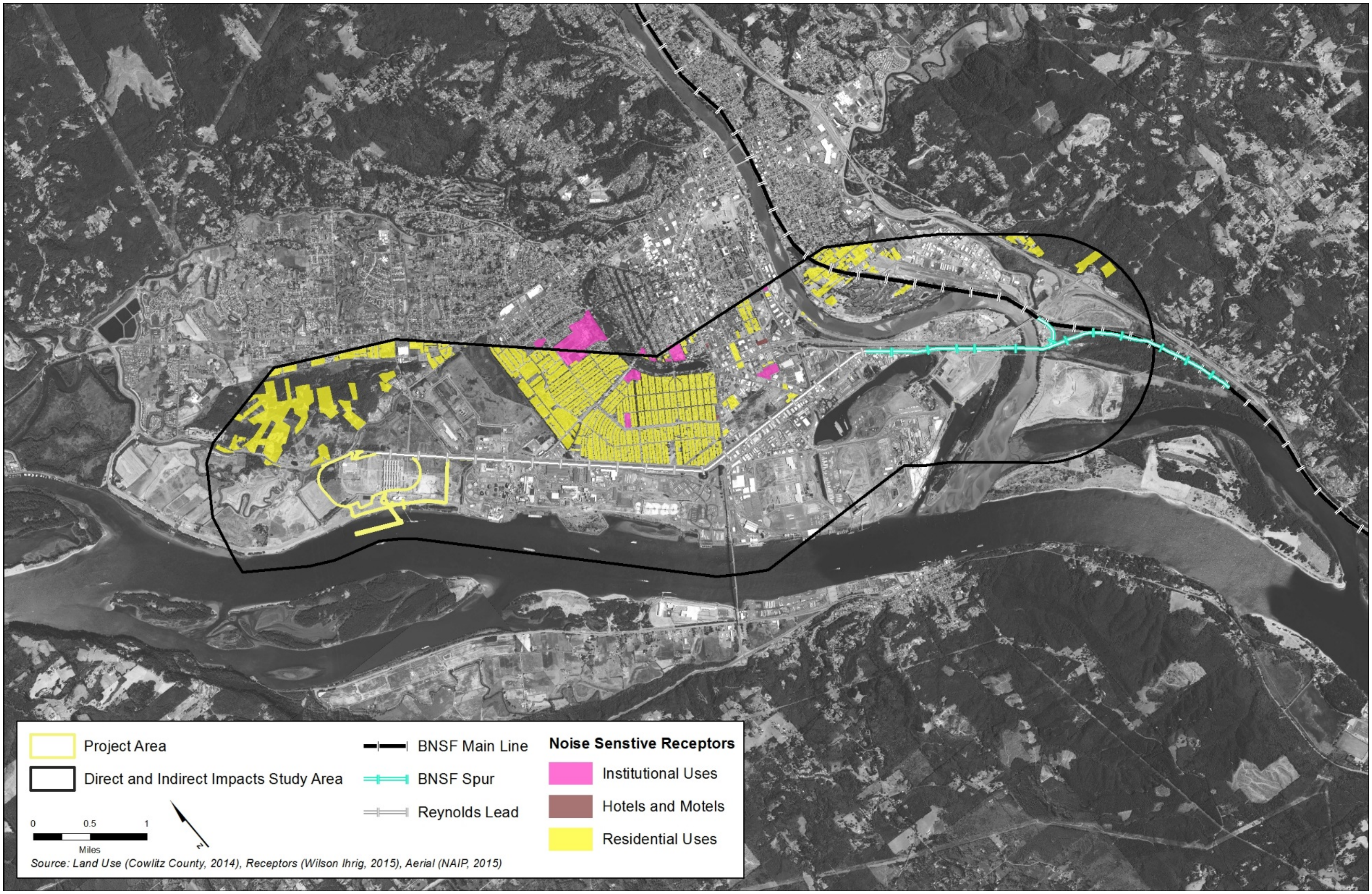
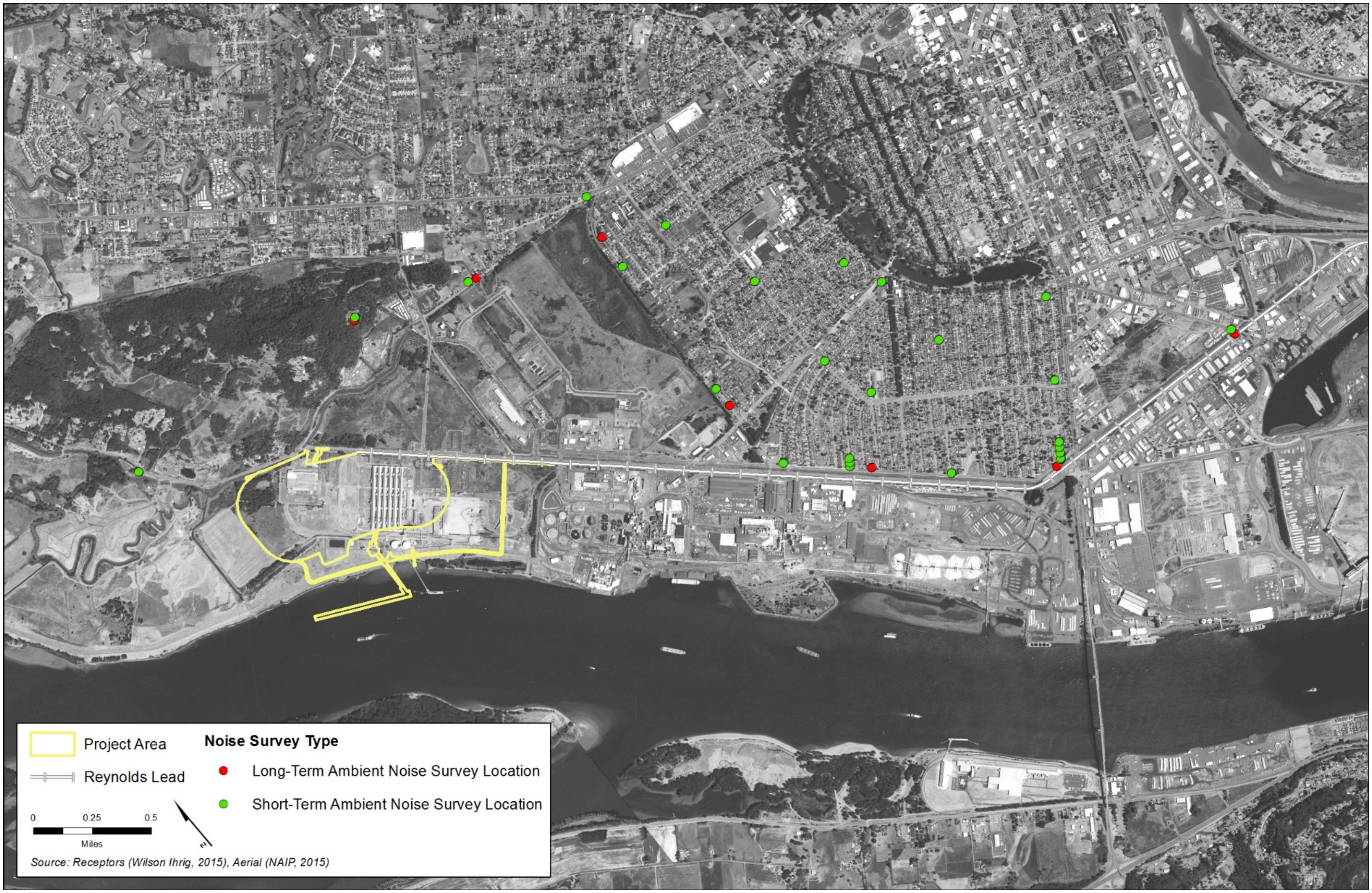


Figure 5.5-3. Ambient Sound Pressure Level Survey Locations



Noise

Construction noise in the project area was evaluated per guidelines established by the Federal Transit Administration (FTA) (2006) and Federal Railroad Administration (FRA) (2012). This approach was selected because daytime construction of the Proposed Action would be exempt from Washington State-permissible noise-level regulations (Washington Administrative Code [WAC] 173-60-040), and construction would primarily occur during daylight hours. Construction noise, including pile-driving, which is typically the most dominant source of noise complaints during construction, was estimated at the noise-sensitive receptors in the study area using detailed information about the anticipated roster of construction equipment to be used and based on information provided by the Applicant. For purposes of this analysis, and because the exact locations of construction equipment and processes are either unknown at this time or could vary during the course of construction, noise was treated as originating from the acoustic center of the geographic locations. An assessment of potential indirect noise impacts from Proposed Action-related construction trains and vehicle traffic was also performed.

Vibration

Pile-driving would be the dominant source of ground vibration during construction. Vibration during pile-driving was calculated using the methods from *Transit Noise and Vibration Impact Assessment* (Federal Transit Administration 2006). Human annoyance can occur at much lower vibration levels than vibration levels that may cause cosmetic damage to structures. Therefore, this lower "annoyance" threshold was used to assess vibration impacts.

Operations

The methods for analyzing noise and vibration impacts related to operations are described in this subsection.

Direct Impacts

The following describes the methods to evaluate potential noise and vibration impacts in the project area.

Noise

The Computer-Aided Noise Abatement Noise Prediction Model (Cadna/A®, Version 4.4.145) was used to estimate the propagation of sound from coal export terminal operations in the project area. The model predicted noise levels at noise-sensitive receptors in the study area and generated noise contours (lines of equal noise levels) for comparison to the Washington State regulatory noise criteria.[1] The *SEPA Noise and Vibration Technical Report* provides the list of sound sources that were included in the model and the parameters and assumptions for each noise source, equipment sound levels, and other assumptions. The equipment analyzed included transfer towers, conveyor belts, conveyor drives, a tandem rotary dumper, shiploaders, stacker/reclaimers, surge bins and the rail loop. The model parameters and assumptions considered buildings and structures, coal storage

[1] Cadna/A® considers natural and human-made topographical barrier effects, including terrain features and structures such as major buildings, storage tanks, and large equipment.

piles, surface acoustical absorption, foliage, temperatures and relative humidity and cladding for exterior surfaces.

Vibration

There would be no substantial sources of ground vibration within the project area during operations, except trains moving on the rail loop in the project area. Using data and methods provided in *Transit Noise and Vibration Impact Assessment* (Federal Transit Administration 2006), it was determined that vibration from train operations is unlikely at distances greater than 40 feet from a railroad track for infrequent events (less than 30 trains per day). The closest vibration-sensitive receptor is approximately 275 feet from the outer track of the rail loop. Therefore, an estimate of vibration generated during coal export terminal operations was not necessary.

Indirect Impacts

The following describes the methods to evaluate potential noise and vibration impacts from Proposed Action-related rail and vessel traffic.

Rail Traffic Noise

As described in Section 5.1, *Rail Transportation*, LVSW plans 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. This analysis assessed rail noise with planned track improvements and without track improvements.

A noise model was used to predict noise levels generated by rail traffic along the Reynolds Lead and BNSF Spur for existing conditions, the No-Action Alternative in 2018, the No-Action Alternative in 2028, and the Proposed Action in 2028. Section 5.1, *Rail Transportation*, describes rail traffic volumes on the Reynolds Lead and BNSF Spur that were assumed for these scenarios. The model assumed continuously welded rail, consistent with the existing rail on the Reynolds Lead and BNSF Spur.

The analysis considered two types of rail noise.

- *Wayside noise*, which refers to the combined effect of locomotive noise and car/wheel noise.
- *Horn noise*, which refers to the sound of locomotive warning horns sounded at public at-grade road/rail crossings. In addition, LVSW operating rules require train engineers to sound locomotive horns at private grade crossings on the Reynolds Lead. Because horn sounding is intentionally loud to warn motorists of oncoming trains, the horn noise footprint is often larger than the wayside noise footprint.

There are five public at-grade crossings and three active private crossings along the Reynolds Lead and BNSF Spur.

- Dike Road
- 3rd Avenue
- California Way
- Oregon Way
- Industrial Way

- Weyerhaeuser entrance west of Douglas Street (private crossing)
- Weyerhaeuser entrance at Washington Way (private crossing)
- 38th Avenue entrance to the Applicant's existing bulk product terminal (private crossing)

The noise model included the FRA provision that horns be sounded not less than 15 seconds or more than 20 seconds before the locomotive reaches an at-grade crossing. To be conservative, the analysis assumed locomotive horn sounding would begin 20 seconds before the locomotive reaches an at-grade crossing. The noise levels were predicted for trains running both with and without sounding horns at crossings.

Noise from surface carriers engaged in interstate commerce by railroad is exempt from Washington State maximum permissible noise level regulations (WAC 173-60-040). Therefore, there are no criteria or guidelines for assessing noise impacts specifically from freight trains, and it was determined that high-speed rail and transit project impact guidelines represented the most appropriate measure.

FRA-adopted noise assessment methods developed by FTA were used to calculate potential noise impacts from operations of the Proposed Action. These methods are documented in the *Transit Noise and Vibration Impact Assessment* (FTA/FRA guidance) (Federal Transit Administration 2006). FRA generally relies on this guidance for analysis of potential noise impacts from conventional rail vehicles traveling at speeds below 90 miles per hour (Federal Railroad Administration 2012).

To supplement FTA/FRA guidance, freight rail source levels from the FRA *High Speed Ground Transportation Noise and Vibration Assessment* were used to characterize noise from freight rail vehicles (Federal Railroad Administration 2012). These guidelines determine noise impacts based on increases in ambient noise level (day-night sound level [L_{dn}][2] or peak hour equivalent sound level [L_{eq}],[3] depending on the type of receptor) after a project is completed. The amount of increase that is acceptable depends on the existing ambient noise level.

FTA/FRA guidance noise impact criteria are based on the land use category receiving the noise. The FTA/FRA guidance identifies three land use categories for assessing potential noise impacts.[4]

- **Category 1.** Tracts of land where quiet is an essential element of their intended purpose, such as outdoor amphitheaters, concert pavilions, and national historic landmarks with significant outdoor use.
- **Category 2.** Residences and buildings where people normally sleep, including homes, hospitals, and hotels.
- **Category 3.** Institutional land uses (schools, places of worship, libraries) that are typically available during daytime and evening hours. Other uses in this category can include medical offices, conference rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

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

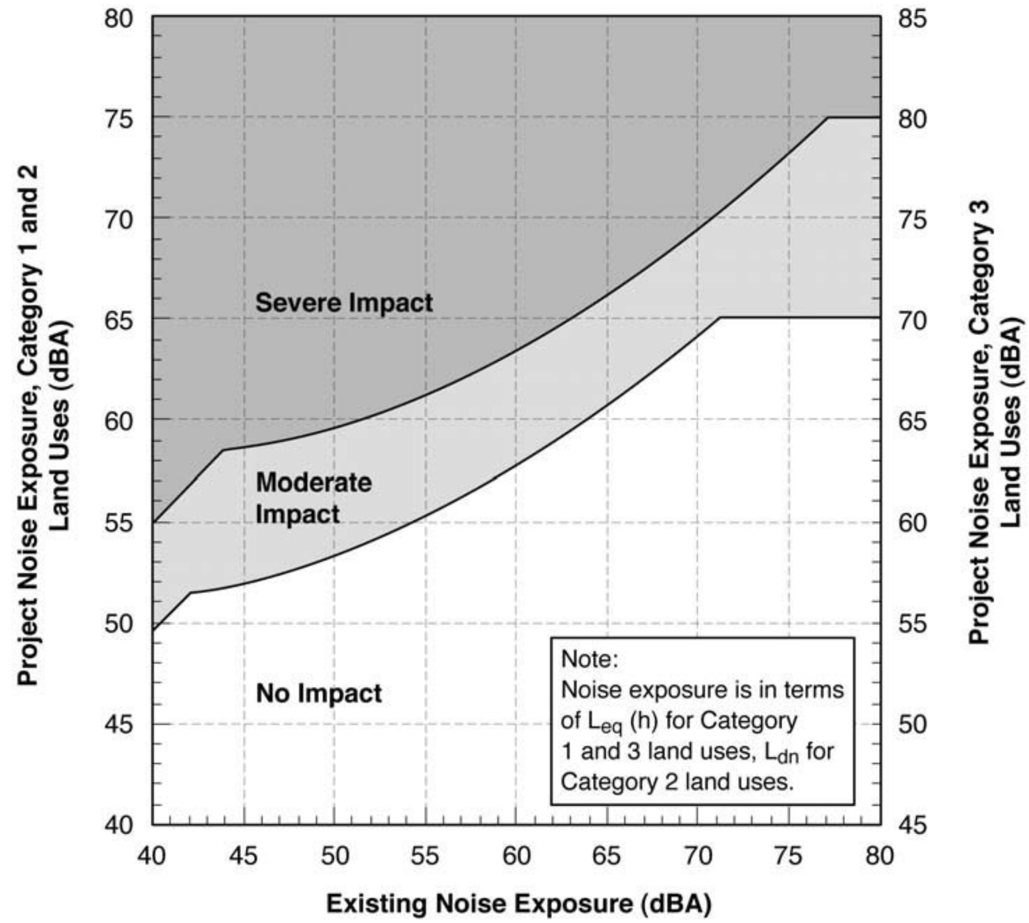
[3] The $L_{eq(h)}$ a noise metric representing a constant sound level containing the same sound energy as the actual fluctuating sound over an hour. As such, the L_{eq} can be considered an energy-average sound level.

[4] Noise exposure values are reported as hourly equivalent sound level ($L_{eq[h]}$) for Category 1 and 3 land uses, and L_{dn} for residential land uses (Category 2).

The FTA/FRA guidance defines three noise impact category levels (Figure 5.5-4).

- **No impact.** The change in the noise level would result in an insignificant increase in the number of instances where people are highly annoyed by new noise.
- **Moderate impact**. The change in the noise level would be noticeable to most people but may not be enough to cause strong adverse community reactions.
- **Severe impact.** A significant percentage of people would be highly annoyed by the noise.

Figure 5.5-4. Noise Impact Criteria



Source: Federal Transit Administration 2006.

The level of impact is determined by the existing level of noise exposure and the change in noise exposure that would result, using a sliding scale according to the land uses affected. As the existing level of noise exposure increases, the additional noise exposure needed to cause a moderate or severe impact decreases. The contribution of Proposed Action-related trains relative to the existing noise levels would differ according to the level of existing noise exposure (Figure 5.5-4). This sliding scale recognizes that people who are already exposed to high levels of noise in the ambient environment are expected to tolerate smaller increases in noise in their community relative to locations with lower existing ambient levels. The increases between the Proposed Action in 2028 and the No Action 2028 levels were compared to the FTA/FRA guidance to determine the level of noise impact.

The assessment of the potential noise impact from Proposed Action-related rail traffic on BNSF Railway Company (BNSF) main line routes in Washington State was based on a potential increase in L_{dn}, and employed an approach similar to that in the FTA/FRA guidance (Federal Transit Administration 2006). The analysis assumed that the distribution of the number of trains between daytime and nighttime would not change.

Rail Traffic Vibration

Using generalized ground surface vibration curves (Federal Transit Administration 2006) and correcting for speed, vibration from Proposed Action-related train operations would be unlikely at distances greater than 40 feet from a railroad track for infrequent events (less than 30 passbys per day). The closest vibration-sensitive receptor is approximately 150 feet away from the Reynolds Lead, and there are no vibration-sensitive receptors adjacent to the BNSF Spur. Therefore, no analysis was conducted to estimate vibration from rail operations.

Vessel Traffic Noise

The general assumptions used to assess impacts from stationary and moving vessels on the Columbia River are presented in Table 5.5-2.

Table 5.5-2. Assumptions Related to Noise from Stationary and Moving Vessels

Equipment	Noise level
Stationary vessels (moored ship)	65 dBA at a distance of 62 feet
Vessels under way	45 dBA at a distance of 400 feet
Foghorns	60 dBA at a distance of 1,800 feet

Notes:
See the *SEPA Noise and Vibration Technical Report* for detailed information on the sources of these noise level assumptions.
dBA = A-weighted decibel

Vessel Traffic Vibration

No analysis was conducted to estimate vibration generated during vessel operations. Proposed Action-related vessels would be similar to those already traveling on the Columbia River. There have been no documented cases of perceptible vibration on shore generated by ship traffic on the river.

5.5.4 Existing Conditions

This section describes the existing noise conditions in the study area.

Figure 5.5-1 illustrates the land uses in the study area. Figure 5.5-2 illustrates the noise-sensitive receptors in the study area, including residential land uses. The closest sensitive receptors to the project area, Reynolds Lead, and BNSF Spur are residential land uses. These land uses are generally located north of the Reynolds Lead and Industrial Way (State Route [SR] 432) between Oregon Way and Washington Way (approximately 1.5 miles), with some residential land uses near the California Way and 3rd Avenue crossings of the Reynolds Lead. Residential land uses are also located across Mt. Solo Road (SR 432) from the project area.

As described in Section 5.5.3, *Methods,* long- and short-term surveys were conducted to determine existing conditions in the study area. Primary noise sources during the surveys varied by location, but were generally observed to include train traffic; vehicle road traffic; noise from existing industrial facilities, mills, and plants; residential activities; and noise from port activities. Table 5.5-3 provides a summary of the primary noise sources at the long-term ambient noise survey locations illustrated in Figure 5.5-3.

Table 5.5-3. Primary Noise Sources at Long-Term Ambient Noise Survey Locations

Long-Term Ambient Noise Survey Location	Noise Sources
602 California Way	California Way and Industrial Way vehicle traffic Trains on the Reynolds Lead Horizon Metals recycling center on California Way
111 15th Avenue	Industrial Way vehicle traffic Trains on the Reynolds Lead
221 Beech Street	Local vehicle traffic Industrial Way vehicle traffic Weyerhaeuser mill Trains on the Reynolds Lead
875 34th Avenue	Local vehicle traffic and residential activity PNW Metal Recycling at Mint Farm Industrial Park
3600 Memorial Park	Local vehicle traffic PNW Metal Recycling at Mint Farm Industrial Park
420 Rutherglen Drive	Distant industrial operations at Mint Farm Industrial Park Weyerhaeuser mill Port of Longview
4723 Mt. Solo Road	Vehicle traffic on Mt. Solo Road
1719 Dorothy Avenue	Local vehicle traffic and residential activity PNW Metal Recycling at Mint Farm Industrial Park

Notes:
See the *SEPA Noise and Vibration Technical Report* for additional information on the noise field surveys.

Figure 5.5-5 illustrates existing noise level contours for all noise sources. The existing ambient noise levels formed the baseline against which the effects of the Proposed Action and No-Action Alternative were measured.

Figure 5.5-5a. Existing Rail Noise Contours, BNSF Spur to Reynolds Lead, Including Train Horns

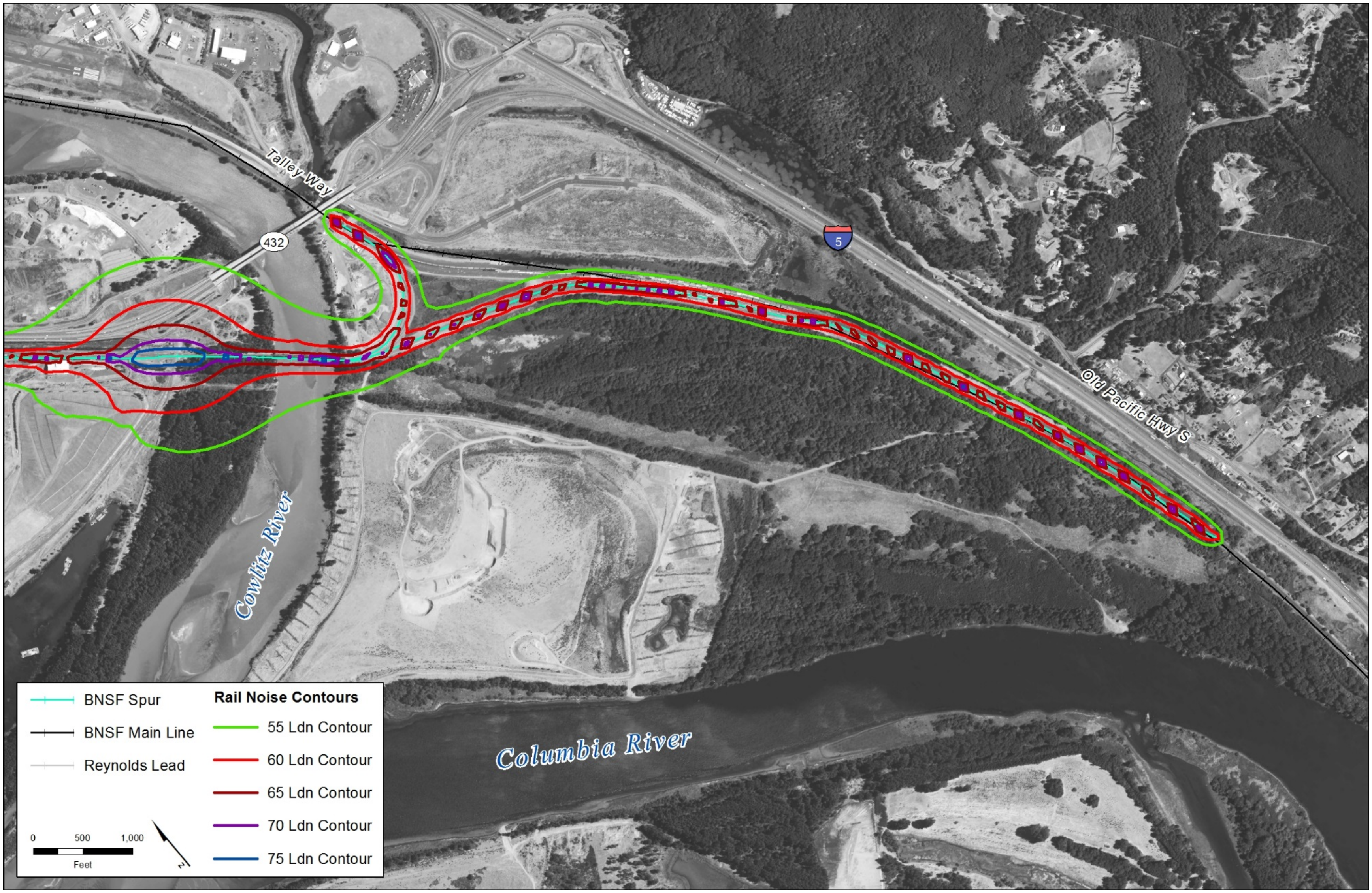


Figure 5.5-5b. Existing Rail Noise Contours, Beginning of Reynolds Lead, Including Train Horns

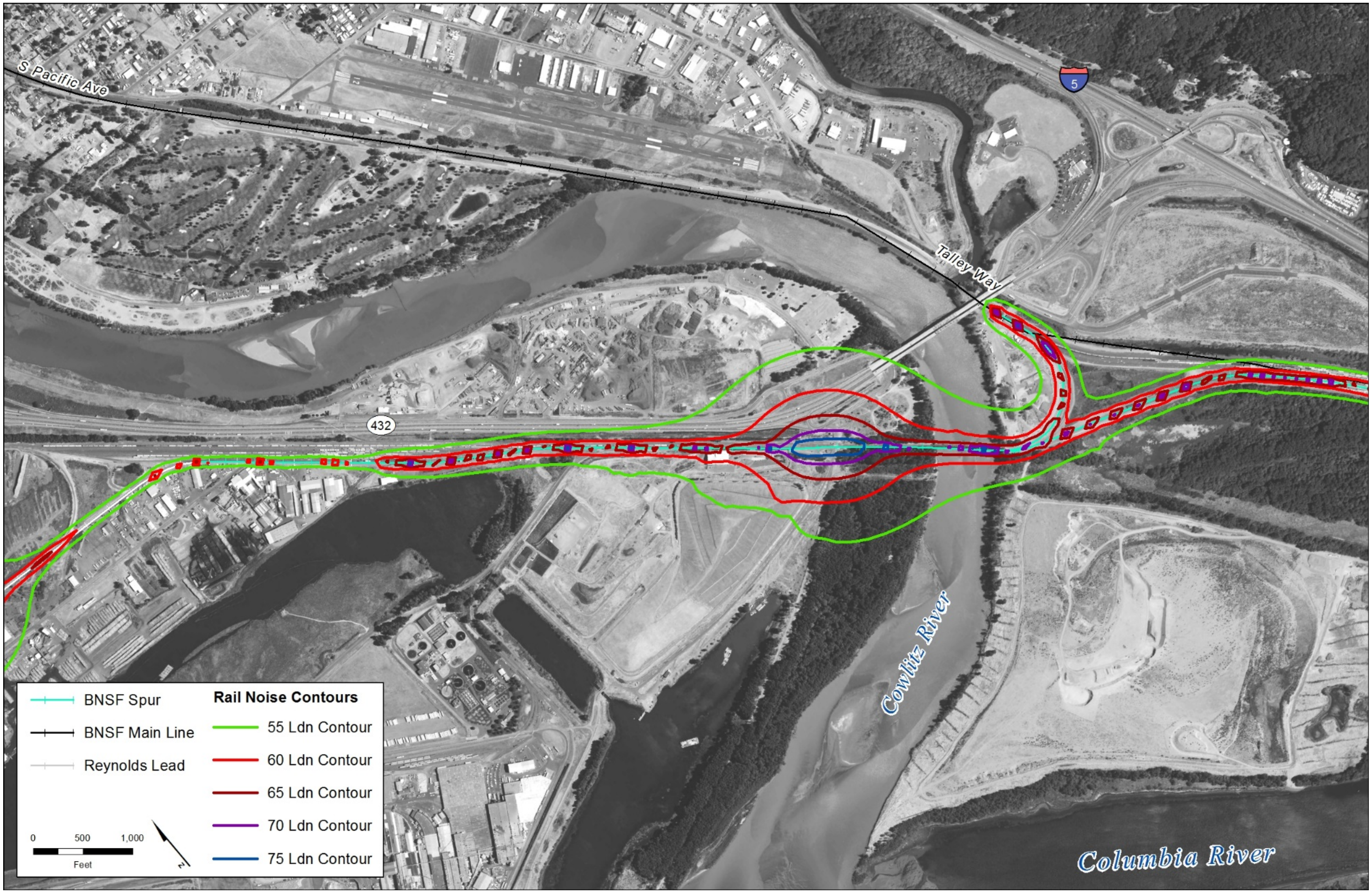
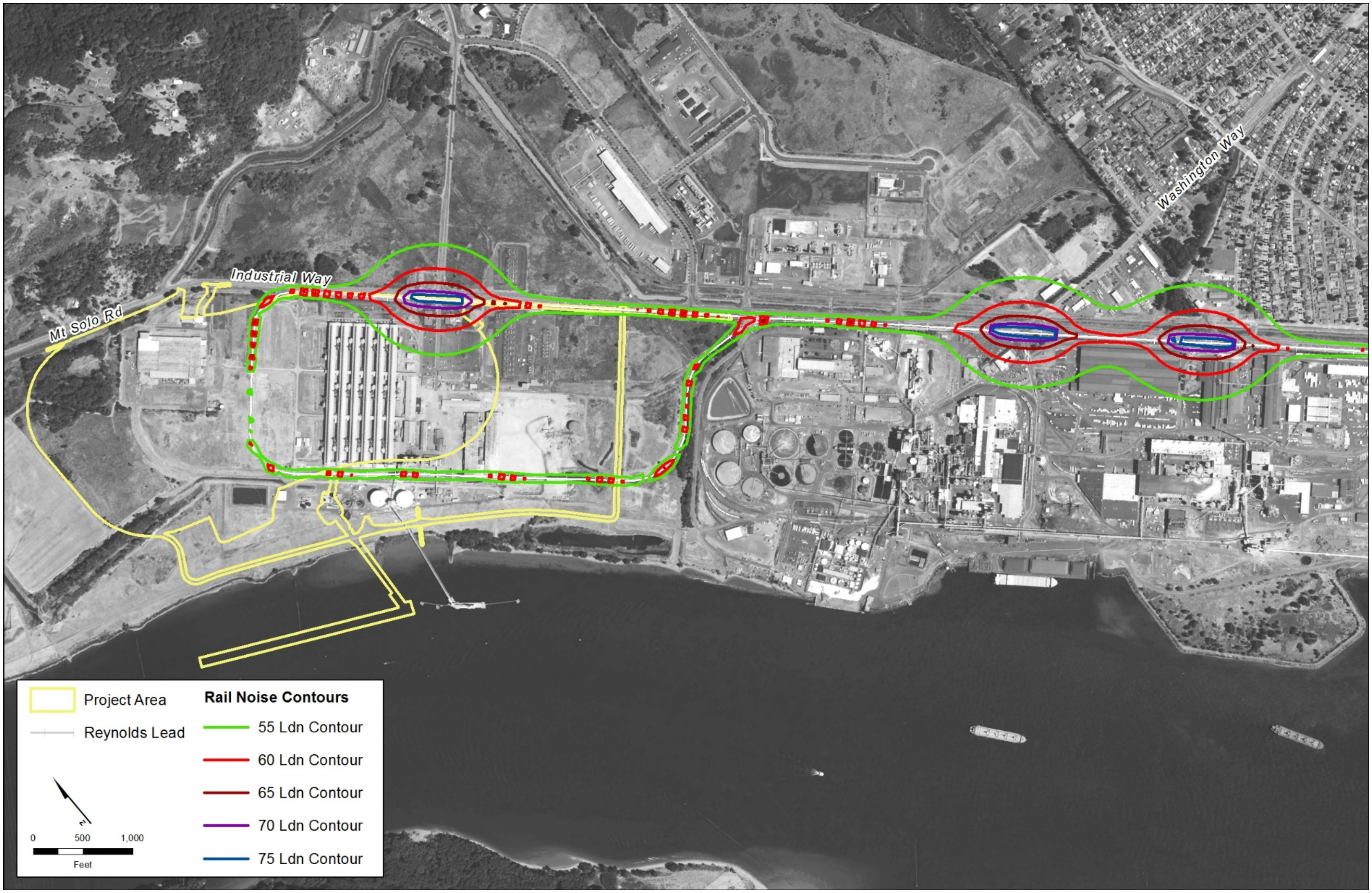


Figure 5.5-5c. Existing Rail Noise Contours, Mid-Reynolds Lead, Including Train Horns

Figure 5.5-5d. Existing Rail Noise Contours, End of Reynolds Lead, Including Train Horns



5.5.5 Impacts

This section describes the potential direct and indirect impacts related to noise and vibration that would result from construction and operation of the Proposed Action and the No-Action Alternative.

5.5.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action.

Construction—Direct Impacts

Construction-related activities associated with the Proposed Action could result in direct impacts as described below. As explained in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives,* construction-related activities include demolishing existing structures and preparing the site, constructing the rail loop and dock, pile-driving, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

Exceed Construction Noise Level Criteria

Construction of the Proposed Action would result in noise levels exceeding applicable noise level criteria at one residence (104 Bradford Place). The noise impact is predicted to occur only during pile-driving when the maximum noise level is predicted to reach 83 A-weighted decibels (dBA), exceeding the applicable criterion of 80 dBA for construction noise. No noise impact is predicted for any other times during construction when there is no pile-driving or when pile-driving is taking place further than approximately 1,500 feet from the residence.

Emit Vibration during Construction

The maximum predicted vibration levels at the closest vibration-sensitive receptor (104 Bradford Place) would be 72 velocity decibels during pile-driving, which would not exceed applicable criteria for maximum allowable vibration from construction at residences. Therefore, while construction of the Proposed Action would emit vibration from pile-driving, no adverse construction vibration impacts are expected at the closest vibration-sensitive receptors.

Construction—Indirect Impacts

Construction of the Proposed Action would result in the following indirect impacts. Construction-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Emit Noise from Construction-Related Road Traffic

Vehicles traveling to and from the project area, mainly on Industrial Way, represent a potential source of noise impacts during construction. A maximum of approximately 330 truck trips per day for the truck and barge construction material delivery scenarios would be required during the peak year of construction. The increase in truck traffic represents an increase of 3.3% in average daily traffic for all vehicles on Industrial Way. This increase in vehicular traffic would not result in a substantial change to the existing noise levels and would be temporary (during the peak year of construction). Therefore, Proposed Action-related construction traffic would not result in an adverse noise impact.

Emit Noise from Construction-Related Rail Traffic

As described in Section 5.1, *Rail Transportation*, the Proposed Action would add an average of 1.3 train trips during the peak construction year if construction materials are delivered by rail. Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, describes the construction scenarios. This level of rail activity would not cause noise levels to increase more than 3 L_{dn} (dBA). Proposed Action-related rail traffic would not result in noise level increases that would meet applicable criteria for a noise impact.

Operations—Direct Impacts

Operation of the Proposed Action would result in the following direct impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Noise

Operation of the Proposed Action would result in the following noise direct impacts.

Exceed Washington State Noise Level Standards

Figure 5.5-6 shows the predicted noise contours for operation of the Proposed Action. Noise from coal export terminal operations is projected to exceed the Washington State noise standard at one residence (104 Bradford Place). The residence where the exceedance would occur is within the 50-dBA contour, which is the applicable Washington State limit for nighttime noise levels in a residential area when the noise is from an industrial source. The predicted noise level at the residence is 55 dBA. This predicted noise level is comparable to the current nighttime noise level at this location. Other residences are located outside the noise level limit contours or would be shielded by topography.

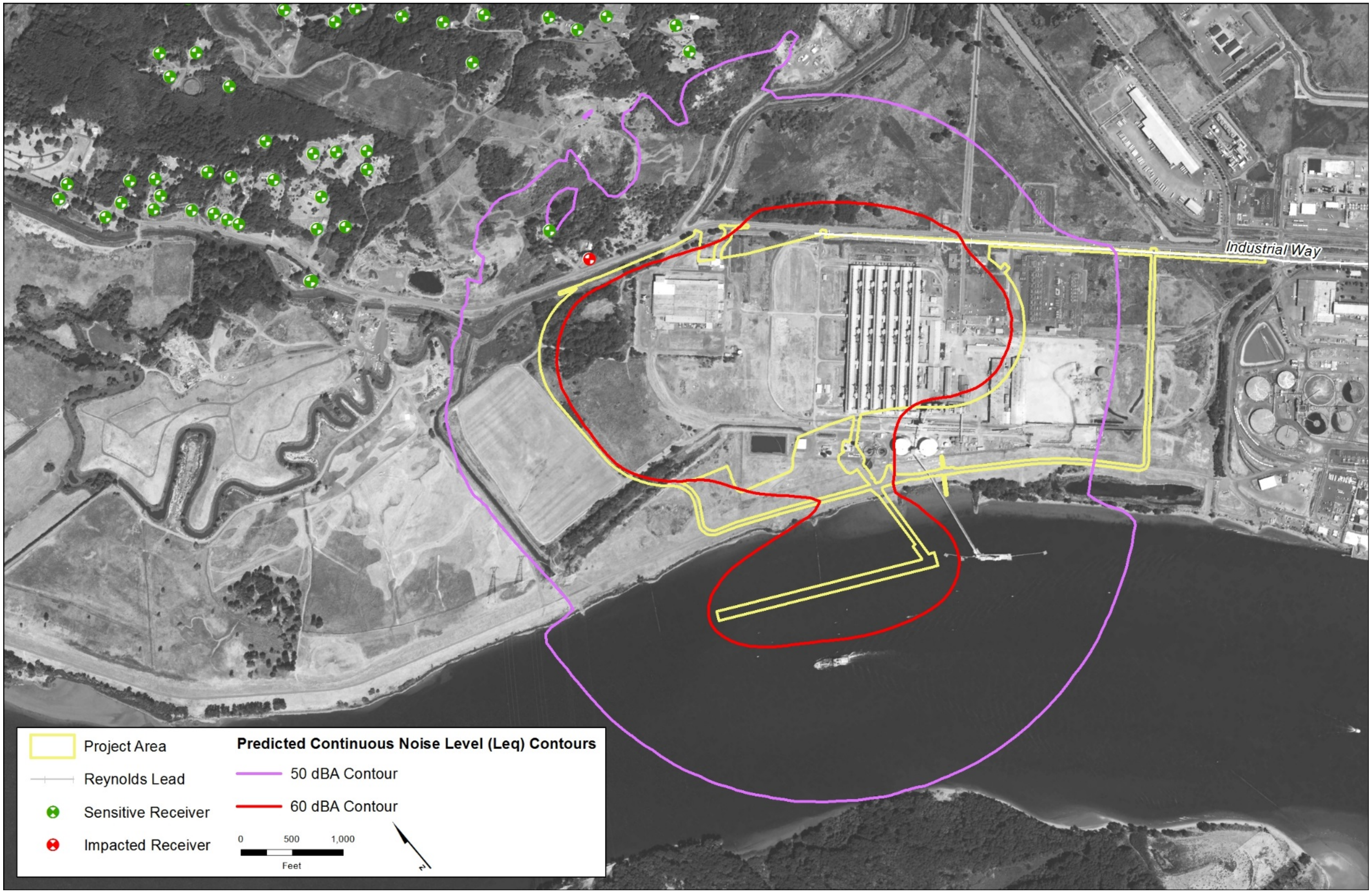
Vibration

As described in Section 5.5.3, *Methods*, no vibration impacts associated with operation of the Proposed Action are anticipated. No substantial sources of ground vibration would occur at the project area during operations, and the closest vibration-sensitive receptor is too far away to be affected by vibration from trains on the rail loop in the project area.

Operations—Indirect Impacts

Operation of the Proposed Action would result in the following indirect impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Figure 5.5-6. Predicted Continuous Noise Level (L_{eq}) Contours during Operations



Emit Noise from Operations-Related Vehicle Traffic

Vehicles traveling to and from the project area, mainly on Industrial Way, represent a potential source of noise impacts during operations. As illustrated in Section 5.3, *Vehicle Transportation*, the annual average daily traffic on Industrial Way would increase approximately 5.7% under the Proposed Action.

In general, a doubling of average daily traffic would be required to increase the L_{dn} from vehicular traffic by 3 dBA at the noise-sensitive receptors. In general, changes in a noise level of less than 3 dBA—as would be expected from the increase in traffic under the Proposed Action—would not be noticed by the human ear. Therefore, no noise-related indirect impacts from operations would be expected.

Emit Noise from Rail Traffic on the Reynolds Lead and BNSF Spur

At full coal export terminal operations, the Proposed Action would add 16 trains daily on the Reynolds Lead and BNSF Spur (8 loaded and 8 empty trains). Operation of the Proposed Action would increase rail traffic-related noise along the Reynolds Lead and BNSF Spur primarily as a result of sounding train horns for public safety.

Figure 5.5-7 illustrates plots of the estimated equal noise levels (L_{dn}) with Proposed Action-related rail traffic in 2028. The noise level contours include the noise from train horns sounded for public safety. Train engineers are required by FRA rules to sound locomotive horns at least 15 seconds, and not more than 20 seconds, in advance of public at-grade crossings. In addition, LVSW operating rules require train engineers to sound locomotive horns at private at-grade crossings. These sounding of horns would occur with or without track improvements on the Reynolds Lead and BNSF Spur that would allow higher train speed through the grade crossings.

Potential noise impacts were based levels of potential impact (moderate impact or severe impact) defined in FTA/FRA guidance, which compares the existing level of noise exposure to the change in noise exposure with Proposed Action-related trains. Table 5.5-4 summarizes the predicted number of affected noise-sensitive receptors exposed to moderate and severe impacts.[5] Figure 5.5-8 illustrates the residential land uses predicted to be exposed to moderate or severe noise impacts.

[5] The number of single residential units that could be affected at each multifamily residence was estimated using online satellite and street photography.

Figure 5.5-7a. Noise Contours with Proposed Action 2028 Rail Traffic, BNSF Spur to Reynolds Lead, Including Train Horns

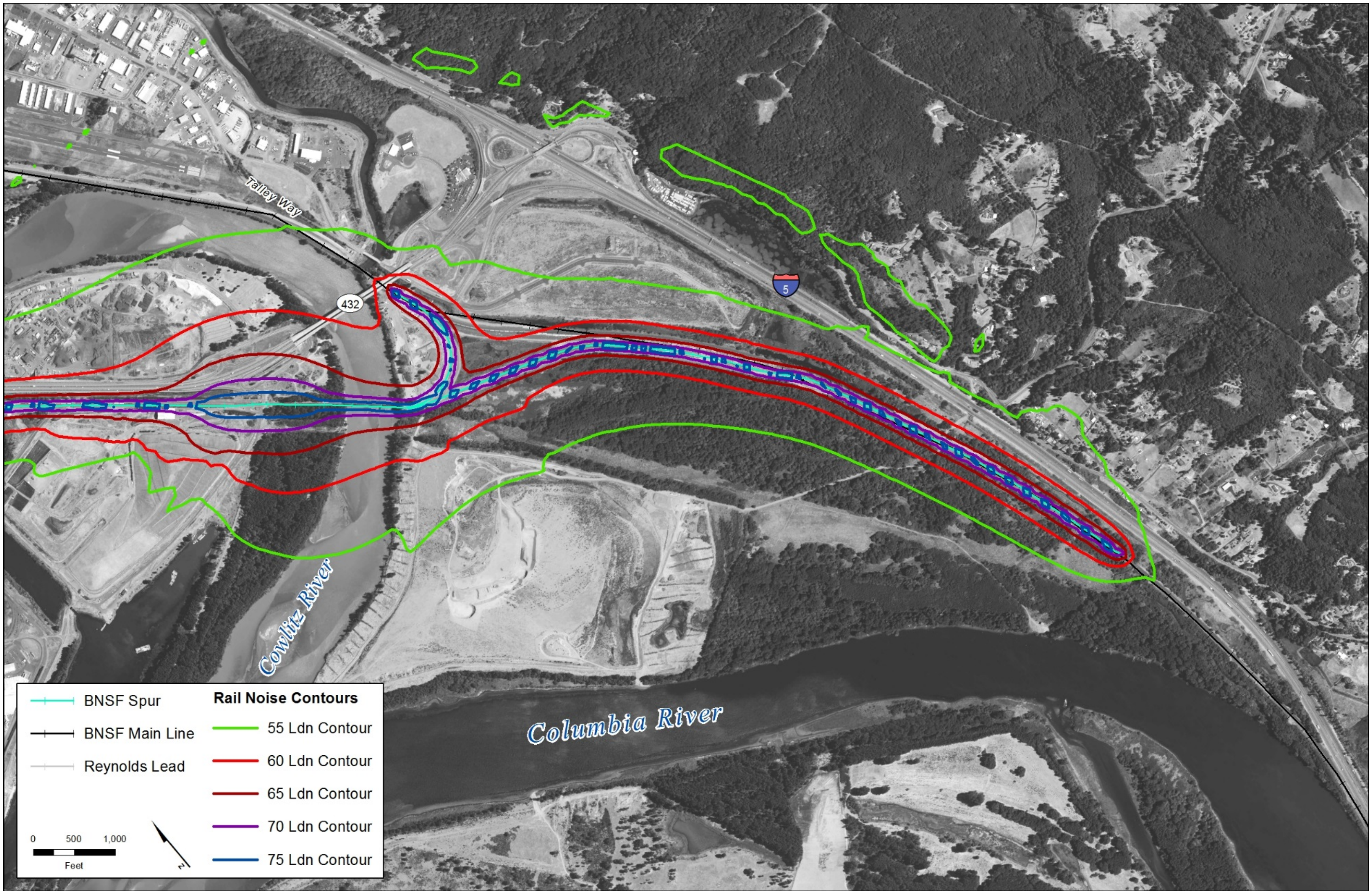


Figure 5.5-7b. Noise Contours with Proposed Action 2028 Rail Traffic, Beginning of Reynolds Lead, Including Train Horns

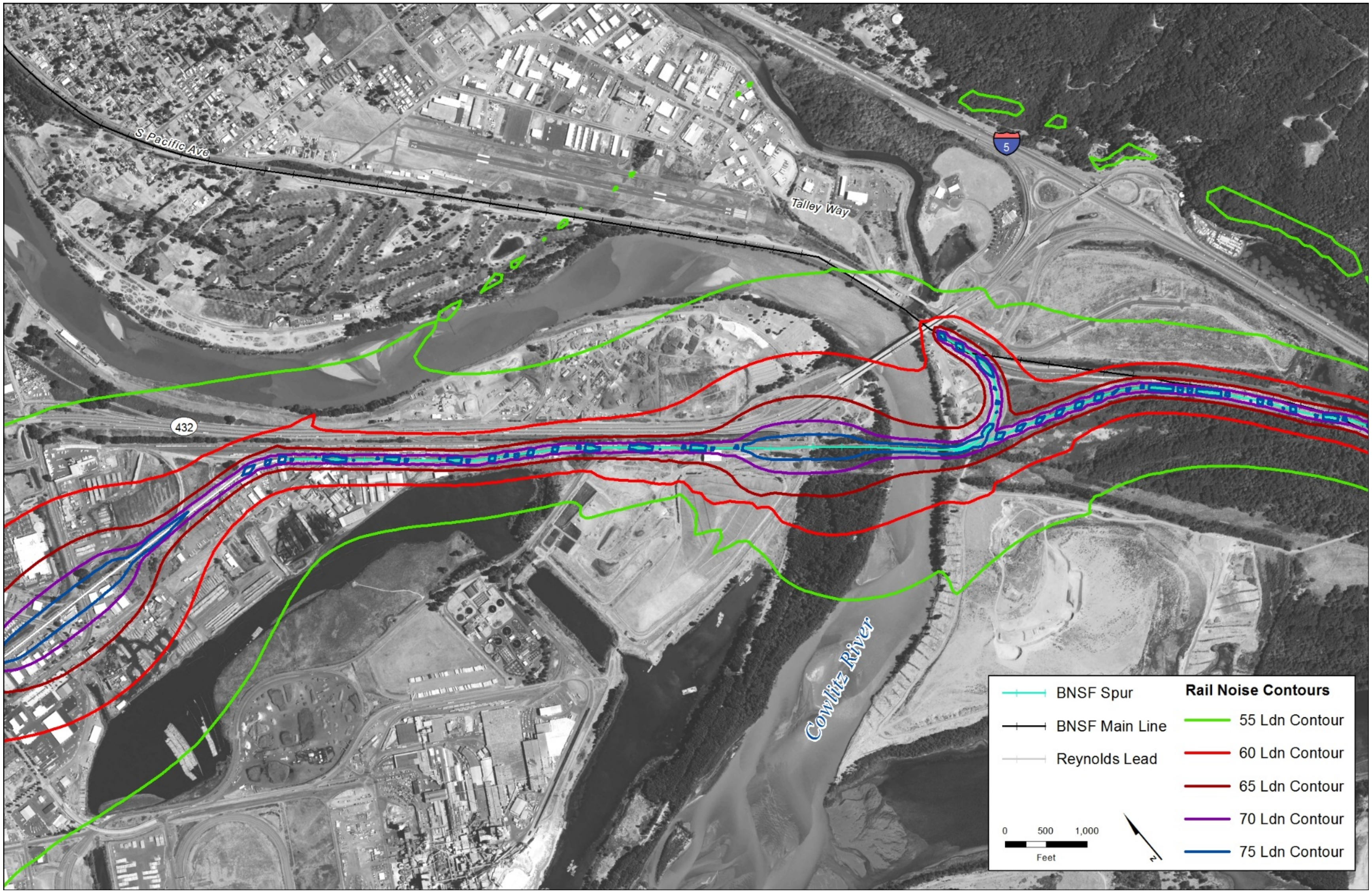


Figure 5.5-7c. Noise Contours with Proposed Action 2028 Rail Traffic, Mid-Reynolds Lead, Including Train Horns

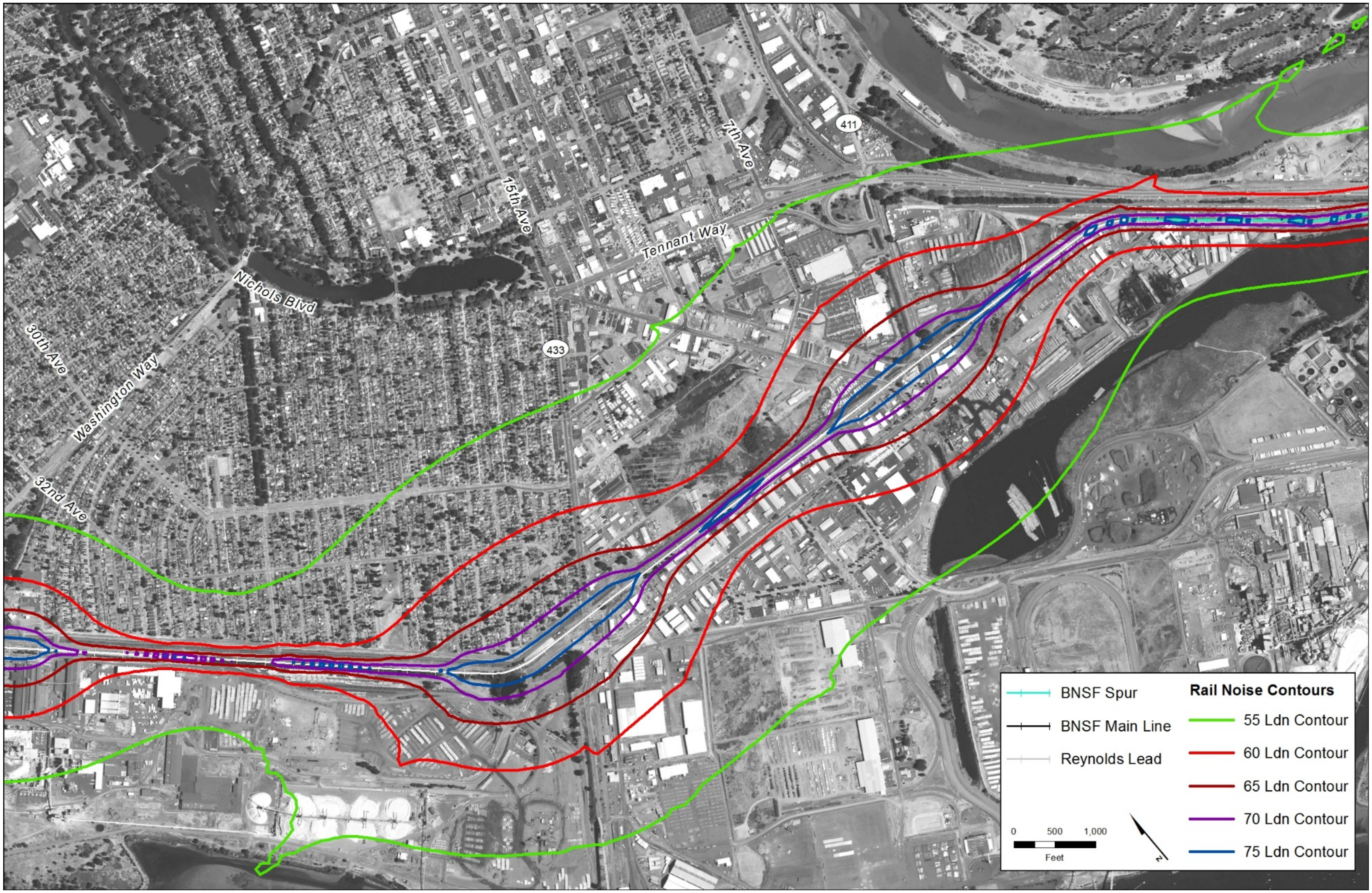


Figure 5.5-7d. Noise Contours with Proposed Action 2028 Rail Traffic, End of Reynolds Lead, Including Train Horns

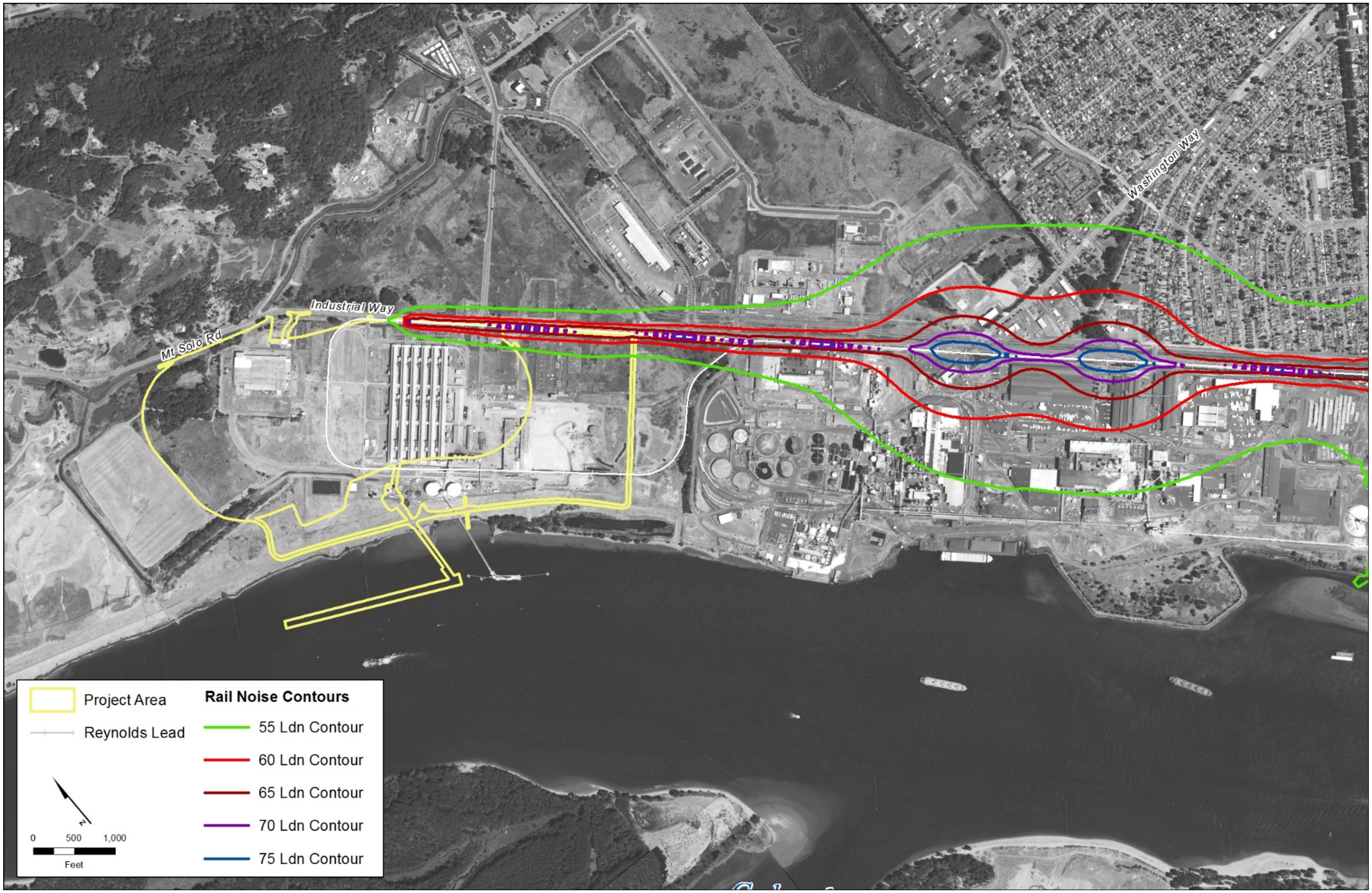


Table 5.5-4. Estimated Number of Noise-Sensitive Receptors Affected by Proposed Action-Related Trains

	Estimated Number of Receptors Impacted	
Reynolds Lead Crossing(s)	**Moderate Noise Impact**	**Severe Noise Impact**
3rd Avenue & California Way	34 mobile homes	10 mobile homes
Oregon Way & Industrial Way	2 mobile homes 133 single-family 18 multifamily[b]	34 single family 5 multifamily[d]
Private driveway at Weyerhaeuser (near Douglas Street & Industrial Way)	4 single family 2 multifamily[c]	0
Total Receptors	**193**	**49**

Notes:
[a] Per FTA/FRA guidance as described in Section 5.5.3, *Methods*.
[b] Estimated 52 individual residences affected.
[c] Estimated 4 individual residences affected.
[d] Estimated 16 individual residences affected.

As shown in the Table 5.5-4, an estimated 193 receptors representing approximately 229 residences would be exposed to a moderate noise impact, and an estimated 49 receptors representing approximately 60 residences would be exposed to a severe noise impact with Proposed Action-related trains. These impacts would be the same with or without the track improvements to the Reynolds Lead because the train noise would be dominated by the locomotive horn sounding at grade crossings. Proposed Action-related trains without horn sounding would not result in noise impacts for train speeds at 10 or 20 miles per hour on the Reynolds Lead.

Emit Noise from Vessel Operations

The Proposed Action would load 70 vessels per month or 840 vessels per year. This equates to 1,680 vessel transits in the Columbia River. Noise from Proposed Action-related vessels would not cause a noise impact at noise-sensitive receptors. For vessels moored at the project area docks (Docks 2 and 3), the noise associated with stationary vessels is estimated to be 29 dBA at the closest noise-sensitive receptors on Mt. Solo Road, approximately 3,800 feet from the docks in the project area. This estimated Proposed Action-related ship noise would be comparable to or less than ambient noise levels at this noise-sensitive receptor.

Proposed Action-related vessel traffic is comparable to or less than existing noise levels, and is unlikely to cause noise impacts along the Columbia River. For vessels under way in the Columbia River, vessel traffic is expected to be 70 ships per month during full operation in 2028. This corresponds to an average of 4.7 vessel transits per day. The noise-sensitive receptors on Barlow Point Road are all more than 400 feet from the edge of the Columbia River. The anticipated typical minimum distance between these closest receptors and the vessels would be about 1,600 feet. The 32 L_{dn} experienced by these closest noise-sensitive receptors would be comparable or less than existing noise levels.

Figure 5.5-8. Noise-Sensitive Receptors Predicted to be Exposed to Moderate and Severe Noise Impacts

Table 5.5-5 summarizes the potential L_{dn} from Proposed Action vessel traffic in 2028 at various perpendicular distances from the Columbia River navigational channel. Overall, the estimated noise exposure from Proposed Action-related vessel traffic would be comparable to or less than ambient noise levels at noise-sensitive receptors and is unlikely to cause noise impacts along the Columbia River.

Table 5.5-5. Potential Noise Exposure Levels from Vessel Traffic at Various Perpendicular Distances from the Columbia River Navigational Channel

Distance (feet)	L_{dn}
400	44
600	40
800	38
1000	36
1200	34
1400	33
1600	32

Noise from foghorns is infrequent and is not expected to cause noise impacts at the noise-sensitive receptors. A foghorn recorded from Barlow Road sounded for approximately 4 seconds every 2 minutes and achieved a maximum noise level of 60 dBA at its point of closest approach to the measurement location (approximately 1,800 feet). These noise levels represent the highest foghorn sound levels to which noise-sensitive receptors on Barlow Point Road are exposed. In addition, with the exception of one noise-sensitive receptor, the levee that runs between the Columbia River and Barlow Point Road serves to some extent as a sound barrier.

Emit Noise from Rail Traffic beyond Longview Junction

As described in Section 5.1, *Rail Transportation*, the Proposed Action would add 8 loaded and 8 empty trains per day (16 total trains per day) to BNSF main line routes in Washington State. Figure 5.5-9 illustrates the expected rail routes. Proposed Action-related trains would travel at similar speeds as existing trains and locomotives would sound horns consistent with existing practices. Therefore, the wayside and horn noise levels associated with any Proposed Action-related train would not change substantially compared to existing conditions.

However, because the Proposed Action would result in more rail traffic on BNSF main line routes, average noise levels would increase. Generally, in areas where existing noise levels are low (particularly at night), there is a greater likelihood that increased train traffic would result in more noticeable noise, particularly near at-grade crossings where trains are required to sound horns for public safety. Table 5.5-6 provides a summary of existing train volumes, projected 2028 baseline train volumes, and projected 2028 train volumes with Proposed Action-related trains. The table also provides a summary of the potential increase in train-related L_{dn} levels from the addition of Proposed Action-related trains relative to baseline conditions in 2028.

Figure 5.5-9. Projected Washington Rail Network Daily Track Utilization in 2028 with Proposed Action-Related Trains

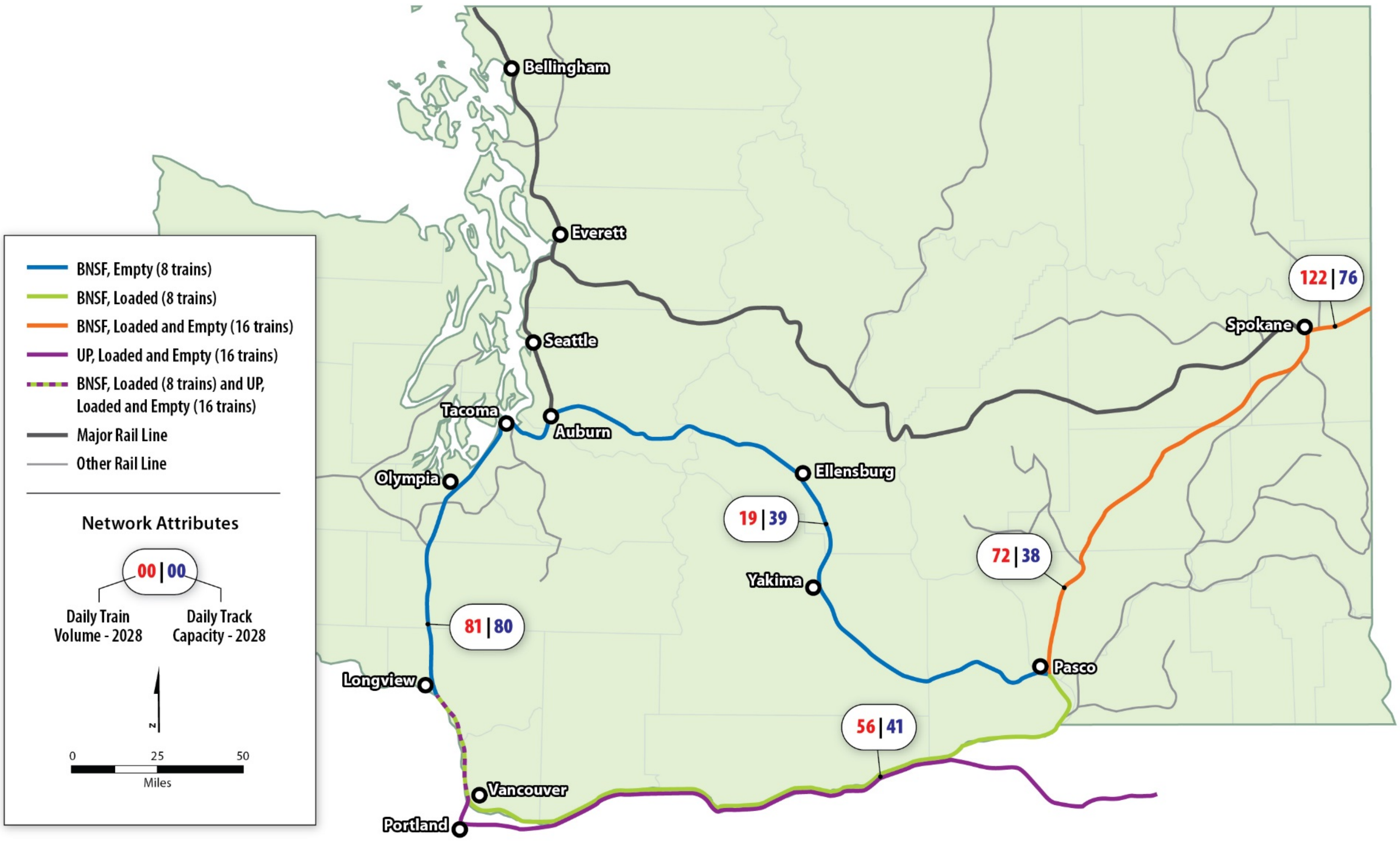


Table 5.5-6. Estimated Increase in Noise Exposure from Proposed Action-Related Trains

Route Segment	Trains per Day 2015	Projected Baseline 2028	Projected 2028 Baseline with Proposed Action-Related Trains[a]	Estimated L_{dn} Increase
Idaho/Washington State Line-Spokane	70	106	122	0.6
Spokane-Pasco	39	56	72	1.1
Pasco-Vancouver	34	48	56	0.7
Vancouver-Longview Junction	50	73	81	0.5
Longview Junction-Auburn	50	73	81	0.5
Auburn-Pasco	7	11	19	2.4

Changes in a noise level of less than 3 dBA are not typically noticed by the human ear. As indicated in Table 5.5-6, the potential increase from Proposed Action-related trains would be less than 3 dBA on BNSF main line routes in Washington State. On most route segments, the potential increase would be less than 1 dBA, which is within the level of precision for acoustical measurements. Therefore, noise impacts from Proposed Action-related trains on the routes to and from Longview would not be expected.

5.5.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products, such as calcine petroleum coke, coal tar pitch, and cement. The Applicant's planned growth would require approximately 2 additional train trips per day on the Reynolds Lead and BNSF Spur.

The potential for changes in noise levels unrelated to the Proposed Action on the Reynolds Lead and BNSF Spur were analyzed for 2028. Plots of the equal L_{dn} noise levels from rail traffic related to the No-Action Alternative in 2028 are available in the *SEPA Noise and Vibration Technical Report*. This noise impact assessment, conducted per the guidelines established by the FTA/FRA at each ambient survey location, showed the net increases relative to the existing noise exposure from 2 additional train trips per day on the Reynolds Lead and BNSF Spur did not reach the thresholds of moderate or severe impact level at any survey location. No-Action Alternative construction-related and operation-related vehicle traffic volumes would be expected to be less than the Proposed Action, which would not result in an adverse noise impact. Therefore, No-Action Alternative-related construction and operations traffic would not result in an adverse noise impact.

The analysis also concluded that there would be no vibration impacts because the closest receptors are too far away to experience meaningful vibration generated by trains on the Reynolds Lead and BNSF Spur.

5.5.6 Required Permits

No plans related to noise and vibration would be required for construction and operation of the Proposed Action.

5.5.7 Potential Mitigation Measures

No adverse vibration impacts are predicted. Therefore, this section describes the potential mitigation measures that would reduce impacts related to noise from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action.

5.5.7.1 Voluntary Mitigation

The Applicant has committed to implementing the following measures.

- Prior to the start of construction, the Applicant will develop a construction noise control plan to be implemented by the construction contractor. The plan will include limiting all construction activity that would exceed applicable regulations to daytime hours (7:00 a.m. to 10:00 p.m.) to ensure aggregate noise complies with WAC 173-60-50 (3)(a) requirements. The plan will also identify the limited equipment or processes that would be allowed to operate during nighttime hours.
- Prior to the start of construction, the Applicant will install, monitor, and respond to community inquiry via a dedicated line (phone, text, and email). The surrounding community will be broadly informed of the noise limits and how to file a complaint. The community inquiry line will be monitored during 24 hours a day, 7 days a week, during active construction. Complaints will be promptly investigated and actions would be taken to control noise to comply with noise level regulatory limits. Reports will be provided to the Cowlitz County Sherriff's Office on a monthly basis.
- To reduce rail noise along the Reynolds Lead, the Applicant will work with LVSW and other stakeholders to convert the Oregon Way and Industrial Way crossings to "quiet crossings". The Applicant will fund additional electronics, barricades, and crossing gates to convert the crossings to "quiet crossings."

5.5.7.2 Applicant Mitigation

The Applicant will implement the following measures to mitigate impacts related to noise and vibration.

Project Area Noise Mitigation

Noise impacts from coal export terminal operations in the project area could be reduced through terminal design or installing building sound insulation for residences that would be exposed to noise levels above the applicable Washington State maximum permissible noise level as a result of the Proposed Action. Given the preliminary nature of the coal export terminal design and operations, it is not known at this time whether terminal design would prevent noise levels from exceeding the applicable standard at all noise-sensitive receptors. If the design would not prevent exceedance of the maximum permissible noise level (WAC 173-60), mitigation of noise impacts from terminal operations could be addressed by the following measure.

MM NV-1. Monitor and Control Increased Noise from Coal Export Terminal Construction and Operations at Closest Residences.

If agreed to by the property owner(s), the Applicant will monitor noise levels at the two residences nearest the project area to detect possible noise impacts from the Proposed Action during construction and operations. Noise will be monitored during construction and until at least 6 months after initiation of operations. The Applicant will submit monthly noise reports to Cowlitz County Building and Planning. If the monitoring identifies a noise impact due to coal export terminal operations, the Applicant will reduce the noise exposure of the receptors with modifications to terminal operations or installation of building sound insulation at the noise receptor.

Rail Noise Mitigation

Horn sounding could be eliminated by establishing a Quiet Zone, which includes enhanced safety measures at at-grade crossings, such that the use of train horns would not be required. FRA provides detailed instructions on the application process for a Quiet Zone (Federal Railroad Administration 2015). The following mitigation measures will address the moderate and severe noise impacts from Proposed Action-related trains.

MM NV-2. Support Implementation of a Quiet Zone along the Reynolds Lead.

To address moderate and severe noise impacts along the Reynolds Lead due to rail traffic, before beginning full operations, the Applicant will coordinate with the City of Longview, Cowlitz County, LVSW, and the affected community to inform interested parties on the FRA process to implement a Quiet Zone that will include the 3rd Avenue and California Avenue crossings. Public outreach on the Quiet Zone process will include low-income and minority populations. The Applicant will assist interested parties in the preparation and submission of the Quiet Zone application to FRA. If the Quiet Zone is approved, the Applicant will fund all improvements.

MM NV-3. Explore Feasibility of Reducing Sound Levels.

If the Quiet Zone for the Reynolds Lead is not implemented, the Applicant will fund a sound reduction study to identify ways to mitigate the moderate and severe and impacts from train noise from the Proposed Action along the Reynolds Lead. The study methods will be discussed with Cowlitz County and the Washington State Department of Ecology for approval.

5.5.7.3 Other Measures to Be Considered

A measure that could be implemented to mitigate noise impacts include the following.

- To address noise from rail traffic on the Reynolds Lead, the City of Longview, LVSW, and interested parties should work with the Applicant to explore a Quiet Zone along the Reynolds Lead.

5.5.8 Unavoidable and Significant Adverse Environmental Impacts

Implementation of the Proposed Action would increase rail traffic that would increase noise levels along the Reynolds Lead and BNSF Spur in Cowlitz County. The increased noise levels from 16 Proposed Action-related train trips per day would meet applicable criteria for moderate or severe noise impacts on noise–sensitive receptors. These increases would occur near at-grade crossings on the Reynolds Lead. These noise impacts would be from train horn noise that is intended for public safety. Railroad noise is exempt from Washington State and local noise limits; however, it is possible for communities to work with FRA to apply for and implement a Quiet Zone to limit train horn sounding. The Applicant will work with the City of Longview, Cowlitz County, LVSW, the affected community, and other applicable parties to apply for and implement a Quiet Zone. However, if a Quiet Zone is not implemented, and Proposed Action-related train horns are sounded for public safety, then the potential for exposure to moderate and severe noise impacts would remain and would be an unavoidable and significant adverse environmental impact.

5.6 Air Quality

Air quality is essential to human and environmental health, and is protected by federal, state, and local regulations. Air pollution can harm humans, plants, animals, and structures. Ambient air quality can be affected by climate, topography, meteorological conditions, and pollutants emitted from natural or human sources.

This section describes air quality in the study area. It then describes impacts on air quality that could result from construction and operation of the Proposed Action and No-Action Alternative. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action. Fugitive emissions from coal dust in the project area and along the rail routes in Washington State are addressed in Section 5.7, *Coal Dust*.

5.6.1 Regulatory Setting

Laws and regulations related to air quality are summarized in Table 5.6-1.

Table 5.6-1. Regulations, Statutes, and Guidelines for Air Quality

Regulation, Statute, Guideline	Description
Federal	
Clean Air Act and Amendments	Enacted in 1970, as amended in 1977 and 1990, requires EPA to develop and enforce regulations to protect the public from air pollutants and their health impacts.
National Ambient Air Quality Standards (U.S. Environmental Protection Agency)	Specifies the maximum acceptable ambient concentrations for seven criteria air pollutants: CO, O_3, NO_2, SO_2, lead, PM2.5, and PM10. Primary NAAQS set limits to protect public health, and secondary NAAQS set limits to protect public welfare. Geographic areas where concentrations of a given criteria pollutant exceed a NAAQS are classified as nonattainment areas for that pollutant.
State	
Washington State General Regulations For Air Pollution Sources (WAC 173-400) and Washington State Clean Air Act (RCW 70.94)	Establish the rules and procedures to control or prevent the emissions of air pollutants. Provides the regulatory authority to control emissions from stationary sources, reporting requirements, emissions standards, permitting programs, and the control of air toxic emissions.
Washington State Operating Permit Regulation (WAC 173-401)	Establishes the elements for the state air operating permit program.
Washington State Controls for New Sources of Toxic Air Pollutants (WAC 173-460)	Establishes the systematic control of new or modified sources emitting toxic air pollution to prevent air pollution, reduce emissions, and maintain air quality that will protect human health and safety.
Washington State Ambient Air Quality Standards (WAC 173-476)	Establishes maximum acceptable levels in the ambient air for particulate matter, lead, SO_2, NO_2, O_3, and CO.

Regulation, Statute, Guideline	Description
Local	
Southwest Clean Air Agency (SWCAA 400)	Regulates stationary sources of air pollution in Clark, Cowlitz, Lewis, Skamania, and Wahkiakum Counties.

Notes:
EPA = U.S. Environmental Protection Agency; CO = carbon monoxide; O_3 = ozone; NO_2 = nitrogen oxides; SO_2 = sulfur dioxide; PM 2.5 = particulate matter up to 2.5 micrometers in size; PM10 = particulate matter up to 10 micrometers in size; NAAQS = National Ambient Air Quality Standards; WAC = Washington Administrative Code; RCW = Revised Code of Washington; SWCAA = Southwest Clean Air Agency

5.6.1.1 Federal and State Ambient Air Quality Standards

Federal and state regulations govern maximum concentrations for criteria air pollutants, which are the key indicators of air quality. Table 5.6-2 lists both the federal and state ambient air quality standards for five criteria air pollutants plus total suspended particulates. Annual standards are never to be exceeded, while short-term standards are not to be exceeded more than once per year, unless noted as explained in Table 5.6-2.

The National Ambient Air Quality Standards (NAAQS) consist of primary standards and secondary standards. Primary standards are designed to protect public health, including protecting the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are designed to protect public welfare from effects such as visibility reduction, soiling, and nuisance (e.g., preventing air pollution damage to vegetation). The Washington State Department of Ecology (Ecology) has established additional state ambient standards for sulfur dioxide for other averaging periods.

The NAAQS were established by the U.S. Environmental Protection Agency (EPA) under authority of the Clean Air Act to protect the public from air pollution. Air pollutants for which there are NAAQS are called *criteria pollutants*. Under the federal Clean Air Act, states are authorized to administer monitoring programs in different areas to determine if those areas are meeting the NAAQS.

EPA regulates nonroad mobile sources under the Clean Air Act to control emissions from nonroad engines (such as construction equipment, locomotives, and vessels). Regulations that are relevant to the Proposed Action include locomotive emission standards for new and rebuilt locomotive engines and the North America Emission Control Area for marine vessels limiting the sulfur content in fuel oil.

Table 5.6-2. Federal and Washington State Ambient Air Quality Standards

Pollutant	Federal		State
	Primary	Secondary	
Carbon monoxide			
8-hour average[a]	9 ppm	No standard	9 ppm
1-hour average[a]	35 ppm	No standard	35 ppm
Ozone			
8-hour average[b,c]	0.070 ppm	0.070 ppm	0.075 ppm
Nitrogen dioxide			
1-hour average[d]	100 ppb	No standard	100 ppb
Annual average	53 ppb	53 ppb	53 ppb
Sulfur dioxide			
Annual average	No standard	No standard	0.02 ppm
24-hour average[e]	No standard	No standard	0.14 ppm
3-hour average[e]	No standard	0.50 ppm	0.50 ppm
1-hour average[f]	75 ppb	No standard	75 ppb
Lead			
Rolling 3-month average	0.15 μg/m^3	0.15 μg/m^3	0.15 μg/m^3
PM10			
24-hour average[g]	150 μg/m^3	150 μg/m^3	150 μg/m^3
PM2.5			
Annual average[h]	12 μg/m^3	15 μg/m^3	12 μg/m^3
24-hour average[i]	35 μg/m^3	35 μg/m^3	35 μg/m^3

Notes:

[a] Not to be exceeded on more than 1 day per calendar year as determined under the conditions indicated in 173 WAC 476.

[b] In December 2015, EPA lowered the federal standard for 8-hour ozone from 0.075 ppm to 0.070 ppm.

[c] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.070 ppm.

[d] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.

[e] Not to be exceeded more than once per calendar year.

[f] 99th percentile of 1-hour daily maximum concentrations averaged over 3 years.

[g] Not to be exceeded more than once per year average over 3 years.

[h] Annual mean averaged over 3 years.

[i] 98th percentile averaged over 3 years.

Source: 173 WAC 476; U.S. Environmental Protection Agency 2012.

ppm = parts per million; ppb= parts per billion; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less; μg/m^3 = micrograms per cubic meter

5.6.1.2 Federal and State Air Toxics

Under the federal Clean Air Act, EPA controls air toxics, which are pollutants known or suspected to cause cancer or other serious health effects, such as birth defects or reproductive effects. Examples of air toxics include benzene, formaldehyde, and toluene. EPA has identified 188 air toxics, which it refers to as hazardous air pollutants (HAPS). No ambient air quality standards have been established for HAPS, and instead EPA has identified all major industrial stationary sources that emit these pollutants and developed national technology-based performance standards to reduce their emissions. The performance standards are designed to ensure that major sources of HAPS are controlled, regardless of geographic location.

Ecology generally requires new or modified stationary sources needing a notice of construction application to assess toxic air pollutant emissions through a review of the best available control technology for toxic air pollutants, quantification of emissions, and a demonstration of human health protection. The objective of this requirement is to reduce or eliminate toxic air pollutants from stationary sources prior to their generation whenever economically and technically practicable. The only new stationary source emission considered under the Proposed Action is fugitive coal dust. While coal dust is not a toxic air pollutant in and of itself, coal dust may contain material that meets the definition for toxic air pollutant emissions; therefore, toxic air pollutant requirements may apply to emissions from a Proposed Action stationary source. Southwest Clean Air Agency has a separate list of pollutants that may apply to emissions under the Proposed Action from this stationary source.

5.6.2 Study Area

The study area for direct impacts on air quality is defined as the project area and emissions from Proposed Action-related trains on the Reynolds Lead and BNSF Spur. For indirect impacts, the study area comprises Cowlitz County, including vessel activity on the Columbia River. Emissions are aggregated and regulated at a larger scale than a localized study area; therefore, direct and indirect emissions are combined. An assessment of air quality impacts from Proposed Action-related trains and vessels for the routes in Washington State is also addressed.

5.6.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts on air quality associated with the construction and operation of the Proposed Action and No-Action Alternative.

5.6.3.1 Information Sources

The following sources of information were used to identify the potential impacts of the Proposed Action and the No-Action Alternative on air quality in the study area.

- Data and information on coal export terminal construction and operation (URS Corporation 2015)
- Northwest International Air Quality Environmental Science and Technology Consortium for existing conditions data (2015)
- California's Air Resource Board vessel transit emissions study (California Air Resources Board 2011)
- National Climatic Data Center Longview, Washington climate data (National Climatic Data Center 2011)
- U.S. Environmental Protection Agency air pollutant emissions factors (U.S. Environmental Protection Agency 1995a, 1995b, 1995c, 1996)
- U.S. Environmental Protection Agency's air modeling guidance (U.S. Environmental Protection Agency 2004, 2014)

- U.S. Environmental Protection Agency's vessel fuel consumption data (U.S. Environmental Protection Agency 2000)
- U.S. Environmental Protection Agency's NONROAD Model (U.S. Environmental Protection Agency 2009)
- U.S. Environmental Protection Agency's vessel exhaust emission standards (U.S. Environmental Protection Agency 2012)
- Washington State Department of Ecology statewide emissions inventory levels (Washington State Department of Ecology 2014)

5.6.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on air quality.

The analysis evaluated emissions from construction and operations of the Proposed Action. Air emissions were estimated for the criteria air pollutants carbon monoxide, nitrogen oxides, sulfur dioxide, particulate matter less than 2.5 micrometers in diameter (PM2.5), and particulate matter less than 10 micrometers in diameter (PM10). Also included were volatile organic compounds (VOCs), an important precursor to ozone. Some VOCs are also hazardous air pollutants (HAPs). The *SEPA Air Quality Technical Report* (ICF International 2016a) provides further information on the pollutants that are considered VOCs and HAPs. Total suspended particles and diesel particulate matter were also estimated. Because construction emissions are temporary and have a short period of activity, these emissions were only evaluated in comparison with emissions thresholds. Operations emissions, however, were evaluated with respect to their impacts on air quality.

Construction

The Applicant has identified three construction-material-delivery scenarios: delivery by truck, rail, or barge.

- **Truck.** If material is delivered by truck, it is assumed that approximately 88,000 truck trips would be required over the construction period. Approximately 56,000 loaded trucks would be needed during the peak construction year.
- **Rail.** If material is delivered by rail, it is assumed that approximately 35,000 loaded rail cars would be required over the construction period. Approximately two-thirds of the rail trips would occur during the peak construction year.
- **Barge.** If material is delivered by barge, it is assumed that approximately 1,130 barge trips would be required over the construction period. Approximately two-thirds of the barge trips would occur during the peak construction year. Because the project area does not have an existing barge dock, the material would be off-loaded at an existing dock elsewhere on the Columbia River and transported to the project area by truck.

The emissions for all three scenarios were analyzed to determine the scenario with the highest emissions. Emissions were estimated for the peak construction year in each scenario.

The following sources of emissions were evaluated.

- Construction equipment operations
- Fugitive dust from earthwork activity
- Vehicle delays at grade crossings
- Construction worker vehicles commuting to the project area
- Truck emissions associated with delivery of construction supplies and materials
- Locomotive emissions associated with delivery of construction supplies and materials (rail delivery scenario only)
- River barges

Emissions were estimated based on frequency and duration of use and fuel types using EPA emissions data or the EPA NONROAD2008a model for nonroad construction equipment activity. The *SEPA Air Quality Technical Report* provides detailed information on the methods used to calculate and model emissions for the peak year of construction.

Operations

The air quality model assessed emissions from operation of the Proposed Action and their impact on localized air quality. The air quality modeling method followed general EPA protocols used in air quality permitting. Representative background concentrations for the study area (Northwest International Air Quality Environmental Science and Technology Consortium 2015)[1] were used to determine background concentrations in air quality analyses since no representative monitoring data are available.

Emissions were estimated for operations that would emit particulate matter from the handling and transfer of coal, including unloading from rail cars, transferring coal on conveyors, piling coal onto storage piles, storing coal in storage piles, and loading coal onto ships. The on-site transfer and storage of coal would create fugitive emissions of coal dust due to product movement and wind erosion. In addition, the assessment considered locomotive exhaust emissions that would occur during the unloading and movement of Proposed Action-related trains, emissions emitted from docked vessels during loading, emissions from tugs used to maneuver vessels into the coal export terminal, emissions from operations and maintenance equipment, and vehicle delay at grade crossings along the Reynolds Lead and BNSF Spur. Emissions were evaluated using EPA's standard regulatory air dispersion model, AERMOD (Version 14134). AERMOD output results were compared to the federal and state ambient air quality standards presented in Table 5.6-2. To assess impacts associated with the Proposed Action, the model was used to predict the increase in criteria air pollutant concentrations. The model's maximum incremental increases for each pollutant and averaging time were added to applicable background concentrations. The resulting total pollutant concentrations were then compared with the appropriate NAAQS.

[1] The Northwest International Air Quality Environmental Science and Technology Consortium (NW AIRQUEST) developed background design value estimates for 2009 through 2011 based on model-monitor interpolated products that provide realistic background design value estimates where nearby ambient monitoring data are unavailable. The work is sponsored by EPA Regional 10, Ecology, and others.

Annual locomotive and vessel emissions for Proposed Action-related trains and vessels were estimated for Cowlitz County and Washington State. These emissions were compared to existing annual emissions to provide context of potential air quality impacts beyond the study area. The *SEPA Air Quality Technical Report* provides detailed information on the methods used to calculate and model emissions during operations, as summarized in this section.

Coal Storage and Handling

Most on-site coal movement would occur in enclosed areas, including the rotary coal car dump and conveyors. Some transfer activities at the coal storage piles would not be enclosed; however, the conveyors, transfer towers, and the coal storage piles themselves would have systems in place for dust control (watering or dry fogging). Watering of the coal storage piles would help to reduce wind erosion. In general, the combination of these control systems would be expected to provide a high level of dust control (up to 99%). However, because these control systems would not operate with negative pressure,[2] a more conservative effectiveness assumption of 95% was used in this analysis.

Locomotives

The impact analysis approach for rail operations used EPA-projected emissions factors for line-haul locomotives, which are based on projected changes in locomotive fleet over the next 30 years (U.S. Environmental Protection Agency 2009). These emissions were based on locomotive engine load and associated fuel consumption during transport to and from the coal export terminal, the unloading of coal from train cars, as well as the total annual coal throughput. It was assumed that all locomotives would use ultra-low-sulfur diesel (15 parts per million [ppm] sulfur).

Vessel

The impact analysis approach for vessel operations assumed that each vessel receiving coal would need three tugs to maneuver the ship, and would require 3 hours total time to assist with docking and departing operations. Further, it was estimated that an average of 13 hours would be needed to load each vessel with coal, and during this period of time, the vessel would be using auxiliary engines. To comply with International Maritime Organization 2016 Emission Control Areas for North America, all vessels were assumed to use the maximum allowed sulfur content marine distillate fuel of 0.1% (1,000 ppm). It was also assumed that all tugboats would use ultra-low-sulfur diesel (15 ppm sulfur).

5.6.4 Existing Conditions

This section describes the existing environmental conditions in the study area related to air quality that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative.

5.6.4.1 Attainment Status

EPA and Ecology designate regions as being attainment or nonattainment areas for regulated air pollutants. Attainment status indicates that air quality in an area meets the federal, health-based ambient air quality standards. Nonattainment status indicates that air quality in an area does not

[2] Negative pressure is a ventilation system that allows air to flow within an enclosed space, with more air pressure outside than inside.

meet those standards. Cowlitz County is currently in attainment for all NAAQS. This designation means that EPA and Ecology expect the area to meet air quality standards.

5.6.4.2 Air Quality Conditions

This section describes climate, meteorological, and air quality conditions in the study area.

Climate and Meteorological Conditions

The project area is located along the Columbia River in southwestern Washington, approximately 50 miles east of the Pacific Ocean. The region is characterized as a mid-latitude, west coast marine-type climate. The Cascade Range to the east has a large influence on the climate in Cowlitz County. The Cascade Range forms a barrier from continental air masses originating over the Columbia River Basin. The Cascades also induce heavy amounts of rainfall; as moist air from the west rises, it is forced to rise up the mountain slopes, which produces heavier rainfall on the western slopes of the Cascades and moderate rainfall in the low-lying areas, such as Longview.

Summers in the region are mild and dry. Winters are cool, but typically wet and cloudy with a small range in daily temperature. The average annual precipitation in Longview is approximately 48 inches, with most precipitation falling from November through March (National Climate Data Center 2011). Average annual rain events, taken as days with more than 0.01 inch of rainfall, occur approximately 175 days per year, based on National Climatic Data Center summaries.

Temperatures are usually mild in the Lower Columbia River Basin. Days with maximum temperatures above 90 degrees Fahrenheit (°F) occur about seven times per year on average. Days with a minimum temperature below 32°F occur about 57 times per year on average, and temperatures below 0°F occur only very rarely (none recorded between 1931 and 2006). Mean high temperatures range from the high 70s in the summer to mid-40s (°F) in winter, while average lows are generally in the low 50s in summer and mid-30s in winter.

Meteorological data collected by the Weyerhaeuser meteorological tower at the nearby Mint Farm Industrial Park between 2001 and 2003 (URS Corporation2015) indicates that the prevailing winds near the project area are from the west-northwest and southeast, following along the alignment of the Columbia River. In the fall and winter (October through March), the winds are primarily from the southeast and east; the winds are typically from the west-northwest in the spring and summer (April through September).

Cowlitz County

Cowlitz County is in attainment or unclassified for all criteria air pollutants, indicating that air quality near the project area meets the federal and state ambient air quality standards.

The only available local air pollutant monitoring is for PM2.5, at a station approximately 1.5 miles east of the project area. The monitoring data show that PM2.5 levels are well within the PM2.5 air quality standards. Although no other monitoring data are available, concentrations of other criteria air pollutants in the study area also are expected to be well within air quality standards.

The Longview air toxics study showed measured levels of toxic air pollutants were below levels of concern for short-term and long-term exposures (Southwest Clean Air Agency 2007). The study found that, of the air toxics that could be directly monitored, the air toxics of most concern for potential health risk in Longview are acetaldehyde, arsenic, benzene, manganese, and formaldehyde, while diesel particulate matter was identified as the most likely contributor to cancer risk in Washington State. No further studies on air toxic monitoring in the Longview-Kelso area have been conducted since that time. The most recent national air toxic assessment showed Cowlitz County had an overall inhalation cancer risk of 30 cancers per million, which is lower than the state average of 40 cancers per million, as well as below the national average of 40 cancers per million (U.S. Environmental Protection Agency 2011).

Air Quality along Transportation Routes

Rail Traffic

The broader study area includes the rail transportation routes for Proposed Action-related trains in Washington State. Figure 5.1-1 in Section 5.1, *Rail Transportation*, illustrates the routes expected to be used by Proposed Action-related trains. Loaded and empty BNSF Railway Company (BNSF) trains would be expected to travel the same route between the Washington–Idaho State line and Pasco. West of Pasco, westbound loaded trains would be expected to travel to the project area along the Columbia River Gorge route, through Vancouver to Longview Junction on the BNSF main line, and then along the BNSF Spur and Reynolds Lead to the project area. Empty trains would be expected to travel from the project area along the Reynolds Lead and BNSF Spur to Longview Junction, on the BNSF main line to Auburn, over Stampede Pass, then through Yakima and back to Pasco. Union Pacific Railroad (UP) trains would travel in Washington State between Vancouver and the project area.

Air quality on the rail route from the Idaho border to Pasco is generally good. Spokane is a maintenance area[3] for carbon monoxide, but has not had an exceedance of the standard in more than 10 years. High winds in this region between spring and fall can combine with dry weather conditions to create dust storms, which can lead to extremely high levels of PM10. Air quality through the Columbia Gorge is generally good, with the primary concern focused on visibility impairment and regional haze issues; standards established to protect visibility are much lower than for health effects. The air quality from Vancouver to Longview is generally good. The few days with higher levels of particulates mostly occur during the home heating season.

The return rail route passes through Tacoma to Auburn, over the Cascades via Stampede Pass, then back to Pasco via Yakima and onward to Spokane. The area east of Auburn experiences some of the highest ozone levels in western Washington, although these levels are still below the NAAQS. The ozone monitoring site near Enumclaw has shown exceedances of the 8-hour ozone standard during the past 3 years (Washington State Department of Ecology 2015). Air quality from Stampede Pass through Yakima and back to Pasco is generally good. Recent monitoring data in the Yakima area has shown higher than usual levels of PM2.5 containing nitrate. In Yakima, much of the PM2.5 comes from wood burning, with the highest levels in winter as a result of increased wood burning along with stagnant air conditions (Washington State Department of Ecology 2015). Nitrate accounts for up to 25% of the wintertime PM2.5 in the Yakima area. High levels of daily PM2.5 are found in Ellensburg for 2 to 3 weeks each year.

With respect to hazardous air pollutants, the 2005 EPA National-Scale Air Toxics Assessment was used by Ecology to estimate cancer risk (Washington State Department of Ecology 2011). Inhalation cancer risks were highest in the major population centers along the rail route (Vancouver and

[3] A maintenance area is one that has been in nonattainment but currently meets air quality standards.

Spokane), with a cancer risk of up to 500 cancers per million. For the smaller communities (Kelso-Longview, Spokane, Yakima, and Pasco), cancer risks were up to 300 cancers per million, although locations along the rail line have cancer risks of less than 75 cancers per million.[4]

Vessel Traffic

Vessel traffic would traverse the Columbia River between the project area and the mouth of the river. Wahkiakum and Pacific Counties in Washington State on the Columbia River are designated as attainment areas for criteria air pollutants.

5.6.5 Impacts

This section describes the potential impacts on air quality that would result from construction and operation of the Proposed Action and No-Action Alternative.

5.6.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action. As noted in Section 5.6.2, *Study Area*, air emissions are aggregated and regulated at a larger scale than a localized study area. Therefore, the direct and indirect impacts of the Proposed Action are combined.

Construction

Construction-related activities associated with the Proposed Action could result in direct and indirect impacts as described below. As described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives,* construction-related activities include demolishing existing structures and preparing the site, constructing the rail loop and dock, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

The construction material delivery scenario with the highest emissions would be the barge scenario, which would deliver construction materials via barge and truck. Haul truck emissions are included for the truck trips needed to make deliveries of construction material to the project area. Maximum annual construction emission estimates for the peak construction year are shown in Table 5.6-3. Table 5.6-4 illustrates the maximum daily construction emission estimates.[5]

The maximum annual construction-related emissions would be well below the *de minimis* levels[6] established by EPA, as shown in Table 5.6-3. This means that although emissions of criteria air pollutants would occur, they would not be expected to cause a significant change in air quality and are unlikely to adversely affect sensitive receptors near the project area.[7]

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[4] EPA released in December 2015 the results from the 2011 National-Scale Air Toxics Assessment. The 2011 Ecology study uses the 2005 National-Scale Air Toxics Assessment.

[5] The estimated emissions shown assume that best management practices would be followed, including measures to reduce idling and dust generated by soil disturbance, and the application of water along access roads to minimize the track-out of soil.

[6] The *de minimis* levels are the lowest thresholds that meet the General Conformity Rule for a federal action. This rule ensures that the action will conform to air quality standards.

[7] While the study area is in attainment for all criteria air pollutants and therefore not subject to federal General Conformity rules (40 CFR 93, subpart B), the emission *de minimis* levels were used to provide a threshold against which to evaluate potential impact from construction.

Table 5.6-3. Estimated Maximum Annual Construction Emissions

	Construction Emissions (tons per year) [maximum per year]								
Source	**CO**	**NO_X**	**SO_2**	**PM2.5**	**PM10**	**VOCs**	**TSP**	**HAPS**	**DPM**
Combustion Sources									
Equipment (in project area)	9.04	24.60	0.95	1.93	1.93	2.23	2.34	0.05	2.34
Haul trucks (in project area)	0.88	4.06	0.01	0.13	0.19	0.18	0.23	0.004	0.23
Haul trucks (in study area)[a]	2.04	9.37	0.03	0.31	0.44	0.41	0.54	0.010	0.54
Barges (in study area)[b]	15.68	59.0	0.028	1.06	1.06	1.51	1.29	0.03	1.29
Passenger commute vehicles/crossing-delay (in study area)[a]	7.5	0.05	0.010	0.04	0.22	0.13	0.22	0.001	<0.001
Total Combustion Sources (in project area)	**9.92**	**28.66**	**0.96**	**2.06**	**2.12**	**2.41**	**2.57**	**0.05**	**2.57**
Total Combustion Sources (all study area)[c]	**19.5**	**38.1**	**1.0**	**2.4**	**2.8**	**2.95**	**3.3**	**0.07**	**3.1**
Fugitive Sources									
Controlled fugitive earthwork (project area)	—	—	—	1.22	5.87	—	12.00	—	—
Total Fugitive Sources	—	—	—	**1.22**	**5.87**	—	**12.00**	—	—
Total									
Construction emissions sources (project area)	**9.9**	**28.7**	**0.96**	**3.28**	**7.99**	**2.41**	**14.6**	**0.05**	**2.6**
All construction emissions sources[c]	**19.5**	**38.1**	**1.0**	**3.6**	**8.7**	**2.95**	**15.3**	**0.07**	**3.1**
General Conformity *de minimis* levels for ozone maintenance areas (CFR 93.153)	100	100	100	100	100	100	—	—	—

Notes:

[a] Not in the project area but in Cowlitz County.

[b] Not in project area. Based on barge maneuvering time for docking of 0.5 hour in and 0.5 hour out; does not include transit on the Columbia River.

[c] Rounded. Does not include barge emissions, but does include haul truck emissions to the project area.

CO = carbon monoxide; NO_X = nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter; VOCs = volatile organic compounds; TSP = total suspended particles; HAPS = hazardous air pollutants; DPM = diesel particulate matter

Table 5.6-4. Estimated Maximum Daily Construction Emissions

	Construction Emissions (pounds per day) [maximum daily]								
Source	**CO**	**NO_x**	**SO_2**	**PM2.5**	**PM10**	**VOCs**	**TSP**	**HAPS**	**DPM**
Combustion Sources									
Equipment (in project area)	82.89	229.60	8.67	17.66	17.66	20.40	21.49	0.42	21.50
Haul trucks (in project area)	14.40	54.70	0.20	2.60	5.00	3.10	6.10	0.10	6.12
Haul trucks (in study area)[a]	24.00	110.48	0.33	3.66	5.21	4.81	6.34	0.12	6.34
Barges (in study area)[b]	120.80	454.70	0.21	8.14	8.14	11.6	9.90	0.61	9.90
Passenger commute and crossing delay (in study area)[a]	20.00	1.43	0.03	0.11	0.58	0.35	0.58	0.01	<0.001
Total Combustion Sources (in project area)	**97.29**	**284.3**	**8.87**	**20.26**	**22.66**	**23.50**	**27.59**	**0.52**	**27.62**
Total Combustion Sources (all study area)[c]	**141.29**	**396.2**	**9.23**	**24.0**	**28.5**	**28.7**	**34.5**	**0.65**	**34.0**
Fugitive Sources									
Controlled fugitive earthwork (in project area)	—	—	—	6.80	32.6	—	66.7	—	—
Total Fugitive Sources	—	—	—	**6.80**	**32.6**	—	**66.7**	—	—
Total									
Construction emissions sources (project area)	**97.29**	**284.3**	**8.87**	**27.1**	**55.3**	**23.5**	**94.3**	**0.52**	**27.6**
All construction emissions sources[c]	**141.29**	**396.2**	**9.23**	**30.8**	**61.1**	**28.7**	**101.21**	**0.65**	**34.0**

Notes:

[a] Not in the project area but in Cowlitz County.

[b] Not in project area. Based on barge maneuvering time for docking of 0.5 hour in and 0.5 hour out; does not include transit on the Columbia River.

[c] Rounded. Does not include barge emissions, but does include haul truck emissions to the project area.

CO = carbon monoxide; NO_X= nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter; VOCs = volatile organic compounds; TSP = total suspended particles; HAPS = hazardous air pollutants; DPM = diesel particulate matter

Operations

Sources of emissions during operations would include fugitive emissions from coal handling and mobile source emissions from maintenance and operation, and emissions from Proposed Action-related trains and vessels.

Emissions

As shown in Table 5.6-5, rail and vessel transport would be the largest sources of emissions during operations. The Proposed Action would produce small quantities of air pollutants from maintenance and operations activities.

Table 5.6-5. Maximum Annual Average Emissions from Operations

	Maximum Annual Average Emissions (tons per year)								
Source	**CO**	**NO_x**	**SO_2**	**PM2.5**	**PM10**	**TSP**	**VOCs**	**HAPS**	**DPM**
Fugitive Sources									
Coal transfer (except coal storage piles)									
Material handling	—	—	—	0.28	1.84	5.25	—	—	—
Coal storage piles									
Wind erosion	—	—	—	0.14	0.92	1.08	—	—	—
Material handling	—	—	—	0.14	0.92	2.62	—	—	—
Mobile Sources									
Maintenance/operations equipment									
Combustion	1.42	4.36	0.19	0.31	0.31	0.38	0.36	0.01	0.38
Employee commute and crossing delay	2.05	0.13	0.003	0.02	0.08	0.008	0.04	0.01	<0.01
Locomotive									
Combustion (study area)[a]	7.63	17.5	0.027	0.36	0.37	0.45	0.60	0.08	0.45
Fugitive dust (study area)[a]	—	—	—	0.12	0.80	0.94	—	—	—
Combustion (project area)	4.00	11.6	0.01	0.24	0.25	0.30	0.48	0.04	0.21
Fugitive dust (project area)	—	—	—	0.27	1.79	2.10	—	—	—
Vessels									
Combustion (study area)[a]	37.9	24.8	3.04	1.64	1.78	2.17	14.1	0.03	0.00
Combustion (project area)	65.9	23.3	4.52	1.02	1.05	1.27	15.3	0.08	0.56
Total: All Mobile Sources, Project Area, Study Area	118.9	81.7	7.8	4.0	6.4	7.6	30.9	0.3	1.6
Total Project Area Sources	71.3	39.3	4.72	2.40	7.08	13.00	16.14	0.13	1.15
Fugitive Dust Only, Project Area	—	—	—	0.83	5.47	11.05	—	—	—
Mobile Combustion Sources, Project Area	71.32	39.26	4.72	1.57	1.61	1.95	16.4	0.13	1.15

Notes:

[a] Study area does not include the project area.

CO = carbon monoxide; NO_X = nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 **=** particulate matter less than 2.5 micrometers in diameter**;** PM10 = particulate matter less than 10 micrometers in diameter**;** TSP = total suspended particles; VOCs = volatile organic compounds; HAPS = hazardous air pollutants; DPM = diesel particulate matter

Impact Assessment

An analysis was performed with the AERMOD dispersion model. The results from the modeling compared with the NAAQS. Two sets of emissions were developed for use in the impact assessment. The first set was used to model annual average concentrations, reflecting emissions over an entire year with train and vessel arrivals spread across the year to simulate the average anticipated activity at the coal export terminal. The second set of emissions was used to determine concentrations at up to 24 hours, reflecting peak emissions that could occur during a single hour. Peak activity included a coal train unloading at the coal export terminal, a vessel loading with coal, and a second vessel docking at the coal export terminal. Tables 5.6-6 and 5.6-7 illustrate the modeling results.

Coal export terminal-only estimated emissions, in combination with the background concentrations, are not anticipated to cause a violation of any NAAQS. Table 5.6-6 summarizes the maximum predicted criteria air pollutant concentrations due to maintenance and operations of the coal export terminal only. This includes the material handling and moving of the coal, the coal storage piles, as well as exhaust emissions from mobile source equipment. The highest incremental impact due to coal export terminal-only operation is the 24-hour PM10 impact, which is 38% of the respective NAAQS.

Table 5.6-6. Maximum Modeled Concentrations from the Operation of the Coal Export Terminal[a]

Pollutant	Averaging Period	Modeled Impact ($\mu g/m^3$)	Background[b,c] ($\mu g/m^3$)	Total Predicted Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	1 hour[d]	10.7	827	838	40,000
	8 hour[d]	4	600	604	10,000
NO_2	1 hour[e,f]	15	56.6	72	188
	Annual[f,g]	0.4	5.3	6	100
SO_2	1 hour[h]	6.8	14.7	21.5	196
	3 hour[i]	4.5	11.5	16.0	1,300
PM2.5	24 hour[j]	4.8	17.8	22.6	35
	Annual[k]	0.2	6.1	6.3	12
PM10	24 hour[l]	57	23	80	150

Notes:

[a] Project sources include emissions from handling coal, the coal storage piles, mobile source exhaust emissions from operation and maintenance of the terminal.

[b] Background design value estimates for 2009 through 2011, based on model-monitor interpolated products (except PM2.5) sponsored by EPA Regional 10, Ecology, and others. From NW AIRQUEST tool Washington State University (http://www.lar.wsu.edu/nw-airquest/lookup.html.)

[c] PM2.5 background based on Ecology's Kelso Monitor (2012 through 2014).

[d] Modeled impact is the highest second high for each calendar year over the 3 modeled years.

[e] The NO_2 1-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[f] Modeled NO_2 impacts applied the Tier III Ozone Limiting Method (OLM), using an ozone background of 42ppb, as per the NW-AIRQUEST tool. For additional information regarding the modeling methodology, see the *SEPA Air Quality Technical Report*.

[g] The NO_2 annual modeled impact is the maximum annual mean over the 3 modeled years.

[h] The SO_2 1-hour modeled impact is the 3-year average of the 99th percentile of the 1-hour daily maximum concentrations.

[i] The SO_2 3-hour modeled impact is not to be exceeded more than once per year.

[j] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[k] The PM2.5 annual modeled impact is the 3-year average of the annual mean.

[l] The PM10 24-hour modeled impact is 3-year average of the highest 2nd high concentration.

$\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter

Table 5.6-7 shows the modeling results for sources in the project area (coal export terminal emissions sources [Table 5.6-6]), plus cargo vessel and train operations while in the project area. Cargo vessel operations are the main source of sulfur dioxide emissions, which has an incremental increase in the 1-hour sulfur dioxide concentration that is 61% of the respective standard. The incremental increase in the 24-hour PM10 is about half the respective standard. The maximum impacts for each pollutant plus the maximum background show total concentrations below the NAAQS for all criteria air pollutants.

Table 5.6-7. Project Area Concentration from Operations (All Sources)[a]

Pollutant	Averaging Period	Modeled Impact (μg/m³)	Background[b,c] (μg/m³)	Total Predicted Concentration (μg/m³)	NAAQS (μg/m³)
CO	1 hour[d]	220	827	1,047	40,000
	8 hour[d]	71	600	671	10,000
NO_2	1 hour[d,e]	100	56.6	157	188
	Annual[f,g]	10.8	5.3	12	100
SO_2	1 hour[h]	119	14.7	134	196
	3 hour[i]	84	11.5	96	1,300
PM2.5	24 hour[j]	12	17.8	29.8	35
	Annual[k]	1.1	6.1	7.2	12
PM10	24 hour[l]	85	23	108	150

Notes:

[a] Project sources include emissions from handling coal, the coal storage piles, mobile source exhaust emissions from the operation and maintenance of the facility.

[b] Background design value estimates for 2009 through 2011, based on model-monitor interpolated products (except PM2.5) sponsored by EPA Regional 10, Ecology, and others. From NW AIRQUEST tool Washington State University (http://www.lar.wsu.edu/nw-airquest/lookup.html.)

[c] PM2.5 background based on Ecology's Kelso Monitor (2012 through 2014).

[d] Modeled impact is the highest second high for each calendar year over the 3 modeled years.

[e] The NO_2 1-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[f] Modeled NO_2 impacts applied the Tier III Ozone Limiting Method (OLM), using an ozone background of 42ppb, as per the NW-AIRQUEST tool. For additional information regarding the modeling methodology, see the *SEPA Air Quality Technical Report*.

[g] The NO_2 annual modeled impact is the maximum annual mean over the 3 modeled years.

[h] The SO_2 1-hour modeled impact is the 3-year average of the 99th percentile of the 1-hour daily maximum concentrations.

[i] The SO_2 3-hour modeled impact is not to be exceeded more than once per year.

[j] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[k] The PM2.5 annual modeled impact is the 3-year average of the annual mean.

[l] The PM10 24-hour modeled impact is 3-year average of the highest 2nd high concentration.

μg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter

Table 5.6-8 shows the modeling results for all project area sources and study area sources (vessels arriving and departing from the coal export terminal, assist tugs, plus trains arriving and departing from the terminal, to approximately 5 miles out). These results are similar to the project area sources. The largest increase as a percentage of the NAAQS is the sulfur dioxide concentration, which is due to the operation of the tugs and cargo vessel. In all cases, the maximum impacts for each pollutant plus the maximum background show total concentrations below the NAAQS for all criteria air pollutants.

Table 5.6-8. Study Area Concentrations from Operations (All Sources)

Pollutant	Averaging Period	Modeled Impact ($\mu g/m^3$)	Background[a,b] ($\mu g/m^3$)	Total Predicted Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
CO	1 hour[c]	346	827	1,173	40,000
	8 hour[c]	97	600	697	10,000
NO_2	1 hour[c,d]	100	56.6	157	188
	Annual[e, f]	16	5.3	21	100
SO_2	1 hour[g]	130	14.7	145	196
	3 hour[h]	127	11.5	138	1,300
PM2.5	24 hour[i]	12	17.8	29.8	35
	Annual[j]	1.2	6.1	7.3	12
PM10	24 hour[k]	85	23	108	150

Notes:

[a] Background design value estimates for 2009 through 2011, based on model-monitor interpolated products (except PM2.5) sponsored by EPA Regional 10, Ecology, and others. Source: NW AIRQUEST tool Washington State University (http://www.lar.wsu.edu/nw-airquest/lookup.html.)

[b] PM2.5 background based on Ecology's Kelso Monitor (2012 through 2014).

[c] Modeled impact is the highest 2nd high for each calendar year over the 3 modeled years.

[d] The NO_2 1-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[e] Modeled NO2 impacts applied the Tier III Ozone Limiting Method, using an ozone background of 42ppb, as per the NW-AIRQUEST tool. For additional information regarding the modeling methodology, see Section 2.1.2.2, *Operations Impact Analysis Approach*.

[f] The NO_2 annual modeled impact is the maximum annual mean over the 3 modeled years.

[g] The SO_2 1-hour modeled impact is the 3-year average of the 99th percentile of the 1-hour daily maximum concentrations.

[h] The SO_2 3-hour modeled impact is not to be exceeded more than once per year.

[i] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of 1-hour daily maximum concentrations.

[j] The PM2.5 annual modeled impact is the 3-year average of the annual mean.

[k] The PM10 24-hour modeled impact is 3-year average of the highest second high concentration.

$\mu g/m^3$ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; CO = carbon monoxide; SO_2 = sulfur dioxide; NO_2 = nitrogen dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter;

Locomotive and Vessel Emissions in Context

This section compares annual emissions from Proposed Action-related trains and vessels in Cowlitz County and Washington State to total annual emissions from locomotives and vessels.

Cowlitz County

Annual Cowlitz County emissions from Proposed Action-related trains and vessels are shown in Table 5.6-9. This table also provides the 2011 Washington statewide emissions for locomotives and commercial marine vessels. Locomotive emissions would occur in the project area, on the Reynolds Lead and BNSF Spur, and on the BNSF main line in Cowlitz County. Vessel emissions would occur in the project area and on the Columbia River in Cowlitz County.

Table 5.6-9. Estimated Maximum Annual Emissions in Cowlitz County for Locomotive and Commercial Marine Vessels for the Proposed Action Compared with the 2011 Cowlitz County Emissions Inventory

	Maximum Annual Average Emissions (tons per year)						
	CO	NO_x	SO_2	PM2.5	PM10	VOCs	DPM
Locomotive							
Proposed Action-related Locomotive emissions	16	41	0.06	1.2	3.5	1.6	0.88
Cowlitz County emissions	137	789	6	23	23	43	23
Commercial Marine Vessels							
Proposed Action-related Vessel emissions	104	48	7.6	2.7	2.8	29	0.6
Cowlitz County emissions	150	1,109	199	34	37	46	34

Notes:
Source: Washington State Department of Ecology 2014.
CO = carbon monoxide; NO_X= nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 **=** particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter**;** VOCs = volatile organic compounds; DPM = diesel particulate matter

Locomotive emissions in Cowlitz County are estimated to increase by about 6% overall with the Proposed Action. The largest emissions increase for a single pollutant would be for PM10, which would increase by approximately 15%. Vessel emissions in Cowlitz County with the Proposed Action are estimated to increase by about 12%. The largest emissions increase for a single pollutant would be carbon monoxide and VOCs, which would increase approximately 69% and 63%, respectively. The increase in carbon monoxide emissions is primarily due to use of the auxiliary engines while ships are docked. While this emission increase represents a substantial increase relative to the commercial marine vessel category, overall it represents a small increase (0.28% and 0.17%) in the total Cowlitz County carbon monoxide and VOC emissions.

Washington State

Annual statewide emissions from Proposed Action-related trains and vessels are shown Table 5.6-10. This table also provides the 2011 Washington statewide emissions inventory totals for locomotives and commercial marine vessels.

Locomotive emissions in Washington State would occur along the rail routes described in Section 5.1, *Rail Transportation*. Vessel emissions in the study area would occur along the Columbia River between the project area and out to 3 nautical miles beyond the mouth of the Columbia River. The largest increase in locomotive emissions for any one pollutant would be for carbon monoxide at 38%, followed by nitrogen oxides with a 15% increase.[8] For commercial marine vessels, the relative increase is smaller with a maximum increase of 12% for VOC and just under 11% for carbon monoxide.

[8] The larger increase in carbon monoxide emissions reflects that no regulatory standards have been promulgated to reduce carbon monoxide emissions from locomotive engines since 1999, while extensive multi-tier federal regulatory standards have been implemented to substantially reduce nitrogen oxide locomotive emissions by 2028.

Table 5.6-10. Estimated Maximum Annual Emissions in Washington State for Locomotive and Commercial Marine Vessels for the Proposed Action in Comparison with the 2011 Statewide Emissions Inventory

	Maximum Annual Average Emissions (tons per year)						
	CO	NO_x	SO_2	PM2.5	PM10	VOCs	DPM
Locomotive							
Proposed Action-related Locomotive emissions	963	2,209	3	46	47	76	47
Statewide emissions	2,536	15,026	95	430	N/A	810	428
Commercial Marine Vessels							
Proposed Action-related vessel emissions	276	161	21	11	13	93	10
Statewide emissions	2,521	20,486	11,529	1,213	N/A	782	1,021

Notes:
Source: Washington State Department of Ecology 2014.
CO = carbon monoxide; NO_X= nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter; VOCs = volatile organic compounds; DPM = diesel particulate matter

Sulfur Dioxide and Mercury Emissions

Combustion of coal in Asia could result in impacts on Washington State related to sulfur dioxide emissions. An analysis was conducted to determine the amount of sulfur dioxide and mercury emissions that would be found over Washington State, specifically attributable to the sulfur and mercury emitted from coal combustion in Asia from coal that passed through the coal export terminal. Appendix I, *Sulfur Dioxide and Mercury Emissions*, summarizes the methods, analyses, and findings. A full description of methods, analyses, and findings of the sulfur dioxide and mercury emissions analysis is provided in the *SEPA Coal Technical Report* (ICF International 2016b).

Using data from models based on different market scenarios, the maximum Proposed Action coal source contribution of just the Asian sulfate concentration in Washington State in 2040 would be less than 0.3%. This assumes that overall growth in coal combustion in Asia is balanced with reductions in sulfur dioxide emissions due to application of additional control technology.

Combustion of coal in Asia could result in impacts on Washington State related to mercury emissions. Appendix I, *Sulfur Dioxide and Mercury Emissions,* shows the annual mercury deposition amounts associated with coal exported from the coal export terminal over Washington State, starting in 2025. In the first 5 years, the deposition amounts are approximately the same across all scenarios. All scenarios show an increase in mercury deposition by 2040, with a maximum deposition amount of 9.2 milligrams per year per square kilometer. This deposition amount represents less than 0.4% of the total Asian-sourced mercury deposition over Washington State as estimated by Strode et al. (2008) at 2,900 milligrams per year per square kilometer. For more information, see Appendix I, *Sulfur Dioxide and Mercury Emissions*.

5.6.5.2 No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the Proposed Action and impacts on air quality related to construction and operation of the Proposed Action would not occur. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses, including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

Expanded bulk terminal operations and maintenance would result in emissions of air pollutants. Emissions were estimated for planned future rail and vessel operations for the No-Action Alternative. In addition, emissions associated with truck transport to the nearby Weyerhaeuser facility were included. Table 5.6-11 illustrates estimated No-Action Alternative emissions.

The largest emissions for any single air pollutant would be nitrogen oxides at 4.4 tons per year. These emissions are lower than the Proposed Action, which were shown to be less than *de minimis*. Therefore, no adverse air quality impacts would be anticipated under the No-Action Alternative.

Table 5.6-11. No-Action Alternative Annual Average Emissions from Rail, Vessel, and Haul Trucks

	Maximum Annual Average Emissions (tons per year)								
Source	**CO**	**NO_X**	**SO_2**	**PM2.5**	**PM10**	**VOCs**	**TSP**	**HAPS**	**DPM**
Locomotive combustion	1.4	3.1	0.01	0.06	0.07	0.11	0.08	0.01	0.06
Vessel combustion	2.6	1.1	0.19	0.06	0.06	0.63	0.08	0.003	0.02
Haul trucks	0.1	0.2	0.002	0.01	0.04	0.02	0.04	0.001	0.04
Total	**4.1**	**4.4**	**0.20**	**0.13**	**0.17**	**0.76**	**0.20**	**0.014**	**0.12**

Notes:
CO = carbon monoxide; NO_X= nitrogen oxide; SO_2 = sulfur dioxide; PM2.5 = particulate matter less than 2.5 micrometers in diameter; PM10 = particulate matter less than 10 micrometers in diameter; VOCs = volatile organic compounds; TSP = total suspended particles; HAPS = hazardous air pollutants; DPM = diesel particulate matter

5.6.6 Required Permits

The following permits would be required for the Proposed Action.

- **Notice of Construction—Southwest Clean Air Agency.** Businesses and industries that cause, or have the potential to cause, air pollution are required to receive approval from the local air agency prior to beginning construction. These are requirements of Washington's Clean Air Act and apply statewide (Chapter 70.94 Revised Code of Washington [RCW]). Businesses located in Cowlitz County are regulated by the Southwest Clean Air Agency. The agency rules generally require an air permit for stationary sources emitting more than 0.75 ton per year of PM10 or 0.5 ton per year for PM2.5.[9] It is anticipated that these levels would be exceeded and the Applicant would need to file a permit application and receive an approved Notice of Construction air permit prior to constructing, installing, establishing, or modifying any equipment or operations that may emit air pollution.

5.6.7 Potential Mitigation Measures

Project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action would reduce air quality

[9] Other criteria air pollutants have higher emission thresholds.

impacts. No significant adverse air quality impacts would occur as a result of construction or operation of the Proposed Action. Therefore, no mitigation is required. Mitigation for coal dust emissions is described in Section 5.7, *Coal Dust*.

5.6.8 Unavoidable and Significant Adverse Environmental Impacts

There would be no unavoidable and significant adverse environmental impacts on air quality.

5.7 Coal Dust

Coal dust is a form of particulate matter[1] and can affect air quality. Coal loaded onto trains consists of pieces and particles of differing size, including small particles, or dust. The vibration of the train during transit can break larger pieces of coal into smaller particles, creating more dust. Wind and air moving over the train may cause coal dust to blow off the rail cars, disperse, and settle onto the ground or other surfaces. Coal dust can also be created from the movement and transfer of coal at an industrial facility. The deposition of coal dust can be a nuisance and affect the aesthetics, look, or cleanliness of surfaces.

This section provides an introduction to coal dust and describes existing conditions related to coal dust. It then describes impacts related to coal dust that could result from construction and operation of the Proposed Action and the No-Action Alternative. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action.

5.7.1 Regulatory Setting

Laws and regulations relevant to coal dust are summarized in Table 5.7-1.

Table 5.7-1. Regulations, Statutes, and Guidelines Applicable to Coal Dust

Regulation, Statute, Guideline	Description
Federal	
Clean Air Act and Amendments	Enacted in 1970, as amended in 1977 and 1990, requires EPA to develop and enforce regulations to protect the public from air pollutants and their health impacts.
National Ambient Air Quality Standards	Specifies the maximum acceptable ambient concentrations for seven criteria air pollutants: CO, O_3, NO_2, SO_2, lead, PM10 and PM2.5. Primary NAAQS set limits to protect public health, and secondary NAAQS set limits to protect public welfare. Geographic areas where concentrations of a given criteria pollutant exceed a NAAQS are classified as nonattainment areas for that pollutant.
State	
Washington State General Regulations For Air Pollution Sources (WAC 173-400) and Washington State Clean Air Act (RCW 70.94)	Establishes the rules and procedures to control or prevent the emissions of air pollutants. Provides the regulatory authority to control emissions from stationary sources, reporting requirements, emissions standards, permitting programs, and the control of air toxic emissions.

[1] Particulate matter is a complex mixture of extremely small particles and liquid droplets. Particulate matter pollution can be composed of a number of components, including nitrates, sulfates, organic chemicals, metals, soil, and dust particles.

Regulation, Statute, Guideline	Description
Local	
Southwest Clean Air Agency (SWCAA 400)	Regulates stationary sources of air pollution in Clark, Cowlitz, Lewis, Skamania, and Wahkiakum Counties.

Notes:
EPA = U.S. Environmental Protection Agency; CO = carbon monoxide; O_3 = ozone; NO_2 = nitrogen oxides; SO_2 = sulfur dioxide; PM2.5 = particulate matter up to 2.5 micrometers in size; PM10 = particulate matter up to 10 micrometers in size; NAAQS = National Ambient Air Quality Standards; WAC = Washington Administrative Code; RCW = Revised Code of Washington; SWCAA = Southwest Clean Air Agency

In occupational settings (such as coal mines), exposure to airborne coal dust is regulated by agencies such as the Occupational Safety and Health Administration and the Mine Safety and Health Administration. In non-occupational settings (such as outdoor exposures) exposure to coal dust in combination with all other types of particulate matter and dust in the ambient air is regulated by the U.S. Environmental Protection Agency (EPA). The federal regulation that applies to particulate matter is part of the National Ambient Air Quality Standards (NAAQS). These standards apply to particle sizes with diameter of less than 10 microns (PM10) and particles with a mean diameter of less than 2.5 microns (PM2.5) (40 Code of Federal Regulations [CFR] 50). The NAAQS were established under the authority of the federal Clean Air Act to protect human health, including sensitive populations such as children and the elderly, with a margin of safety.

There are no federal or state guidelines or standards in the United States that identify acceptable levels of ambient dust deposition levels. The source most commonly cited on the question of levels of coal dust deposition for nuisance impacts[2] is the New Zealand Ministry of Environment document *Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions* (New Zealand Ministry of Environment 2001). This study cites acceptable levels of dust deposition and identifies two trigger levels for dust nuisance impacts above current background levels.

- 4.0 grams per square meter per month (g/m^2/month) for industrial or sparsely populated locations. This equates to an approximate visible layer of dust on outdoor furniture or window sills.
- 2.0 g/m^2/month for sensitive residential locations.

A highly visible dust, such as black coal dust, will cause visible soiling at lower levels than other types of dust. British Columbia, Canada, has a less stringent maximum desirable level for average dustfall in a residential area of 5.1 g/m^2/month and for nonresidential areas of 8.7 g/m^2/month (British Columbia Ministry of Environment 2014).

5.7.1.1 Railroad Coal Dust Requirements

The BNSF Railway Company (BNSF) Coal Loading Rule[3] requires all shippers at any Montana or Wyoming coal mine to take measures to load cars in a way that ensures coal dust losses in transit are reduced by at least 85% compared to rail cars where no remedial measures have been taken. This is most commonly done by loading coal rail cars with a modified loading chute that produces a coal bed with a rounded top. This shaped profile limits the loss of coal dust from wind while the

[2] Refers to the level of dust deposition that affects the aesthetics, look, or cleanliness of surfaces but not the health of humans and the environment.

[3] For more information, see http://www.bnsf.com/customers/what-can-i-ship/coal/coal-dust.html

train is moving. In addition to the shaped profile, topper agents (i.e., surfactants) are applied to the surface of the coal mound to limit coal dust loss. The topper agent is applied before leaving the coal mine area. The Safe Harbor provision in the BNSF Coal Loading Rule identifies five acceptable topper agents and application rates that BNSF states have been shown to reduce coal dust losses by at least 85% when used in conjunction with coal load profiling. A shipper can use any of the five approved topping agents.[4]

In 2014, BNSF constructed and began operating a surfactant spray facility along its main line in Pasco, Washington, where coal trains traveling west along the main line route through the Columbia River Gorge are sprayed with a topper agent to lessen potential coal dust release from rail cars.

5.7.2 Study Area

The study area for direct impacts is the project area. The study area for indirect impacts differs for each co-lead agency. The indirect impacts study areas are as follows.

- **Cowlitz County and Ecology.** The area along the Reynolds Lead and BNSF Spur up to 1,000 feet from the rail line.
- **Ecology only.** The area along the rail routes for Proposed Action-related trains on BNSF main line routes in Washington State up to 1,000 feet from the rail line.

5.7.3 Methods

This section describes the sources of information and methods used to evaluate the potential impacts of coal dust associated with the construction and operation of the Proposed Action and the No-Action Alternative.

5.7.3.1 Information Sources

The following sources of information were used to identify the potential impacts of the Proposed Action and No-Action Alternative on coal dust in the study area.

- *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015).
- *Millennium Coal Export Terminal, Longview, Washington Environmental Report Air Quality. Appendix L – Air Quality Modeling Analysis* (URS Corporation 2015).
- *Final Report Environmental Evaluation of Fugitive Coal Dust Emissions from Coal Trains Goonyella, Blackwater and Moura Coal Rail Systems Queensland Rail Limited* (Connell Hatch 2008: 41).
- *Duralie Extension Project, Air Quality Assessment* (Heggies 2009).
- *Analysis of Carry-Back at the RG Tanna Coal Terminal (Draft), Exploration & Mining* (Commonwealth Scientific and Industrial Research Organisation 2007).
- *Diesel particulate matter and coal dust from trains in the Columbia River Gorge, Washington State* (Jaffe et al. 2015).

[4] For more information, see http://www.bnsf.com/customers/what-can-i-ship/coal/include/dust-toppers.xls

- *Inorganic composition of fine particles in mixed mineral dust– pollution plumes observed from airborne measurements during ACE-Asia* (Maxwell-Meier et al. 2004).
- Information from the Applicant about anticipated coal handling and transfer activities in the project area.
- Information from the *SEPA Rail Transportation Technical Report* (ICF International and Hellerworx 2016) on the rail routes of Proposed Action-related trains through Washington State.

5.7.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative related to coal dust. The methods for direct impacts during construction are not addressed because coal would not be handled in the project area or transported by rail during construction of the Proposed Action. For operations of the coal export terminal, air quality modeling was performed for the following primary sources of coal dust.

- Transfer and handling of the coal from rail to storage piles.
- Fugitive emissions from coal storage piles.
- Transfer and handling of coal from piles to ship.

For the transport of the coal via rail to the proposed coal export terminal, air quality modeling was conducted based on the coal dust emissions estimated from a moving train with some adjustments in the emissions rates based on the 2014 air quality monitoring study conducted in Cowlitz County as summarized in this section.

Direct Impacts

Operation of the Proposed Action could result in coal dust emissions, including during the handling and transfer of coal related to rail unloading, ship loading, conveyor transfer, coal-pile development and removal, and wind erosion of coal piles. Coal transfers would occur in enclosed areas (e.g., rotary coal car dump facility, conveyors) and open areas (e.g., coal storage piles).

Coal dust emissions and impacts in the study area were assessed using the EPA standard regulatory air dispersion model, AERMOD (Version 14134). The model was used to estimate the coal dust deposition during operations. AERMOD was used because impacts would be localized, and the model is designed to assess emissions for multiple point, area, and volume sources in simple and complex terrain, and uses hourly local meteorological data. In addition, AERMOD estimates the deposition of particulates (such as coal dust) using information on the particulates' emissions rate and particle sizes.

The modeling estimated coal dust deposition impacts from coal dust emissions for full operations (44 million metric tons per year). Table 5.7-2 summarizes the sources of coal dust emissions and their estimated annual average emissions rates that were used in the analysis.

Table 5.7-2. Coal Dust Total Suspended Particulates Emissions Rates at Maximum Throughput

Operation	Annual Average TSP Emissions Rate (tons per year)
Coal pile wind erosion	1.08
Coal pile development and removal	2.62
Ship transfer and conveyors	5.25
Train unloading	0.91
Total	**9.86**

Notes:
TSP = total suspended particulates

Coal dust emissions were characterized as two source types: volume and area. Coal transfer operations were characterized as volume sources, which included eight transfer towers, a rotary rail dump, surge bin work points, and two conveyors to load coal onto the ships with emissions rates estimated based on EPA AP-42, Section 13.2.4. Area sources are used to model low-level ground releases. The coal piles were modeled as area sources with the emissions estimated following the EPA AP-42, Section 13.2.5 approach. The coal dust emissions from tandem rotary unloaders that would unload the coal were modeled as a volume source with emissions estimated following the EPA AP-42, Section 13.2.5 approach. Weyerhaeuser's Mint Farm meteorological station was used in the analysis for the years 2001 to 2003. This station is located approximately 0.5 mile southeast of the project area.

The modeling was completed for the deposition of the coal particles and a more conservative assumption about the effectiveness of full enclosures and spray/fogging for conveyors. A 95% reduction effectiveness was assumed for the enclosed conveyor and spray/fogging systems, which is consistent with a similar facility's draft permit from the Oregon Department of Environmental Quality (2013).

No applicable information was available on the particle size distribution for Powder River Basin or Uinta Basin coal for small particle sizes; therefore, the analysis used data from comparable mines in Australia (Katestone 2009). Emissions rates in the project area were based on EPA AP-42 methods and meteorological data from Weyerhaeuser's Mint Farm meteorological station (0.5 mile from the project area).

The U.S. Geological Survey is preparing a study that identifies methods for determining potential impacts on aquatic resources from coal dust exposure. The study, not yet published, uses two locations along rail lines in the Columbia River in Washington State as examples. The study will consider diet and other pathways of exposure and also compare results to levels of concern determined in previous studies. While not available for consideration for this Draft EIS, it is anticipated that the published study will be considered for the Final EIS.

Indirect Impacts

Over the past 10 years, air quality monitoring studies have collected information on the deposition and ambient concentration levels of coal dust associated with coal train operations. These studies have been conducted in various locations, including Australia, Canada, and the United States.

However, the available documentation from these studies often does not provide information on all factors that affect coal dust emissions from trains.[5]

To supplement data from existing studies, a field study was conducted in October 2014 to collect sample data on coal dust emitted from existing coal trains on the BNSF main line just north of the Lewis River in Cowlitz County where several loaded coal trains pass each day (Figure 5.7-1). In this area, freight trains generally travel at speeds of approximately 40 to 45 miles per hour. These data were used to improve knowledge regarding coal dust emissions and improve the reliability of the impact assessment.

The objective of the sampling program was to collect coal dust data at a location in Cowlitz County under conditions that were conducive to coal dust emissions from passing coal trains. The study measured fugitive coal dust emissions from passing trains with a set of air samplers on each side of the tracks, to measure the upwind background concentrations and deposition, and the downwind concentrations and deposition—the difference being the contributions of the passing trains. The *SEPA Coal Technical Report* (ICF International 2016) contains detailed information on the study including the sampling program, laboratory analysis, quality assurance, and results.

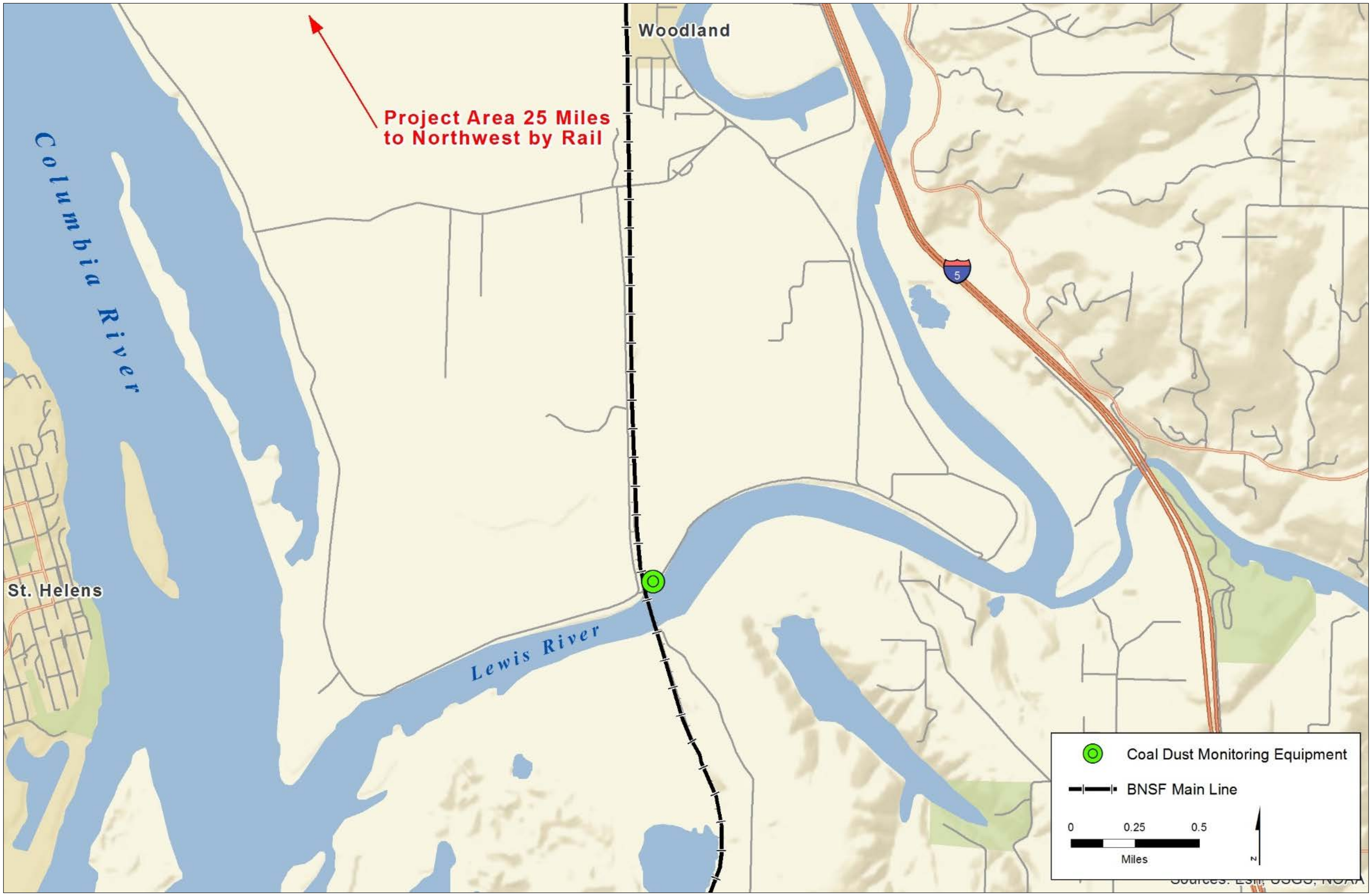
Data collected during the first 2 weeks in October 2014, provided a representative sample. This analysis used the data collected during the field study to evaluate coal train emissions estimates based on studies in Australia, to verify their applicability to similar projects in the United States, and to evaluate the potential future impacts from the increased transport of coal to the proposed export terminal via rail.

Data collected at the site included the following.

- Continuous airborne particulate matter using a size-segregating laser-based optical scattering technique with data recorded at a 10-second time resolution. Measurements were made at the anticipated downwind (east) side of the tracks.
- Short-term particulate matter deposition using deposition plates on both sides of the tracks that sampled during triggered events with a train passage.
- Short-term airborne particulate matter on both sides of the tracks using impaction sampling techniques triggered during selected train passages.
- Integrated 24-hour airborne particulate matter using filter-based techniques with measurements primarily focused on the anticipated downwind (east) side of the tracks.
- Meteorological measurements of wind speed, wind direction, temperature, humidity and solar radiation at a 30-second time resolution to document the conditions during the sampling events.
- Train speed and video recording (documenting the number of coal cars, etc.)

[5] Factors include rail car size, number of rail cars, shaping of the coal in the rail car, application and type of topping agent, distance over which the coal is transported, and meteorological conditions.

Figure 5.7-1. Coal Dust Monitoring Location



During the study period, 23 coal trains were observed and samples were obtained for 22 of the trains. Of the 22 sample sets, 11 were submitted to the laboratory for full analyses, along with data from two non-coal freight trains for comparison.[6] Prior to the start of the study period, it was verified with the receivers of the coal (TransAlta Power Plant near Centralia and Westshore Terminals in British Columbia, Canada) that the coal was originating from the Powder River Basin and that surfactant was applied at the mine. At the time of this study the BNSF Pasco spray station was not yet operational and no additional surfactant material was being applied to the coal after leaving the mine.

To determine the coal particle concentrations from the collected samples, analytical methods were developed to evaluate the coal particle concentrations in the three different types of measurements and collection devices: fallout of particles; airborne concentrations in the optical microscopy size range; and particles in the "respirable" size range. All data collected during the measurement program were processed and validated prior to using in the coal dust analysis.

Air quality modeling was performed using AERMOD for the periods in which wind direction was clearly across the rail line and when a complete set of deposition plates and impaction samplers were recorded at the study site. This resulted in four periods in which suitable measurements were made for comparison to modeling results. A key input to the modeling is the emissions factor used to characterize the amount of coal dust from a moving fully loaded coal rail car. The approach used the equation reported in the Connell-Hatch study (2008a, 2008b). This equation has since been used in a number of environmental studies in Australia (GHD 2012; Heggies 2009). The emissions factor for the rate of coal dust (total suspended particulates [TSP] sized) emitted is expressed in metric units of grams of TSP per kilometer or rail per metric ton of coal moved as follows.

$$\textit{Emissions Factor (loaded coal train)} = 0.0000378(V)^2 - 0.000126(V) + 0.000063$$

where V is the speed of the train (kilometer/hour)

This equation was developed from the analysis of coal dust loss (without mitigation) and a minimum air velocity needed for particle lift-off from a wind tunnel study over a variety of wind speeds. This emissions factor was further adjusted by 1.34 to account for the larger-sized rail cars used to transport coal in the United States (44.12 m^2) versus those used in Australia (30.37 m^2) (Connell-Hatch 2008a). Each loaded rail car was estimated to hold 122 tons of coal and an 85% emissions reduction effectiveness[7] was applied based on best practice of shaping the coal for transport by rail to minimize fugitive emissions and the application of a topping agent at the mine. Emissions rates for each operational setting were calculated and used in the AERMOD dispersion model using the on-site monitored meteorological data.

Findings from the model were then used to adjust the emissions estimates to produce the best fit with the observed data. The revised emissions estimates were then adjusted to reflect the rail traffic for the Proposed Action and the impact assessed.

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[6] The other data were not analyzed because the train came to a complete stop on the section of track being studied.

[7] BNSF tariffs require shippers to control coal dust emissions through use of load profiling and application of an approved topping agent or other measures to reduce emissions by at least 85% (BNSF Price List 6041-B and Appendices A and B, issued September 19, 2011).

5.7.4 Existing Conditions

This section provides an introduction to coal dust and describes the existing conditions in the study area related to coal dust that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative.

5.7.4.1 Introduction to Coal Dust

Coal dust is a form of particulate matter. Particulate matter is composed of small particles suspended in the air. There are both natural and human sources of particulate matter. Natural sources include dust storms and smoke from wildfires. Human sources include smoke from power plants and factories, wood smoke, vehicle engine exhaust, dust from unpaved roads, tobacco smoke, and coal dust.

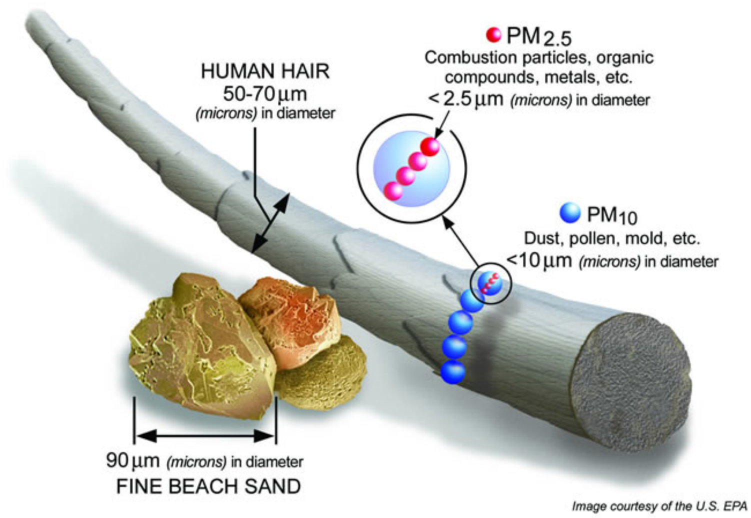
Coal loaded into train cars is made up of pieces and particles of differing size, including small particles, or dust. The movement of the rail cars during transit creates vibrations that can break larger pieces of coal into smaller particles, creating more dust. Likewise, during transit, wind and air moving over rail cars may blow coal dust[8] off the rail cars, disperse it in the air before the dust settles onto the ground. Coal dust is also generated and dispersed by winds and air currents during coal stockpiling and handling activities. The distance from the train or stockpile to where the dust settles on the ground varies depending primarily on the size of the particles, meteorological conditions including wind speed, and/or train speed.

Coal Dust and Human Health

From a human health perspective, inhalation of coal dust (particulate matter) is the primary exposure pathway of concern. Ingestion of coal dust is a potential, but less significant, exposure pathway. The principal characteristic of concern for particulate matter related to human health is particle size. Some particles are visible to the unaided eye as dust or smoke, but the smaller, invisible particles pose a human health risk. When particulate matter is inhaled, larger particles are filtered in the nose or throat by cilia and mucus, but small particles can pass through into the lungs. The smallest particles can enter the circulatory system, where they harden and inflame the arteries. Most of the smallest particles are produced by combustion, such as the burning of wood or fossil fuels, although some may also be present in dust, such as road dust and coal dust. Figure 5.7-2 illustrates typical small particle sizes

[8] Coal dust lost from rail cars is often referred to as fugitive coal dust. In the air quality regulatory context, emissions that are not emitted from a stack, vent, or other specific point that controls the discharge are known as fugitive emissions. For example, windblown dust is fugitive particulate matter.

Figure 5.7-2. Particulate Matter Particle Sizes



Source: U.S. Environmental Protection Agency 2013.

Because the health effects of particulate matter depend on particle size, scientists and regulatory agencies typically group small airborne particles into two categories based on particle size. The first category is *inhalable particles*, which includes PM10. For comparison, a human hair is approximately 70 microns in diameter. The second category is *inhalable fine particles*, which includes PM2.5. These particles are small enough to penetrate into the gas exchange regions of the lungs and are considered to pose the greatest risk to human health. The PM10 category includes PM2.5. As discussed in Section 5.7.1, *Regulatory Setting*, both sizes are regulated by federal law as criteria air pollutants. Particles smaller than 10 microns and larger than 2.5 microns are often referred to as *inhalable coarse particles*. Particulate matter is sometimes measured TSP. TSP measures particles of approximately 50 microns and smaller, and includes PM10 and PM2.5.

Coal dust contains large, visible particles and the smaller TSP, PM10, and PM2.5. The larger particles and TSP may result in nuisance impacts (impacts that affect the aesthetics, look, or cleanliness of surfaces). PM10 and PM2.5 have been determined to cause increased health hazard if the regulatory limits are exceeded (U.S. Environmental Protection Agency 2014c). If any pollutant level exceeds regulatory limits, health impacts would depend on the concentration in the air, the duration of the exposure, and the number of times exposure occurs.

While coal dust impacts in coal mines have been widely studied, the health impacts of non-occupational exposure to coal dust, such as coal dust from rail cars, have not been extensively studied. Some studies have found that communities near large coal-handling and processing facilities could have higher rates of respiratory complaints (Temple and Sykes 1992; Brabin et al. 1994). Others have found no difference between these communities and those farther away from coal facilities (Pless-Mulloli et al. 2000; Moffatt and Pless-Mulloli 2003).

The *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) considered human health impacts from coal dust inhalation for a proposed rail line in Montana. Using dispersion modeling, the study found the maximum annual average contribution of coal dust of 0.46 μg/m³ per train round trip of PM10, and 0.09 μg/m³ per train round trip of PM2.5. The per-train contribution to particulate matter of coal dust along the rail right-of-way for a 24-hour period was 1.85 μg/m³ per train round trip for PM10, and 0.40 μg/m³ per train round trip for PM2.5. Receptors used for modeling were placed every 10 meters out to 300 meters in a direction perpendicular to the rail track with maximum annual average concentrations found at either 40 or 50 meters.

The study also looked at human health impacts from coal dust ingestion by comparing concentration of coal dust and trace elements to federal health screening levels. The study concluded concentrations of coal dust constituents (including trace elements in coal and the chemical constituents of coal surfactants) in soil, dust, water, and fish would be below screening levels for human exposure for all evaluated pathways.

Emissions, Dispersion, and Deposition of Coal Dust

Rail cars and coal-handling facilities generate and emit coal dust. The total amount of fugitive coal dust released by a rail car or a coal-handling facility depends on the following factors.

- Coal type and composition
- Coal moisture content
- Ambient wind speed and direction
- Precipitation falling on the coal
- Topper agents or dust suppressants
- Size of the top opening of the rail car
- Shape (profile) of the coal surface in the car
- Position of the car in the train
- Time and distance traveled
- Train speed

Coal dust and other forms of particulate matter do not remain in the air indefinitely. Eventually, these particles settle out of the air and deposit on the ground. Coal dust may be deposited directly onto the rail ballast, along the rail right-of-way, or in adjacent areas. Where the coal dust lands (the distance from and the direction from the rail right-of-way) depends on particle size, wind speed, and other meteorological conditions. Human exposure to deposited coal dust can occur by human ingestion of soil, sediment, surface water, groundwater, agricultural products, fish, or other animals that have ingested soil or water tainted by coal dust deposits. Ecological impacts can occur by exposure of plants and animals to coal dust and its constituents in soil, sediment, surface water, and groundwater. Deposited coal dust could also cause nuisance impacts. Airborne coal dust may be deposited on houses, automobiles, boats, outdoor furniture, and other property.

Airborne coal dust dispersion can be predicted using mathematical models that describe the physical processes to simulate the particulate matter concentration. These models, known as dispersion models, take into account the time-varying sources of emission, as well as meteorological and seasonal conditions. The models require reasonable estimates of emissions rates to yield reliable estimates of the dispersion and deposition of particulate matter. As discussed below, this analysis used a dispersion model to assess coal dust deposition from the Proposed Action.

Coal Dust Emissions from Rail Cars

Most coal dust from rail cars comes directly from the surface of the coal pile in the rail car (Queensland Rail 2008). Smaller amounts may come from coal that has fallen onto the surfaces of the car or the wheel assemblies during loading.

A study funded by the U.S. rail industry (Calvin et al. 1993) estimated a train operating under clear, dry, sunny conditions lost between 0.17% (shaped profile) and 0.34% (unshaped profile) of the total coal load, with no use of surfactants or topper agents. These estimates were based on measuring the weight of the cars after loading and again at the end of the trip. The study did not provide information on the particle sizes associated with this emission of coal dust. The *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) notes that weighing cars before and after a trip does not account for the effects of the moisture content of coal. Some types of coal contain large amounts of water, up to more than 60% by weight in some lignite coals, and this technique is unreliable for estimating coal dust emissions because coal may dry out and become lighter during transport.

More recently, Ferreira et al. (2003) conducted full-scale measurements of coal dust emitted from coal trains. They placed dust-collecting instruments onto rail cars carrying coal from a port to a power station in Portugal. Some of the rail cars were equipped with mechanical covers that partially covered the coal load but left some of the coal exposed. Ferreira et al. found that these cars lost less than 0.001% of the loaded coal over a 220-mile trip with an average speed between 34 and 37 miles per hour.

An industry study conducted in Queensland, Australia also found the amount of coal dust emitted by rail cars to be small. This study, prepared on behalf of Queensland Rail Limited (now Aurizon), used a mathematical model (Witt et al. 1999) to predict the emissions of TSP-sized coal dust from trains moving on the Goonyella, Blackwater, and Moura rail systems in Queensland. The model estimated that these rail cars would lose an average of 0.0035% of their total load. For cars carrying approximately 90 tons of coal, typical for the cars in the study, this amounted to an average of about 6 pounds of coal dust lost per car, over trips between 100 and 300 miles in length (Queensland Rail 2008).

Witt et al. (1999) developed a computational fluid dynamics model that takes into account the effects of wind direction and velocity. Experimental measurements of dust lift-off from the surface in a wind tunnel at different travel speeds were used by Witt et al. (1999) to characterize the dust emissions rate. Based on the experimental data, Witt et al. developed a model for predicting the mass and particle size distribution lifted at different air speeds. The Queensland Rail (2008) study modified the equations that were developed by Witt et al. (1999) based on the emissions reported by Ferreira et al. (2003), as a function of train speed for particle size distributions. These equations were developed in the absence of any significant moisture. As such, the Queensland Rail study equations provide a conservative estimate because, by wetting the coal, surface precipitation tends to reduce actual emissions. This study did not include adjustments for the use of other dust control techniques such as covers or chemical topper agents.

The BNSF/UP Super Trial (BNSF Railway Company 2010) reported reductions in coal dust emissions using chemical topper agents. BNSF has imposed a tariff (a schedule of shipping rates and requirements) that requires coal shippers in Wyoming and Montana to control coal dust emissions from rail cars. One method allowed by the tariff is to use one of topper agents (surfactants) that, along with shaping the load profile, have been shown to reduce average coal dust emissions by at least 85%.

Airborne Coal Dust Dispersion

The concentration of coal dust in the air does not remain constant. Like all forms of particulate matter, coal dust disperses over time. Some studies that examine the movement of coal dust in the air use monitoring equipment to estimate the concentration of particulate matter. Others use mathematical dispersion models that describe the physical processes to simulate the particulate matter concentration.

The *Draft Environmental Impact Statement for Tongue River Railroad Company* (Surface Transportation Board 2015) used the AERMOD model to assess both air quality (ambient concentrations of particulate matter) and deposition. Results from the modeling showed a maximum increase in annual PM10 from coal dust emitted by trains of 6.1 micrograms per cubic meter ($\mu g/m^3$) at a distance of 50 meters from the rail line. The maximum annual increase in PM2.5 was 1.2 $\mu g/m^3$ at 50 meters from the rail line. Both of these increases would be insufficient to lead to a violation of NAAQS for either PM2.5 or PM10.

In another coal dust study, the *Pollution Reduction Program 4. - Particulate Emissions from Coal Trains* report (Australian Rail Track Corporation 2012) measured TSP, PM10, and PM2.5 concentrations as loaded and unloaded coal trains passed the monitors (4 meters from the nearest of four tracks) and compared these measurements with the concentration of particulate matter when no train was present. ARTC found that both loaded and unloaded coal trains were associated with higher measured concentrations of particulate matter. On average, coal trains increased the concentration of PM10 by as much as 7.6 $\mu g/m^3$ and the concentration of PM2.5 by as much as 2.1 $\mu g/m^3$ as the train passed by the monitor. The ARTC study did not analyze the measured particulate matter to determine the proportion of coal dust.

The Queensland, Australia Department of Science, Information Technology, Innovation and the Arts (DSITIA) conducted a 1-month study of dust at three sites in the Brisbane suburb of Tennyson. This study was conducted in response to community concern over dust from coal trains (Department of Science, Information Technology, Innovation and the Arts 2012). The monitoring site closest to the rail line was 6 meters (20 feet) from the track. The DSITIA study found that the major component of deposited dust was mineral dust (not coal dust), ranging between 40 and 50%. Coal accounted for 10 to 20% of deposited dust in the samples. Measurement of airborne dust levels indicated particulate matter concentrations increased by an average of less than 5 $\mu g/m^3$ when the train was passing by the monitor. The DSITIA study measured airborne dust concentrations as PM20 (particles with a diameter less than 20 microns), so the concentrations of PM10 and PM2.5 would have been lower.

Airborne Coal Dust Deposition

Coal dust emitted to the atmosphere settles out of the air and deposits on the ground. Coal dust may be deposited directly onto the rail ballast, along the right-of-way, or in adjacent areas. Where the coal dust lands (the distance from and the direction from the rail right-of-way) depends on particle size, wind speed, and other meteorological conditions.

A Queensland, Australia study of the deposition of coal dust along rail lines over a 6-month period found that the maximum deposition of coal dust (TSP size and smaller) occurred at approximately 3 meters (10 feet) from the edge of the track (Queensland Government Safety in Mines Testing and Research Station 2007).

For the *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) a model was prepared to evaluate airborne coal dust deposition. This model evaluated particles over 250 microns because particles of this size would deposit very quickly after being blown from a rail car and would primarily deposit within the right-of-way of the railroad. The study concluded that larger particles would deposit mostly within 5 meters (approximately 16.4 feet) of the center of the rail line and would not be likely to deposit outside of the rail right-of-way, even under unusually windy conditions.

Ecological Impacts of Coal Dust

The *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) evaluated the potential ecological impacts of coal dust. The following presents the methods and findings of the study. The study used an air dispersion and deposition model combined with a fate and transport model to estimate concentrations of coal dust in soil, water, and sediment. Coal from the proposed source mine in the Powder River Basin, Otter Creek, was used to characterize the trace metals in the coal. The study then compared estimated soil, sediment, and water concentrations of trace metals based on coal dust deposition modeling with EPA ecological soil screening levels to evaluate soil exposure for ecological receptors, including plants, soil invertebrates, avian wildlife, and mammalian wildlife (U.S. Environmental Protection Agency 2005). Freshwater screening values account for ecological impacts from fish exposure (U.S. Environmental Protection Agency 2013d). To evaluate the movement of dust to soil and subsequently to sediment and surface water, the study used the area-wide average deposition rate of particulates 250 microns in diameter and smaller. The study did not explicitly model particles of aerodynamic diameter 250 microns and larger because particles of this size would not deposit outside of the right-of-way. The study followed EPA risk assessment guidance to assume that 100% of the chemical constituents in coal dust are bioavailable (U.S. Environmental Protection Agency 2007). The study found that none of the chemical concentrations estimated for soil would result in values greater than the EPA ecological soil screening levels for plants, soil invertebrates, avian wildlife, or mammalian wildlife.

Concentrations of coal dust constituents in surface water were estimated based on the average deposition from air over a modeled watershed and subsequent runoff and erosion into a modeled water body. Nearly all of the estimated values for water in the model were well below available EPA freshwater screening benchmarks (U.S. Environmental Protection Agency 2013). The study found barium is the only coal dust constituent analyzed for which predicted concentration (10.1 micrograms per liter) would exceed the freshwater screening benchmark of 4.0 micrograms per liter. The study concluded that the concentration of barium from coal dust in freshwater would be unlikely to exceed the screening benchmark. The findings of the study found estimates of coal dust constituent concentrations in soil, sediment, and surface water were below screening levels for ecological exposure, with the exception of values for barium in surface water.

Based on the use of several conservative assumptions in the analysis, such as 100% bioavailability, overestimate the likely concentration of barium in surface water. Furthermore, when barium is released to water, the compound will precipitate, or come out of solution, as barium sulfate, which has low solubility in water. Therefore, the study did not expect that concentrations of soluble barium in surface water would exceed benchmark or screening levels.

Safety Impacts of Coal Dust

The *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) considered the potential for impacts from coal dust on safety through the fouling of railroad ballast. The Surface Transportation Board concluded that there is evidence that coal dust can harm the stability of railroad ballast. The study concluded higher levels of coal train traffic would result in more frequent impacts than lower traffic levels. Impacts at locations near the tracks would be greater than at locations farther away. Impacts from trains carrying coal with a shaped load profile and to which a topper agent has been applied would be less than impacts from trains carrying untreated coal.

Nuisance Impacts of Coal Dust

The potential for nuisance impacts at a specific location would be affected by many factors, including train traffic levels, train speed, coal dust emissions reduction measures in use, distance from the track, and local topographic and meteorological conditions. The *Draft Environmental Impact Statement, Tongue River Railroad Company* (Surface Transportation Board 2015) found higher levels of coal train traffic would result in more frequent impacts than lower traffic levels. Impacts at locations near the tracks would be greater than at locations farther away. Impacts from trains carrying coal with a shaped load profile and to which a topper agent was applied would have less impacts than trains carrying untreated coal.

5.7.4.2 Existing Conditions in the Study Area

The following describes the existing coal dust conditions in the study area.

Applicant's Leased Area

The existing bulk product terminal in the Applicant's leased area currently receives 1 to 2 coal trains per week, consisting of 25 to 30 coal rail cars. Coal is stored in silos in the Applicant's leased area, adjacent to the project area, and transferred via truck to the Weyerhaeuser facility, located 1 mile to the southeast. Because the coal is stored in silos and only 1 to 2 trains are received each week, coal dust emissions are estimated to be small and confined almost entirely within the Applicant's leased area.

Cowlitz County

Approximately 2 loaded coal trains, each consisting of approximately 125 cars, operate daily along the northbound BNSF main line in Cowlitz County (Western Organization of Resource Councils 2014).

Cowlitz County is classified as an attainment area or unclassified[9] for both PM10 and PM2.5. Of these two pollutants only PM2.5 is currently being monitored. The PM2.5 monitoring station located

[9] The U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) designate regions as being attainment or nonattainment areas for regulated air pollutants. Attainment status

at Olympic Middle School is a neighborhood-scale site, affected primarily by smoke from home heating. It is considered representative of the Longview-Kelso area and is used for curtailment calls during the home heating season. The estimated 24-hour design value in 2014 was 18 microns per cubic meter ($\mu g/m^3$). While not a reference instrument, it is considered a strong indicator of the relative PM2.5 concentration of the Longview-Kelso area. Air quality in other locations of Cowlitz County is generally as good as or better than in the Longview-Kelso area.

The most recent national air toxic assessment found that Cowlitz County had an overall inhalation cancer risk of 34 cancers per million, which is slightly lower than the state average of 43 per million and below the national average of 50 per million[10] (U.S. Environmental Protection Agency 2015). Seventy percent of the Cowlitz County air toxic cancer risk is due to just three air toxics: formaldehyde, benzene, and the classification group of chemicals of polycyclic aromatic hydrocarbons.

Washington State

Currently, 2 to 4 loaded coal trains, each consisting of approximately 125 cars, operate daily in Washington State beyond Cowlitz County, mainly along the BNSF main line (Western Organization of Resource Councils 2014; *The Herald* 2013). Section 5.6, *Air Quality*, describes existing air quality conditions for PM10 and PM2.5 along Proposed Action-related rail routes.

5.7.5 Impacts

This section describes the potential direct and indirect impacts related to coal dust that would result from construction and operation of the Proposed Action and the No-Action Alternative.

5.7.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area as a result of construction and operation of the Proposed Action.

At full operation, Proposed Action-related trains would add 8 loaded and 8 empty coal trains per day (16 total trains per day) to the rail lines between the Powder River Basin or the Uinta Basin and the project area. In the project area, unloading facilities would unload coal from rail cars within an enclosed structure. The unloading facilities would contain equipment to rotate rail cars and discharge the coal from the rail cars into a large hopper. As the tandem rotary dumper rotates the rail cars and begins to unload the coal into hoppers beneath the dumper, sprayers would spray water to avoid and minimize dust dispersion within the enclosed structure.

A network of belt conveyors would transport coal from the rail car unloading facilities to the stockpile area, and from the stockpile area to the vessel-loading facilities, or from rail cars directly to the vessel-loading facilities. All belt conveyors and transfer stations would be fully enclosed, except for the stockpile area and vessel-loading conveyors, which would be open due to their operational requirements. The coal stockpile area would have a dust suppression system. Vessels would be loaded using shiploaders that would include enclosed boom and loading spout. The loading spout

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indicates that air quality in an area meets the federal, health-based ambient air quality standards. Unclassified is an area with not enough air quality monitoring data has been collected to classify the area.

[10] The NATA assessment did not include diesel particulate matter in the risk assessment as EPA believes the cancer potency risk factor has to large of uncertainty to provide meaningful results.

would also be telescopic and would be inserted below the deck of the vessel during vessel loading to avoid and minimize dust dispersion.

Construction

Construction would not result in direct or indirect impacts related to coal dust because it would not include any coal-handling or transport activities.

Operations—Direct Impacts

Operation of the Proposed Action would result in the following direct impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Emit and Deposit Coal Dust In and Near the Project Area

Operation of the Proposed Action would emit coal dust from coal handling and transport activities in the project area. Table 5.7-3 illustrates the estimated maximum annual and monthly coal dust deposition at or beyond the project area and Applicant's leased area boundaries.

Table 5.7-3. Estimated Maximum Annual and Monthly Coal Dust Deposition

Location	Maximum Annual Deposition ($g/m^2/year$)	Maximum Monthly Deposition ($g/m^2/month$)	Trigger Level for Sensitive Areas ($g/m^2/month$)[a]
Project area boundary (fence line) near Mt. Solo Road	1.88	0.31	2.0

Notes:
[a] Source: New Zealand Ministry of Environment 2001
$g/m^2/year$ = grams per square meter per year; $g/m^2/month$ = grams per square meter per month

The estimated maximum monthly coal dust deposition (0.31 $g/m^2/month$) would be at the project area boundary near Mt. Solo Road (Figure 5.7-3). The estimated maximum monthly coal dust deposition (0.31 $g/m^2/month$) would be below the trigger level for sensitive areas (2.0 $g/m^2/month$).

The spatial extent of the estimated maximum annual coal dust deposition near the project area is shown in Figure 5.7-4. As shown, within a few thousand feet of the project area, the annual deposition of coal dust is estimated to be less than 0.1 g/m^2.

Operations—Indirect Impacts

Operation of the Proposed Action would result in the following indirect impacts. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Cowlitz County

A dispersion model was performed to assess coal dust deposition from Proposed Action-related trains along the Reynolds Lead and BNSF Spur and along the BNSF main line in Cowlitz County based on existing freight train speeds.

Figure 5.7-3. Estimated Maximum Monthly Coal Deposition

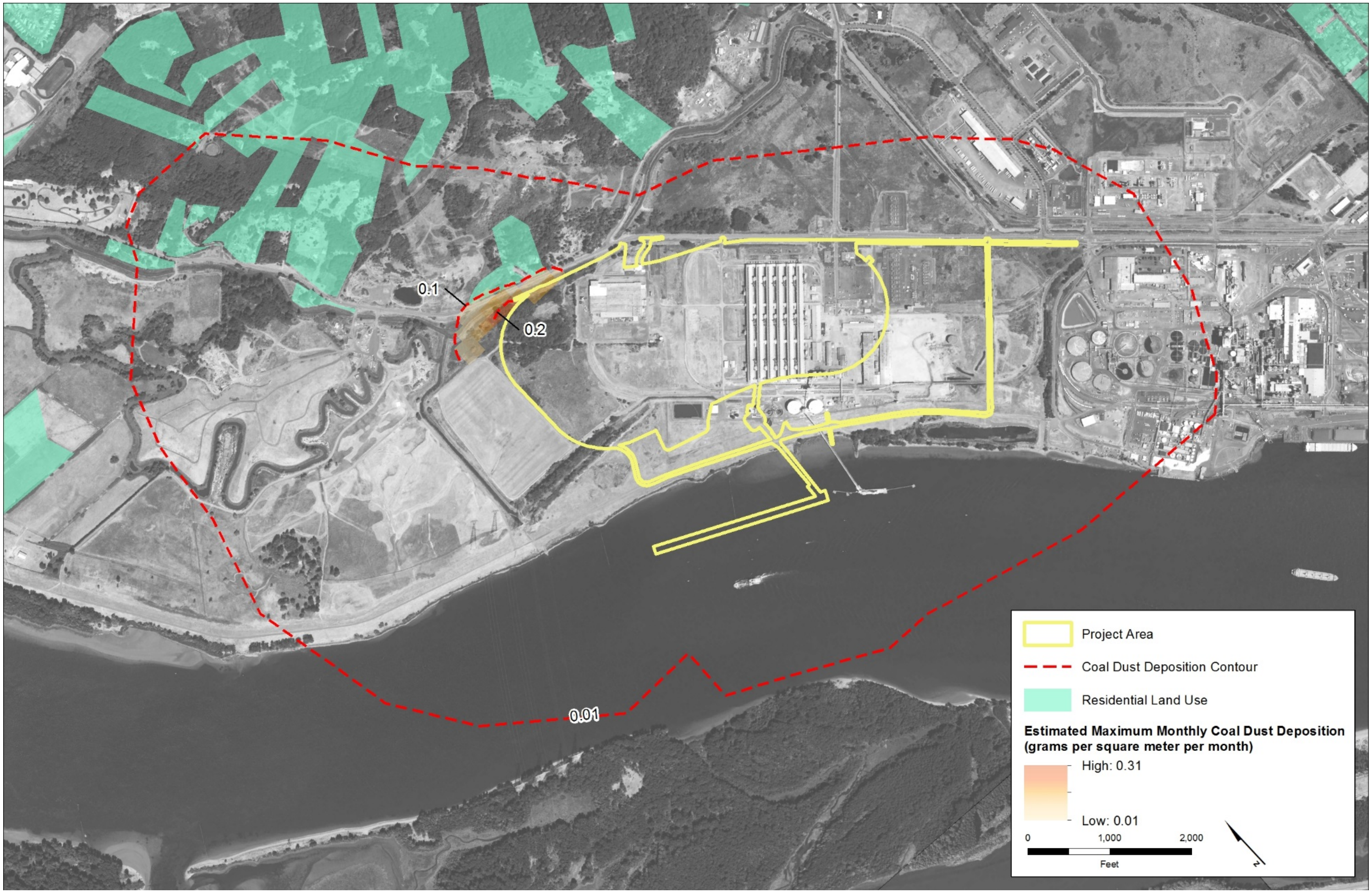
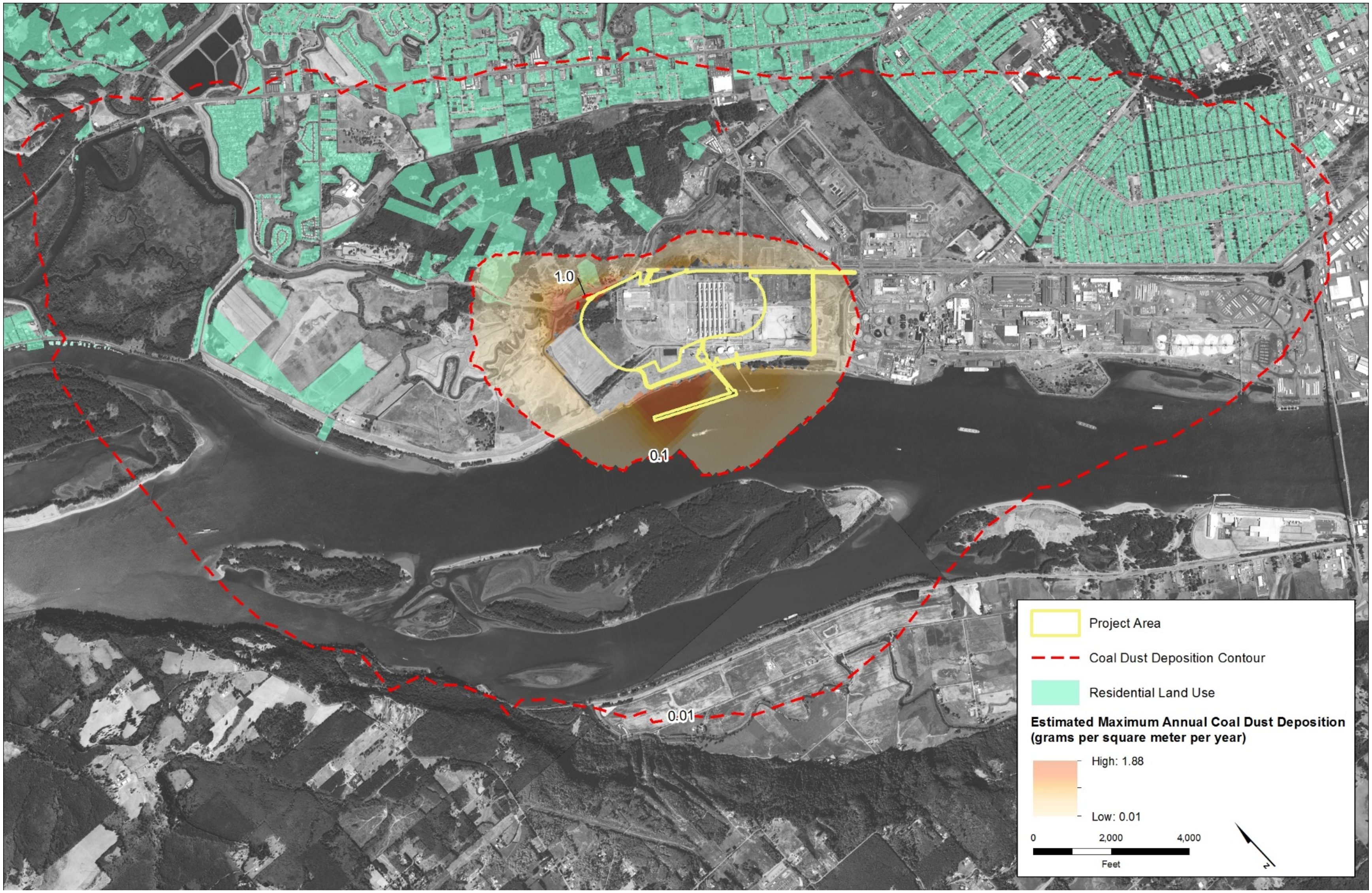


Figure 5.7-4. Estimated Maximum Annual Coal Deposition



- **Reynolds Lead and BNSF Spur**. Emissions of PM10 and PM2.5 from Proposed Action-related trains at 100 feet from the rail line were projected to be below the NAAQS (Table 5.7-4). The estimated maximum modeled 24-hour increase in PM10 concentration due to coal dust is 0.28 μg/m^3; the estimated maximum increase in 24-hour PM2.5 due to coal dust is 0.05 μg/m^3. The estimated annual PM2.5 concentration would increase 0.01 μg/m^3. Concentrations would decline by approximately 50% at approximately 160 feet from the rail line. The closest residential receptor is located approximately 180 feet from the north side of the Reynolds Lead.

Table 5.7-4. Estimated Maximum PM10 and PM2.5 Concentrations 100 Feet from Rail Line—Reynolds Lead and BNSF Spur

Pollutant	Averaging Period	Maximum Modeled Impact (μg/m^3)	Background[a] (μg/m^3)	Total Concentration (μg/m^3)	NAAQS (μg/m^3)
PM10	24 hour[b]	0.28	28	28.28	150
PM2.5	24 hour[c]	0.05	16	16.05	35
	Annual[d]	0.01	5.3	5.31	12

Notes:
[a] Background concentrations are monitoring design values from Northwest International Air Quality Environmental Science and Technology Consortium (2015).
[b] The PM10 24-hour modeled impact is 3-year average of the second-highest concentrations.
[c] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of the daily maximum concentrations.
[d] Modeled annual impact is the annual average over 3 modeled years.
NAAQS = National Ambient Air Quality Standards; μg/m^3 = microns per cubic meter

Table 5.7-5 reports the estimated maximum increase in deposition along the Reynolds Lead and BNSF Spur at the closest residential receptor (approximately 180 feet from the Reynolds Lead and BNSF Spur). The estimated maximum monthly deposition would be below the trigger for sensitive receptors (New Zealand Ministry of Environment 2001). These concentrations would decrease by 50% at approximately 340 feet from the Reynolds Lead and BNSF Spur.

Table 5.7-5. Estimated Maximum and Average Monthly Coal Dust Deposition—Reynolds Lead and BNSF Spur

Distance (feet)	Average Maximum Monthly Deposition (g/m^2/month)	Maximum Monthly Deposition (g/m^2/month)	Trigger Level for Sensitive Receptors (g/m^2/month)[a]
180	0.013	0.017	2.0
340	0.006	0.008	2.0

Notes:
[a] Source: New Zealand Ministry of Environment 2001
g/m^2/month = grams per square meter per month

- **BNSF Main Line.** Emissions of PM10 and PM2.5 from Proposed Action-related trains at the closest residential receptors are estimated to be below the NAAQS (Table 5.7-6). While some receptors are as close as 50 feet, others are more than 100 feet from the BNSF main line and therefore would have lower concentrations than the 100-foot concentration shown in

Table 5.7-6. These estimated concentrations are higher than estimates for the Reynolds Lead because higher train speeds on the main line[11] enhance the lift-off of coal particles from open rail cars. However, in all cases, these concentrations are below NAAQS.

Table 5.7-6. Estimated Maximum PM10 and PM2.5 Concentrations—BNSF Main Line, Cowlitz County

Pollutant	Averaging Period	Distance from Rail Line (feet)	Modeled Impact (μg/m³)	Background[a] (μg/m³)	Total Concentration (μg/m³)	NAAQS (μg/m³)
PM10	24 hours[b]	50	30.0	28.0	58.0	150
		100	23.0	28.0	51.0	150
PM2.5	24 hours[c]	50	4.5	21.0	25.5	35
		100	3.8	21.0	24.8	35
	Annual[d]	50	2.1	5.9	8.0	12
		100	1.7	5.9	7.6	12

Notes:

[a] Background concentrations are monitoring design values for Woodland, Washington (Northwest International Air Quality Environmental Science and Technology Consortium 2015).

[b] The PM10 24-hour modeled impact is 3-year average of the second-highest concentration.

[c] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of the daily maximum concentrations. The modeled impact is different than the annual average due to day-to-day variation in meteorology.

[d] Modeled impact is the annual average over the 3 modeled years. The modeled impact is different than the 24-hour average due to day-to-day variation in meteorology.

NAAQS = National Ambient Air Quality Standards; μg/m³ = microns per cubic meter

The estimated maximum monthly coal dust deposition along the BNSF main line in Cowlitz County would exceed the trigger level for certain residential receptors (Table 5.7-7). These estimated depositions are higher than estimates for the Reynolds Lead and BNSF Spur because higher train speeds on the main line enhance the lift-off of coal particles from open rail cars. The estimated maximum monthly deposition is slightly above the trigger level for sensitive receptors at 100 feet (New Zealand Ministry of Environment 2001).[12] As a result, residents who live along the main line could experience nuisance levels which may visible soiling on window sills, outdoor furniture, and other property.

[11] Based on the near maximum coal train speed of 50 miles per hour observed during the coal dust monitoring (Figure 5.7-1).

[12] These modeled results are comparable to those found during recent monitoring conducted by Corporation of Delta (2014) that reported coal dust deposition amounts ranging from 2 to 10 g/m²/month (July 2013, April 2014, and October 2014) for an average of six 125-car loaded coal trains passing each day at an average speed of 35 mph (Brotherston 2014). The dust fall monitor was located 66 feet from the BNSF main line.

Table 5.7-7. Estimated Maximum and Average Monthly Coal Dust Total Suspended Particulate Deposition—BNSF Main Line, Cowlitz County[a]

Distance (feet)	Average Maximum Monthly Deposition (g/m^2/month)	Maximum Monthly Deposition (g/m^2/month)	Trigger Level for Sensitive Receptors[b] (g/m^2/month)
50	**2.2**	**3.1**	2.0
100	1.4	**2.3**	2.0
150	0.98	1.8	2.0

Notes:
[a] **Bolded, shaded gray** indicates the estimated deposition would be higher than the trigger level for sensitive receptors.
[b] Source: New Zealand Ministry of Environment 2001
g/m^2/month = grams per square meter per month

Table 5.7-8 compares the maximum trace element concentrations found in coal dust with their respective acceptable source impact levels (ASIL).

Table 5.7-8. Estimated Maximum Concentrations of Trace Elements Compared with Acceptable Source Impact Levels—BNSF Main Line, Cowlitz County

Substance[a]	Maximum Concentration (μg/m³)	ASIL (μg/m³)	Averaging Time	Percentage of ASIL (%)
Arsenic and inorganic arsenic compounds	0.000062	0.000303	Annual	20.4
Beryllium and compounds	0.000007	0.000417	Annual	1.8
Cadmium and compounds	0.000002	0.000238	Annual	0.7
Chromium (VI)[b]	0.0000047	0.00000667	Annual	70.4
Cobalt as metal dust and fume	0.00013	0.1	24 hour	0.1
Copper, dusts and mists	0.0015	100.0	1 hour	0.002
Lead compounds	0.000038	0.0833	1 year	0.046
Manganese dust and compounds	0.00093	0.04	24 hour	2.3
Mercury, aryl and inorganic	0.000005	0.09	24 hour	0.005
Nickel and compounds	0.000031	0.0042	Annual	0.74
Selenium compounds	0.000065	20.0	24 hour	0.0003
Vanadium compounds	0.000732	0.2	24 hour	0.37
Crystal silica (PM4 -respirable) daily average	0.94[c]	3.0	8 hour	31.3

Notes:
[a] The fraction of trace elements found in coal is based on the maximum fraction of these elements found in two Powder River Basin coal beds (Stricker et al. 2007) in combination with the coal dust air quality modeling.
[b] Chromium (VI) is likely substantially lower than as shown in the table because the percent of chromium as chromium (VI) was conservatively assumed to be the same as coal fly ash, which is a post-combustion coal residual. Combustion is known to substantially increase the percentage of chromium as chromium (VI) (Stam et al. 2011).
[c] Based on analysis of coal dust sample from field program. Total crystal silica fraction in coal dust is the sum of the crystal silica quartz and silicate fractions.
ASIL = acceptable source impact level; μg/m³ = microns per cubic meter

ASILs are screening concentrations for toxic air pollutant in the ambient air, and are based on the levels established in Washington Administrative Code (WAC) 173-460-150 for stationary sources, but are shown here for comparison purposes. As shown in Table 5.7-8, all predicted maximum concentrations of trace elements found in coal dust along the BNSF main line in Cowlitz County would be less than their respective ASILs.

Washington State (Outside Cowlitz County)

A dispersion model was run to assess coal dust concentration and deposition from the Proposed Action-related trains traveling along the BNSF main line from the Washington–Idaho border to Cowlitz County. The model predicted concentration of PM10 and PM2.5 at a distance of 100 feet from the rail line to be below the NAAQS (Table 5.7-9). These concentrations would decrease by 50% another 100 feet away from the rail line.

Table 5.7-9. Estimated Maximum PM10 and PM2.5 Concentrations 100 Feet From Rail Line—BNSF Main Line, Washington State (Outside Cowlitz County)

Pollutant	Averaging Period	Modeled Impact (μg/m³)	Background[a] (μg/m³)	Total Concentration (μg/m³)	NAAQS (μg/m³)
PM10	24 hour[b]	24.2	101.0	125.2	150
PM2.5	24 hour[c]	2.8	24.2	27.0	35
	Annual[d]	0.92	8.9	9.82	12

Notes:

[a] Background for PM10 is the maximum highest second high 24-hour average over the 3-year period (2012-–2014) from Kennewick or Spokane. The background PM2.5 from the Spokane monitor from the 2012–2014 period.

[b] The PM10 24-hour modeled impact is 3-year average of the second-highest concentration.

[c] The PM2.5 24-hour modeled impact is the 3-year average of the 98th percentile of the daily maximum concentrations. The modeled impact is different than the annual average due to day-to-day variation in meteorology.

[d] Modeled impact is the annual average over the 3 modeled years based on Moses Lake meteorological data (2010–2012). The modeled impact is different than the 24-hour average due to day-to-day variation in meteorology.

NAAQS = National Ambient Air Quality Standards; μg/m³ = microns per cubic meter

The maximum monthly coal dust emissions along the BNSF main line in Washington State (outside of Cowlitz County) would be below the trigger level (Table 5.7-9). The results show the increase in deposition for receptors located about 100 and 200 feet from the rail line. Maximum monthly deposition occurs during December, but would be below the trigger level. The predicted maximum concentration of trace metals would be similar to the levels reported for Cowlitz County, which were not predicted to exceed the ASIL for any substance (Table 5.7-10).

Table 5.7-10. Estimated Maximum and Average Monthly Coal Dust Deposition—BNSF Main Line, Washington State (Outside Cowlitz County)

Distance (feet)	Average Maximum Monthly Deposition (g/m^2/month)	Maximum Monthly Deposition (g/m^2/month)	Trigger Level for Sensitive Areas (g/m^2/month)[a]
100	0.71	0.86	2.0
200	0.26	0.50	2.0

Notes:
[a] Source: New Zealand Ministry of Environment 2001
g/m^2/month = grams per square meter per month

For empty rail cars on the return routes to the Powder River Basin and Uinta Basin, an Australian study evaluated the volume of coal left in rail cars after trains are unloaded (Commonwealth Scientific and Industrial Research Organisation 2007). Applying the results of this study and the emissions factor equation to estimate the coal dust emissions rate, the estimated empty rail car coal dust emissions rate would be less than 0.2% of the loaded rail car rate.

Impact Summary

The coal dust analysis made the following conclusions.

- **Project area.** Estimated maximum monthly deposition of coal dust within the project area would be below the threshold of 2.0/m^2/month (New Zealand Ministry of Environment 2001) used for this analysis.
- **Reynolds Lead and BNSF Spur, Cowlitz County:**
  - Estimated maximum PM10 and PM2.5 concentrations from coal dust emissions plus background would be below applicable NAAQS.
  - Estimated maximum and average monthly deposition of coal dust would be below the threshold of 2.0/m^2/month (New Zealand Ministry of Environment 2001) used for this analysis.
- **BNSF Main Line, Cowlitz County:**
  - Estimated maximum PM10 and PM2.5 concentrations from coal dust emissions plus background would be below applicable NAAQS.
  - Estimated maximum (at 100 feet) and average (at 50 feet) monthly deposition of coal dust would be slightly above the threshold of 2.0/m^2/month (New Zealand Ministry of Environment 2001) used for this analysis.
- **BNSF Main Line, Washington State (outside Cowlitz County):**
  - Estimated maximum PM10 and PM2.5 concentrations from coal dust emissions plus background would be below applicable NAAQS.
  - Estimated maximum and average monthly deposition of coal dust would be below the threshold of 2.0/m^2/month (New Zealand Ministry of Environment 2001) used for this analysis.

In 2015, a study was published that evaluated PM2.5 concentrations during the passing of a coal train on the BNSF main line in the Columbia River Gorge in Washington State (Jaffe et al. 2015). The study evaluated 2-minute average PM2.5 concentrations. After 2 minutes PM2.5 concentrations returned to background levels. The study was conducted before the BNSF surfactant facility in Pasco began operation similar to the modeling study for the Proposed Action. The maximum 2-minute monitored concentration from a single unit coal train was measured at 130 feet downwind of the coal train. As shown in Table 5.7-6 the maximum modeled 24-hour PM2.5 concentration was 3.8 $\mu g/m^3$ at 100 feet for a Proposed Action-related train, which is similar to results found by Jaffe (2.6 $\mu g/m^3$) if 8 unit trains are considered and expressing in terms of the regulatory averaging period of 24-hour concentration. Thus, the findings of Jaffe and the results of the analysis for the Proposed Action are generally consistent.

Overall, the impacts of PM10 and PM2.5 emissions from Proposed Action-related rail transport of coal would not be significant because emissions would be below applicable federal standards. The average and maximum deposition of coal dust on the BNSF main line in Cowlitz County was estimated to be above the nuisance thresholds at 50 and 100 feet, and because no state or federal standards apply, this an unavoidable but not significant impact.

5.7.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal and impacts related to coal dust from construction and operation of the Proposed Action would not occur. The Applicant would continue with current and future operations in the project area. The project area could be developed for other industrial uses, including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement. Petroleum coke transfer would have minimal coal dust emissions because the material is stored in a building and the transfer from vessel occurs through vacuum unloader.

5.7.6 Required Plans and Permits

The following required permit would be required in relation to coal dust for the Proposed Action.

- **Notice of Construction—Southwest Clean Air Agency.** Businesses and industries that cause, or have the potential to cause, air pollution are required to receive approval from the local air agency prior to beginning construction. These requirements of Washington's Clean Air Act apply statewide (Chapter 70.94 Revised Code of Washington [RCW]). Businesses located in Cowlitz County are regulated by the Southwest Clean Air Agency. The agency rules generally require an air permit for a stationary sources emitting more than 0.75 ton per year of PM10 or 0.5 ton per year for PM2.5.[13] It is anticipated these levels would be exceeded and the Applicant would need to file a permit application and receive an approved Notice of Construction air permit prior to constructing, installing, establishing, or modifying any equipment or operations that may emit air pollution.

[13] Other criteria air pollutants have higher emissions thresholds.

5.7.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to coal dust from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action.

5.7.7.1 Voluntary Mitigation

The Applicant has committed to implementing the following measure to mitigate impacts related to coal dust.

- To address coal dust emissions from rail cars, the Applicant will not receive coal trains unless the coal has been appropriately shaped in the rail cars and surfactant applied at the mine area.

5.7.7.2 Applicant Mitigation

The Applicant will implement the following measure to mitigate impacts related to coal dust.

MM CDUST-1. Monitor and Reduce Coal Dust Emissions in the Project Area.

To address coal dust emissions, the Applicant will monitor coal dust during operation of the Proposed Action at locations approved by the Southwest Clean Air Agency. If coal dust levels exceed an established level, the Applicant will take further actions to reduce coal dust emissions. Potential locations to monitor coal dust include the coal piles, on the dock, where the rail line enters the facility when coal operations begin, and at a location near the closest residences to the project area, if agreed to by the property owner(s). The Applicant will conduct monthly reviews of the emissions data and maintain a record of data for at least 5 years after full operations. If emissions data show exceedances of air quality standards, the Applicant will report this information to Southwest Clean Air Agency, Cowlitz County and Ecology. The Applicant will gather 1 year of fenceline data on particulate matter (PM) 2.5 and PM10 prior to beginning operations and maintain the data as reference. This data will be reported to the Southwest Clean Air Agency, Cowlitz County, and Ecology.

MM CDUST-2. Establish Reporting Process for Coal Dust Complaints in Cowlitz County.

To address coal dust emissions, the Applicant will meet with the Southwest Clean Air Agency prior to the start of operations to design and implement a coal dust awareness and investigation system for community members in Cowlitz County. The system will receive complaints or concerns, investigate, respond, resolve and report findings to the complainant and Southwest Clean Air Agency. The system will be available during operation of the Proposed Action. The Applicant will operate the system or provide funding for Southwest Clean Air Agency to operate the system. A report will be submitted annually to Cowlitz County and the City of Longview and posted on Southwest Clean Air Agency website.

MM CDUST-3. Reduce Coal Dust Emissions from Rail Cars.

To address coal dust emissions, the Applicant will not receive coal trains unless surfactant has been applied at the BNSF Railway Company (BNSF) surfactant facility in Pasco, Washington for

BNSF trains traveling through Pasco. While other measures to control emissions are allowed by BNSF, those measures were not analyzed in this Draft EIS and would require additional environmental review. For trains that will not have surfactant applied at the BNSF surfactant facility in Pasco, before beginning operations, the Applicant will work with rail companies to implement advanced technology for applicants of surfactants along the rail routes for Proposed Action-related trains.

MM CDUST-4. Provide Information to the Columbia River Gorge Commission.

To address statewide public interests and concern of coal dust emissions, the Applicant will attend at least one Columbia River Gorge Commission public meeting per year and be available to present information on coal dust emissions and rail traffic related to the Proposed Action and discuss concerns.

5.7.7.3 Other Measures to Be Considered

The following measure could be implemented to mitigate impacts related to coal dust.

- BNSF should conduct a dust monitoring study along BNSF main line in Cowlitz County to evaluate coal dust emissions from coal trains, and if necessary, take further actions to reduce such emissions.

5.7.8 Unavoidable and Significant Adverse Environmental Effects

Implementation of the mitigation measures described above would reduce impacts related to coal dust. There would be no unavoidable and significant adverse environmental impacts from coal dust.

5.8 Greenhouse Gas Emissions and Climate Change

This section describes the estimated greenhouse gas emissions that would result from construction and operation of the Proposed Action (Section 5.8.1) and assesses the potential climate change impacts on the Proposed Action (Section 5.8.2).

5.8.1 Greenhouse Gas Emissions

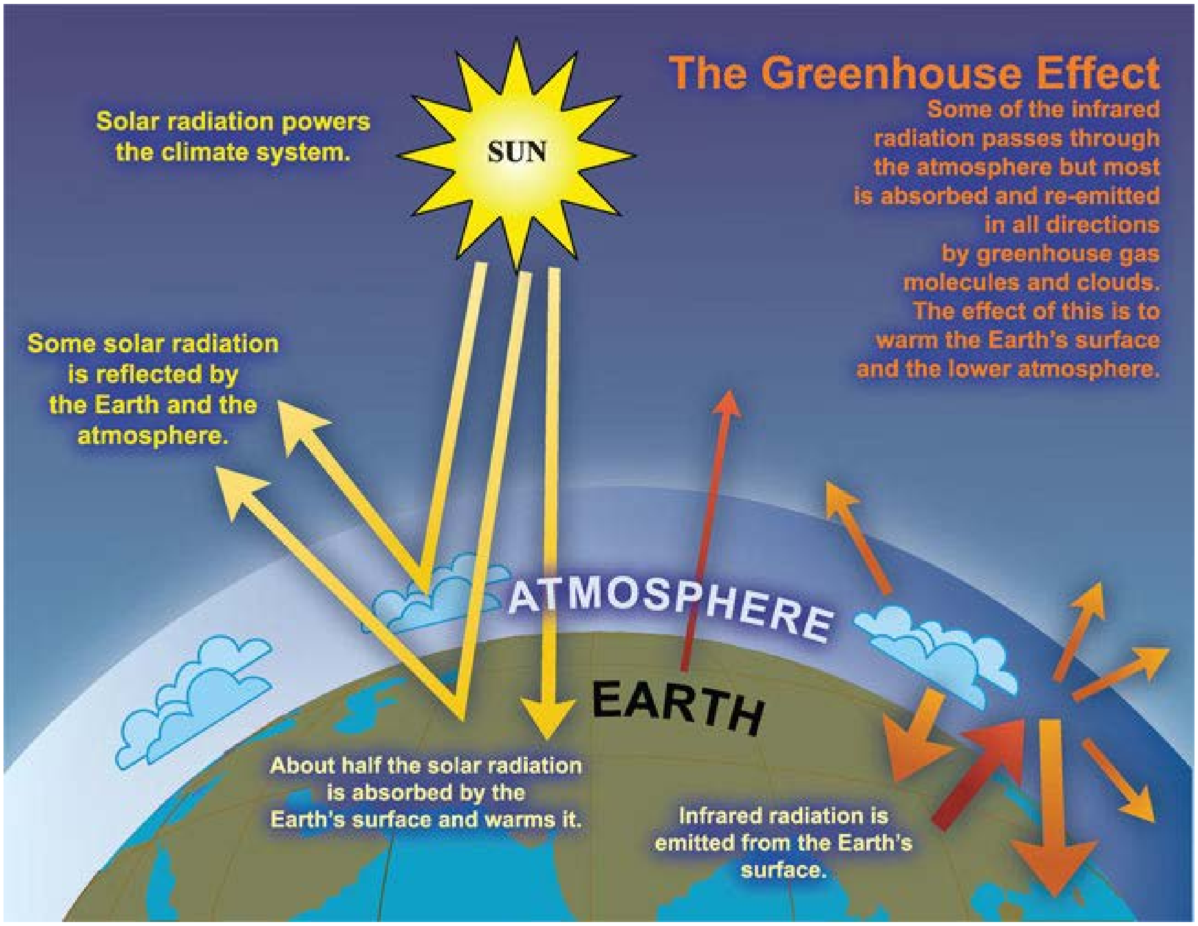
Greenhouse gases are air pollutants that trap solar energy in the atmosphere and contribute to global warming and climate change. Greenhouse gases are emitted from natural sources and are removed from the atmosphere by natural processes. Greenhouse gases are also emitted from human processes, which are now outpacing the natural processes that remove greenhouse gases from the atmosphere. Identifying and reducing excess greenhouse gas emissions from human processes are critical to reducing climate change. Greenhouse gases are global, rather than local, air pollutants with worldwide impacts.

5.8.1.1 Greenhouse Effect

The Earth retains outgoing thermal energy and incoming solar energy in the atmosphere, thus maintaining temperatures suitable for biological life. This retention of energy by the atmosphere is known as the greenhouse effect. When solar radiation reaches the Earth, most of it is either reflected or absorbed by the Earth's surface—or to a lesser degree, its atmosphere. Simultaneously, the Earth radiates its own heat and energy out into space. Factors such as the reflectivity of the Earth's surface, the abundance of water vapor, or the extent of cloud cover affects the degree to which solar radiation may be absorbed and reflected. Figure 5.8-1 shows how the energy flows to and from Earth and the role that the greenhouse effect plays in maintaining heat in the atmosphere.

The composition of gases in the Earth's atmosphere determines the amount of energy absorbed and reemitted by the atmosphere or simply reflected back into space. The predominant gases in the Earth's atmosphere, nitrogen and oxygen (which together account for nearly 90% of the atmosphere), exert little to no greenhouse effect. Some naturally occurring gases, such as carbon dioxide (CO_2), methane, and nitrous oxide trap outgoing energy and contribute to the greenhouse effect. Additionally, manufactured pollutants, such as hydrofluorocarbons, can contribute to the greenhouse effect. Unlike most air pollutants (e.g., sulfur dioxide and particulate matter) that have only a local impact on air quality, greenhouse gases affect the atmosphere equally, regardless of where they are emitted, and thus they are truly global pollutants. A ton of methane emissions in Asia affects the global atmosphere to the same degree as a ton of methane emissions in the United States.

Figure 5.8-1. Model of the Natural Greenhouse Effect



Source: Intergovernmental Panel on Climate Change 2007

The extent to which a given greenhouse gas traps energy in the atmosphere and contributes to the overall greenhouse effect is characterized by its global-warming potential. Some gases are more effective at trapping heat, while others may be longer-lived in the atmosphere. The reference gas against which others are compared is carbon dioxide, and global warming potential is thus expressed in terms of carbon dioxide equivalent (CO_2e). CO_2e reflects both a gas's ability to trap heat and the rate at which it breaks down in the atmosphere. Most analyses use 100 years as the period of reference for global warming potential. For example, 1 unit of carbon dioxide has a 100-year global warming potential of 1, whereas an equivalent amount of methane has a global warming potential of 25.

Greenhouse gas emissions occur from both natural as well as human (anthropogenic) sources. Natural sources include decomposition of organic matter and aerobic respiration. Anthropogenic greenhouse gas emissions are predominantly from the combustion of fossil fuels, although industrial processes, land-use change, agriculture, and waste management are also significant.

Atmospheric concentrations of greenhouse gases have increased since the Industrial Revolution, but the natural processes that remove those greenhouse gases from the atmosphere have not increased proportionally. Additionally, concentrations of long-lived manufactured pollutants such as hydrofluorocarbons have increased in recent decades. As the atmospheric concentrations of greenhouse gases increase, the atmosphere's ability to retain heat increases as well. Since the instrumental record began in 1895, the average temperature in the United States has risen by approximately 1.3 to 1.9 degrees Fahrenheit (°F) (U.S. Global Change Research Program 2014). Furthermore, these average temperatures are expected to increase at a faster pace in the 21st century, by 2.5°F to 11°F above preindustrial levels by 2100 (U.S. Global Change Research Program 2014).

The increase of greenhouse gas emissions in the atmosphere has been determined to pose risks to human and natural systems (Intergovernmental Panel on Climate Change 2014). Higher global surface temperatures cause widespread changes in the Earth's climate system. These changes may adversely affect weather patterns, biodiversity, human health, and infrastructure. A discussion of projected climate change in Cowlitz County and Washington State is provided in Section 5.8.2.4, *Climate Change Existing and Future Conditions*.

5.8.1.2 Regulatory Setting

Laws and regulations relevant to greenhouse gases are summarized in Table 5.8-1.

Table 5.8-1. Regulations, Statutes, and Guidelines for Greenhouse Gases

Regulation, Statute, Guideline	Description
Federal	
Clean Air Act of 1963 (42 USC 7401) as amended	In 2007, the U.S. Supreme Court ruled that greenhouse gases are air pollutants under the Clean Air Act.
The President's Climate Action Plan (2013)	Sets forth plan for cutting carbon pollution, preparing for the impacts of climate change, and leading international efforts to address climate change.[a]
Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units	In 2015, under the Clean Power Plan, EPA set state-specific target emissions reductions to reduce carbon dioxide emissions in the power sector by 32% below 2005 levels by 2030 (80 FR 64661). The greenhouse gas analysis uses the proposed Clean Power Plan. The final Clean Power Plan was released in August 2015, after the modeling was completed for the greenhouse gas analysis.
United States Submittal to the United Nations Framework on Climate Change	U.S. and other nations submitted INDC to the United Nations in 2015.
Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews	The Council on Environmental Quality has published revised draft guidance on how NEPA analysis and documentation should address greenhouse gas emissions and the impacts of climate change.
State	
Limiting Greenhouse Gas Emissions (RCW 70.235)	Requires state to reduce overall greenhouse gas emissions as compared to a 1990 baseline and report emissions to the governor biannually. Specific goals include achieving 1990 greenhouse gas emissions levels by 2020; 25% below 1990 levels by 2035; and 50% below 1990 levels by 2050 or 70% below the State's expected emissions that year.

Regulation, Statute, Guideline	Description
Washington Clean Air Act (RCW 70.94)	Establishes rules regarding preservation of air quality and penalties for violations. Carbon dioxide mitigation fees are evaluated as part of the permit required by the Clean Air Act (RCW 70.94.892) to reflect requirements from RCW 80.70. RCW 70.94.151 states that the department will be responsible for adopting rules requiring reporting of emissions defined by 70.235.010 from facility, source, site, or fossil fuel supplier that meet or exceed 10,000 metric tons of CO_2e annually.
Washington Carbon Pollution and Clean Energy Action (Executive Order 14-04, 2014)	In December 2014, Governor Inslee established the Governor's Carbon Emissions Reduction Taskforce to provide recommendations to the 2015 legislative session on the design and implementation of carbon emissions limits and market mechanisms program for Washington State.
Washington's Leadership on Climate Change (Executive Order 09-05, 2009)	In 2009, Governor Gregoire ordered the state to assess the effectiveness of various greenhouse gas reduction strategies by estimating emissions, quantifying necessary reductions, and identifying strategies and actions that could be used to meet the 2020 target. Assessments were done across multiple sectors and sources of emissions, including industrial facilities, the electricity sector, low-carbon fuel standards, vehicle miles traveled, coal plants, and forestry.
Path to a Low-Carbon Economy: An Interim Plan to Address Washington's Greenhouse Gas Emissions (2010)	The second Climate Comprehensive Plan report to the Governor and State Legislature outlines a plan to achieve emissions reductions to 1990 levels by 2020, as required by RCW 70.235.
Local	
No local laws or regulations apply to greenhouse gas emissions.	

Notes:
[a] Executive Office of the President 2013
USC = United States Code; EPA = U.S. Environmental Protection Agency; INDC = Intended Nationally Determined Contribution; NEPA = National Environmental Policy Act; FR = *Federal Register*; CO_2e = carbon dioxide equivalent; RCW = Revised Code of Washington

5.8.1.3 Study Area

The study area for greenhouse gas emissions for Cowlitz County, as a SEPA co-lead agency, is defined as Cowlitz County. For the Washington State Department of Ecology (Ecology) as a SEPA co-lead agency, greenhouse gas emissions were studied based on the expected transportation routes and emissions from the combustion of coal. While the study areas for the co-lead agencies are different, the analysis used the same approach to calculate greenhouse gas emissions.

5.8.1.4 Methods

This section describes the sources of information and methods used to evaluate the greenhouse gas emissions associated with the construction and operation of the Proposed Action and the No-Action Alternative. The *SEPA Greenhouse Gas Emissions Technical Report* (ICF International 2016a) provides detailed descriptions of the methods summarized below.

Information Sources

The following sources of information were used to identify the existing conditions relevant to greenhouse gas emissions in the study areas.

- *SEPA Coal Market Assessment Technical Report* (ICF International 2016b) and emissions data used to evaluate the greenhouse gas emissions.
- *SEPA Air Quality Technical Report* (ICF International 2016c)
- *SEPA Energy and Natural Resources Technical Report* (ICF International 2016d)
- *SEPA Rail Transportation Technical Report* (ICF International 2016e)
- *SEPA Vessel Transportation Technical Report* (ICF International 2016f)

To estimate the greenhouse gases emitted as a result of the activities and processes described in the above reports, the greenhouse gas analysis combined those reports' estimates of fuel consumption and vehicle operation with greenhouse gas emissions factors to estimate greenhouse gas emissions for construction and operation aspects of the Proposed Action. The greenhouse gas emissions factors were drawn from the following sources.

- California Air Resources Board (2011)
- Clean Cargo Working Group (2014)
- Energy Information Agency (1994)
- U.S. Environmental Protection Agency (2015a)
- Intergovernmental Panel on Climate Change (2006, 2007)

Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and the No-Action Alternative on greenhouse gas emissions. This section also describes the method for estimating the greenhouse gas emissions associated with each emissions source.

Scope of the Analysis

The Proposed Action would emit greenhouse gases during construction and operation. Emissions in Cowlitz County would come predominantly from the combustion of fossil fuels for construction and operation of the Proposed Action. Emissions outside of Cowlitz County would also result from the changes due to transportation and combustion of coal, both domestically and internationally, as related to the Proposed Action. This analysis includes activity data from the reports identified in Section 5.8.1.4, *Methods, Information Sources,* to estimate emissions in and outside of Cowlitz County. Additionally, this greenhouse gas analysis evaluates emissions scenarios based on the flow of coal to and through the coal export terminal.

Geographically, the analysis of greenhouse gas emissions from the Proposed Action includes emissions from the transport of Powder River Basin and Uinta Basin coals from their points of extraction to the coal export terminal in Cowlitz County, final transport to Asia, and the end-use combustion of coal in Asia. The analysis also considers changes in coal combustion and emissions elsewhere that could occur when imported coal from the Proposed Action displaces other coal. The substitution of natural gas for coal in the United States because of an increase in domestic coal prices is also evaluated. This analysis of greenhouse gas emissions does not include emissions from future coal extraction in the Powder River Basin and the Uinta Basin. Emissions from extraction are covered in separate greenhouse gas analyses as part of the National Environmental Policy Act (NEPA) requirements for coal mines. Additionally, any future coal mine leases would require separate greenhouse gas analyses as part of the NEPA requirements for new coal mines. The greenhouse gas emissions analysis considers the following elements.

- **Analysis period.** To be consistent with activity data from the other technical reports, this analysis considers construction, operation, transportation, and fossil fuel combustion emissions from 2018 through 2038.
- **Emissions in Cowlitz County.** Greenhouse gas emissions in Cowlitz County are estimated for the construction and operation of the Proposed Action. These are described in *Method for Impact Analysis*, *Sources of Emissions in Cowlitz County*. Greenhouse gas emissions are measured in CO_2e, which is based on the global warming potential factors consistent with the Intergovernmental Panel on Climate Change Fourth Assessment Report (2007) for carbon dioxide, methane, and nitrous oxide.[1]
- **Emissions Outside of Cowlitz County.** Greenhouse gas emissions from the Proposed Action outside of Cowlitz County were estimated. These are described below in *Method for Impact Analysis*, *Emissions Outside of Cowlitz County*. Greenhouse gas emissions calculations are characterized in terms of CO_2e.
- **Induced demand for energy.** This analysis addresses coal combustion in Asia that would result from the increased supply of coal from the Proposed Action. As described in the *SEPA Coal Market Assessment Technical Report*, the addition of 44 million metric tons of coal to the Asian market would increase supply and lower international coal prices. Asian coal markets would respond to lower prices by consuming more coal overall. This additional demand for coal that would result from more supply and lower prices is referred to as induced demand.
- **Displacement of other energy sources.** Coal transported through the coal export terminal could displace other energy sources, nationally and internationally. Depending on the scenario, coal transported through the terminal could affect coal production in Australia, China, and Indonesia, and could affect coal consumption throughout Asia. Conversely, in the United States, natural gas could be used as a substitute for coal combustion. The analysis of greenhouse gas emissions considers this displacement.
- **Coal market assessment scenarios.** Each coal market assessment scenario represents a range of greenhouse gas emissions estimates, based on economic and policy projections from 2020 to 2040. For each scenario, the greenhouse gas emissions from Asian coal combustion, U.S. coal combustion, and U.S. natural gas combustion are influenced by factors such as coal prices, transportation costs, and competing energy sources. Estimates of coal transport, coal consumption, and natural gas substitution are informed by projections in the *SEPA Coal Market Assessment Technical Report*, which considers four scenarios based on economic and policy projections from 2020 to 2040. The scenarios represent a range of greenhouse gas emissions estimates determined using a multidimensional model. The four scenarios and their key

[1] The U.S. Greenhouse Gas Emissions Inventory covers six greenhouse gases; however, since the Proposed Action does not include refrigeration, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the estimate of greenhouse gas emissions.

concepts are described below. The four scenarios were compared against a baseline existing condition where the Proposed Action would not be built.

- **2015 Energy Policy Scenario.** The 2015 Energy Policy scenario represents the potential impact of new international climate and energy policies on international coal demand. Functionally, this scenario is the same as the Past Conditions (2014) scenario except for two parameters. First, the international thermal coal demand is derived from an international policy perspective (International Energy Agency 2014). Second, this scenario includes the Clean Power Plan in the form in which it was originally proposed, which will reduce coal consumption in the United States (U.S. Environmental Protection Agency 2014). The final Clean Power Plan was released in August 2015, after the modeling was completed for the coal market assessment and greenhouse gas analysis. This scenario more accurately reflects current global conditions and is the preferred scenario for purposes of this study.
- **Past Conditions (2014) Scenario.** The Past Conditions (2014) scenario represents the state of the energy markets as of 2014 and, therefore, assumes no climate policies enacted. Consequently, it does not include the Clean Power Plan effective in late 2015, and does not, therefore, reflect current energy policy conditions. The international demand for coal varies by country, using "business-as-usual" projections described in the *SEPA Coal Market Assessment Technical Report*.
- **Lower Bound Scenario.** The Lower Bound scenario minimizes induced coal demand as a result of the Proposed Action. This scenario evaluates the net carbon dioxide emissions from construction and operation of the Proposed Action in which the induced coal demand from the coal export terminal is minimized. The resulting low estimate of global carbon dioxide emissions from coal combustion is meant to be plausible and does not represent the absolute lowest amount of carbon dioxide emissions. The energy market under the Lower Bound scenario could reflect a large demand for renewable energy resulting in reduced demand for coal combustion (described in the *SEPA Coal Market Assessment Technical Report*).
- **Upper Bound Scenario.** The Upper Bound scenario maximizes induced coal demand as a result of the Proposed Action. In this scenario, more coal plants are constructed than in the Past Conditions (2014) scenario, thus driving up demand. The increase in demand causes both international coal consumption and prices to increase. The Upper Bound scenario is also meant to be a plausible scenario and does not represent an absolute maximum of global carbon dioxide emissions or carbon dioxide emissions that would result from the Proposed Action (described in the *SEPA Coal Market Assessment Technical Report*).

  Table 5.8-2 summarizes the characteristics of the four scenarios. For each scenario, the table provides the following information.

  - **Purpose:** the characteristics that the scenario is intended to represent.
  - **U.S. coal markets:** how the domestic coal market would react to changes in demand due to changes in supply and pricing.
  - **Asian coal markets:** how the international coal market would react to changes in coal demand due to changes in supply and pricing.
  - **Coal prices:** a range of coal prices captures increases and decreases in coal production and transportation costs relative to the Past Conditions (2014) scenario.
  - **Climate policy:** the effect of meeting the 2014 goals of the proposed Clean Power Plan and U.S.–China climate negotiations.

Table 5.8-2. Coal Market Assessment Scenarios Definitions in Relation to the Baseline Assumptions

Scenario	Purpose	U.S. Coal Market Conditions (Relative to Baseline Assumptions)	Asian Coal Market Conditions (Relative to Baseline Assumptions)	Coal Prices (Relative to Baseline Assumptions)	Climate Policy
2015 Energy Policy	Represents impacts of an international climate policy on the coal market as enacted by 2014 and the proposed domestic Clean Power Plan	Coal demand is *less* sensitive to price changes because coal demand is very low due to climate policies	Coal demand is *less* sensitive to price changes because coal demand is very low due to climate policies	Baseline assumptions	Climate policy resembling implementation of proposed Clean Power Plan and meeting goals of 2014 U.S.–China climate negotiations
Lower Bound	Represents energy markets where renewable penetration is high and international coal prices and demand are low, making domestic coal exports less attractive to international markets	• Lower coal demand due to higher Powder River Basin and Uinta Basin coal prices • Decreased coal combustion emission factors • Overall *less* sensitive to price changes	• Lower coal demand due to increased renewables • Lower coal prices due to lower demand • Decreased coal combustion emission factors • Overall *less* sensitive to price changes	• Higher Powder River Basin and Uinta Basin coal prices due to assumed higher production costs • Higher U.S. rail transportation costs due to higher overall system use	No climate policy; however, assumes significant renewable energy use
Upper Bound	Represents energy markets where coal consumption is high, leading to high international demand and prices, making domestic coal exports more attractive to international markets	• Higher coal demand due to lower Powder River Basin and Uinta Basin coal prices • Higher coal combustion emission factors • Overall *more* sensitive to price changes	• Higher coal demand resulting in higher coal prices • Higher coal combustion emission factors • Overall *more* sensitive to price changes	• Lower Powder River Basin and Uinta Basin coal prices due to assumed lower production costs • Lower U.S. rail transportation costs due to continuing low oil prices and increased competition with trucking	No climate policy
Past Conditions (2014)	Represents the state of energy markets in the absence of climate policies	Baseline assumptions	Baseline assumptions	Baseline assumptions	No climate policy

Method for Assembling an Emissions Time Series

Because greenhouse gases accumulate in the atmosphere, this assessment characterizes greenhouse gases over the full analysis period (2018 to 2038) for each year as well as for each scenario. The time series was estimated from existing data and assembled as follows.

- **Coal market assessment.** The *SEPA Coal Market Assessment Technical Report* provides estimates for throughput for 2020, 2025, 2030, and 2040. It does not consider a start-up period, so the activity data and emissions estimates for 2025, which assume a full throughput of 44 million metric tons, are prorated. Assuming that *net* emissions and activity are zero in 2020, the analysis assumes a linear growth to a throughput of 25 million metric tons in 2025. Between 2025 and 2028, the throughput increases linearly at a slightly faster rate to reach full capacity at 44 million metric tons by 2028.
- **Activity data.** The activity data that characterize coal export terminal operations represent conditions in 2028, when the facility is expected to be fully operational. These data do not reflect the coal export terminal startup, in which the coal throughput increases from zero immediately after construction in 2020 to full capacity of 44 million metric tons by 2028. Emissions estimates are proportional to throughput and can be expressed as emissions per unit of coal throughput.

5.8.1.5 Existing Conditions

This section describes the existing environmental conditions in the study areas related to greenhouse gas emissions that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative.

As discussed in Section 5.8.1.1, *Greenhouse Effect,* greenhouse gas emissions trap heat in the atmosphere and increase surface temperatures on the Earth, which contribute to global warming and climate change. The climate impacts of global warming include sea level rise, changes in precipitation and snowpack patterns, ocean acidification, wildfire seasons, and fluctuations in surface temperatures.

In 2012, Washington State was responsible for contributing 92.0 million metric tons of CO_2e. Of that 2012 total for Washington State, 42.5 million metric tons of CO_2e (46.2%) are attributable to the transportation sector, and 12.1 million metric tons of CO_2e (13.2%) are attributable to coal combustion in the electricity sector (Washington State Department of Ecology 2016).

Near the project area, greenhouse gas emission sources include locomotives for rail traffic along the BNSF Spur (approximately seven trains per day), Reynolds Lead (approximately two trains per day), vehicular traffic on area roadways, ongoing operations of the existing bulk product terminal in the Applicant's leased area, and other industrial uses along the Columbia River. The *SEPA Greenhouse Gas Technical Report* provides estimates of selected greenhouse gas emissions near the project area.

Method for Impact Analysis

This section provides an overview of the method for calculating greenhouse gas emissions in the study areas for each source. More information about each method is described in the *SEPA Greenhouse Gas Emissions Technical Report*.

Sources of Emissions in Cowlitz County

As previously described, greenhouse gas emissions were estimated from construction, operation, and transportation in Cowlitz County. Changes in greenhouse gas emissions in Cowlitz County were calculated from the following activities related to the Proposed Action.

- **Vegetation and soil removal.** Construction of the Proposed Action would clear vegetation and remove surface soil, both of which sequester carbon dioxide (remove carbon dioxide from the atmosphere).
- **Coal export terminal construction.** Construction of the Proposed Action would generate greenhouse gas emissions from operation of construction equipment and transport of employees and construction materials to the project area.
- **Employee commuting.** Construction and operation of the Proposed Action would generate greenhouse gas emissions from construction workers commuting to the project area, and during operations, daily employee commuting to and from the project area.
- **Rail transport.** Operation of the Proposed Action would require rail transport of coal in Cowlitz County and in the project area.
    - Rail transport in Cowlitz County to and from the coal export terminal on the BNSF Railway Company (BNSF) main line, BNSF Spur, and Reynolds Lead.
    - Rail operations in the project area, including emissions from movement, switching, and idling on site.
- **Vehicle-crossing delay.** Operation of trains for the Proposed Action would result in additional vehicle delay at at-grade rail crossings. Engine idling would generate greenhouse gas emissions.
- **Coal export terminal operation.** Operation of the Proposed Action would generate greenhouse gas emissions from equipment such as loaders, maintenance vehicles, and cranes.
- **Vessel idling and tugboat use at the coal export terminal.** Operation of the Proposed Action would generate greenhouse gas emissions from vessel maneuvering into and then idling at the loading area. Additionally, tugboats assisting in vessel maneuvering would generate greenhouse gas emissions.
- **Vessel transport.** Operation of the Proposed Action would generate greenhouse gas emissions from vessels transporting coal in Cowlitz County from the project area down the Columbia River to the border of Cowlitz County.

Sources of Emissions Outside of Cowlitz County

To assess broader potential impacts on Washington State, changes in greenhouse gas emissions outside Cowlitz County were calculated from the following activities related to the Proposed Action.

- **Rail transport.** Operation of the Proposed Action would require rail transport from the extraction sites in the Powder River Basin in Montana and Wyoming and the Uinta Basin in Utah and Colorado to the project area (see Section 5.1, *Rail Transportation*, for expected routes). Relative rail traffic by coal market scenario and year was determined based on the *SEPA Coal Market Assessment Technical Report*.

- **Coal export terminal electricity consumption.** Operation of the Proposed Action would consume electricity, generating greenhouse gas emissions from fuel combustion emissions at off-site power plants.
- **Helicopter and pilot boat trips.** Operation of the Proposed Action would generate greenhouse gas emissions from helicopter and pilot boat transfers along the Columbia River outside of Cowlitz County.
- **Vessel transport.** Operation of the Proposed Action would generate greenhouse gas emissions from vessels transporting coal outside of Cowlitz County.
  - Vessel transport in Washington State beyond Cowlitz County to 3 nautical miles past the mouth of the Columbia River.
  - Vessel transport from the United States to markets in China, Hong Kong, Japan, South Korea, and Taiwan.
- **Coal combustion in Asia and the United States.** Operation of the Proposed Action would generate greenhouse gas emissions from project-related coal combustion in the United States and the Pacific Basin.
- **Induced natural gas consumption in the United States.** Operation of the Proposed Action would change greenhouse gas emission rates as a function of changes in the coal market. As coal prices increase due to the increased demand for coal to export, the United States' natural gas consumption is expected to increase. While greenhouse gas emissions from coal combustion would decrease, emissions from natural gas combustion would increase.

5.8.1.6 Impacts

This section describes the greenhouse gas emissions that would result from construction and operation of the Proposed Action and the No-Action Alternative. Detailed emissions by scenario are available in the *SEPA Greenhouse Gas Emissions Technical Report* and *SEPA Coal Market Assessment Technical Report*.

Proposed Action

This section describes the greenhouse gas emissions that could occur in the study areas as a result of construction and operation of the Proposed Action.

Greenhouse gas emissions are presented as 2028 emissions (the first year of full export capacity operation for the coal export terminal) and total net emissions over the 2018 to 2038 time series. The total net emissions are the sum of emissions for the total time series, including construction beginning in 2018 and operation of the Proposed Action through 2038.

This section presents the aggregated results of each of the emissions sources described in Section 5.8.1.4, *Methods*. Details of the emissions associated with each source are available in the *SEPA Greenhouse Gas Emissions Technical Report.*

Construction

Construction-related activities associated with the Proposed Action would result in greenhouse gas emissions in Cowlitz County of 23,601 metric tons of CO_2e for all scenarios as described below. As explained in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives,* construction-related activities include demolishing existing structures and preparing the site, constructing the rail loop and dock, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

Initial construction was assumed to occur over an 18-month period (2018 to 2020). Consequently, except for vegetation and wetlands cover, the total greenhouse gas construction-related emissions from 2018 to 2020 are 1.5 times the initial 12-month period (Table 5.8-3). For construction emissions from lost sequestration related to vegetation and wetland clearing, the emissions occur in the first year. Construction greenhouse gas emissions would be the same across all four scenarios.

Table 5.8-3. Construction Greenhouse Gas Emissions (metric tons of CO_2e)

	Scenario			
Source	**2015 Energy Policy**	**Lower Bound**	**Upper Bound**	**Past Conditions (2014)**
Vegetation and Soil Removal [a]				
Emissions During 12 Months of Construction Period	11,776	11,776	11,776	11,776
Total Emissions 2018–2020	11,825	11,825	11,825	11,825
Construction Equipment				
Emissions During 12 Months of Construction Period	5,349	5,349	5,349	5,349
Total Emissions 2018–2020[a]	8,024	8,024	8,024	8,024
Construction Worker Commuting				
Emissions During 12 Months of Construction Period	465	465	465	465
Total Emissions 2018–2020[b]	698	698	698	698
Construction Trucks				
Emissions During 12 Months of Construction Period	1,081	1,081	1,081	1,081
Total Emissions 2018–2020[b]	1,621	1,621	1,621	1,621
Construction Barges				
Emissions During 12 Months of Construction Period	955	955	955	955
Total Emissions 2018–2020[b]	1,433	1,433	1,433	1,433
Subtotal Construction Emissions				
Emissions During 12 Months of Construction Period	19,627	19,627	19,627	19,627
Total Emissions, 2018–2020[a]	23,601	23,601	23,601	23,601

Notes:

[a] Loss of accumulated carbon stocks during construction plus the loss of ongoing carbon sequestration.

[b] Construction emissions occur over an 18-month period prior to the operation of the coal export terminal; therefore, emissions from 2021 through 2038 are zero. Given the 18-month period for construction, total construction emissions are those for the 12-month period multiplied by 1.5.

Operations—Cowlitz County

Operation of the Proposed Action would result in annual greenhouse gas emissions of 38,477 metric tons of CO_2e in Cowlitz County for all scenarios. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Greenhouse gas emissions in Cowlitz County during operations are primarily driven by rail transport of coal, vessel idling and tugboat use at the coal export terminal, and vessel transport of coal (Table 5.8-4). The greenhouse gas emissions are presented in terms of the 2028 emissions (the assumed first year of full export capacity operation for the coal export terminal) and total net emissions from 2021 (when export operation begins) to 2038. Greenhouse gas emissions in Cowlitz County would be the same across all four scenarios.

Table 5.8-4. Operations—Cowlitz County Greenhouse Gas Emissions (metric tons of CO_2e)

	Scenario			
Source	**2015 Energy Policy**	**Lower Bound**	**Upper Bound**	**Past Conditions (2014)**
Vegetation and Soil Removal				
Annual Emissions, 2028	16	16	16	16
Total Emissions, 2021–2038	294	294	294	294
Rail Transport				
Annual Emissions, 2028	21,489	21,489	21,489	21,489
Total Emissions, 2021–2038	306,313	306,313	306,313	306,313
Vehicle-Crossing Delay				
Annual Emissions, 2028	223	223	223	223
Total Emissions, 2021–2038	3,178	3,178	3,178	3,178
Coal Export Terminal Equipment Operation				
Annual Emissions, 2028	903	903	903	903
Total Emissions, 2021–2038	12,894	12,894	12,894	12,894
Vessel Idling and Tugboat Use at the Coal Export Terminal				
Annual Emissions, 2028	7,338	7,338	7,338	7,338
Total Emissions, 2021–2038	104,740	104,740	104,740	104,740
Vessel Transport				
Annual Emissions, 2028	8,232	8,232	8,232	8,232
Total Emissions, 2021–2038	118,573	118,573	118,573	118,573
Employee Commuting				
Annual Emissions, 2028	275	275	275	275
Total Emissions, 2021–2038	3,922	3,922	3,922	3,922
Subtotal—Cowlitz County Emissions				
Annual Emissions, 2028	38,477	38,477	38,477	38,477
Total Emissions, 2021–2038	549,915	549,915	549,915	549,915

Operations—Outside of Cowlitz County

For full coal export terminal operations in 2028, the Proposed Action would result in the following annual greenhouse gas emissions outside of Cowlitz County of 3,192,548 metric tons of CO_2e for the preferred 2015 Energy Policy scenario. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Greenhouse gas emissions outside of Cowlitz County during operations are primarily driven by coal combustion in Asia and the United States, which varies greatly between coal market assessment scenarios (Table 5.8-5). The greenhouse gas emissions are presented in terms of the 2028 emissions (the first year of full export capacity operation for the coal export terminal) and total net emissions from 2021 (when export operation begins) to 2038.

Table 5.8-5. Operations—Emissions Outside of Cowlitz County (metric tons of CO_2e)

	Scenario			
Source	**2015 Energy Policy**	**Lower Bound**	**Upper Bound**	**Past Conditions (2014)**
Rail Transport				
Annual Emissions, 2028	951,505	951,505	897,328	951,505
Total Emissions, 2021–2038	13,349,583	13,451,684	12,920,725	13,410,738
Coal Export Terminal Electricity Consumption				
Annual Emissions, 2028	177	177	177	177
Total Emissions, 2021–2038	3,191	3,191	3,191	3,191
Helicopter and Pilot Boat Trips				
Annual Emissions, 2028	756	756	756	756
Total Emissions, 2021–2038	10,796	10,796	10,796	10,796
Vessel Transport[a]				
Annual Emissions, 2028	296,012	657,591	1,580,050	670,643
Total Emissions, 2021–2038	3,158,808	2,732,158	22,724,743	7,511,454
Coal Combustion in Asia and the United States[a]				
Annual Emissions, 2028	1,773,662	-3,603,435	27,047,892	-1,951,264
Total Emissions, 2021–2038	18,744,034	-54,610,906	373,134,929	-53,493,618
Induced Natural Gas Consumption in the United States[a]				
Annual Emissions, 2028	170,435	850,628	1,781,076	1,225,279
Total Emissions, 2021–2038	1,750,895	13,202,107	33,324,486	23,662,506
Subtotal—Emissions Outside of Cowlitz County				
Annual Emissions, 2028	3,192,548	-1,142,778	31,307,280	897,097
Total Emissions, 2021–2038	37,017,307	-25,210,970	442,118,871	-8,894,933

Notes:

[a] Emissions for these sources are presented as net emissions. Net greenhouse emissions represent the difference between the Proposed Action and the no-action for each scenario as defined in the *SEPA Coal Market Assessment Technical Report*.

Total Greenhouse Gas Emissions

This section presents the aggregated results of each of the emissions sources described previously. The total net emissions are the sum of emissions for the total time series, including construction beginning in 2018 and operation through 2038.

Table 5.8-6 shows the greenhouse gas emissions in Cowlitz County from construction and operation of the Proposed Action (Table 5.8-6) as 573,516 metric tons of CO_2e. These emissions are the same for each of the four scenarios, as they are emitted in proportion to throughput and are not influenced by outside economic factors. The largest contributors to the emissions are transportation-related emissions, including locomotive operation and vessel transport in Cowlitz County. Together, these two sources contribute about 74% of the emissions generated in Cowlitz County.

Table 5.8-6. Total Greenhouse Gas Emissions in Cowlitz County (metric tons of CO_2e)

	Scenario			
Period	2015 Energy Policy	Lower Bound	Upper Bound	Past Conditions (2014)
Annual Emissions, 2028	38,477	38,477	38,477	38,477
Total Emissions, 2018–2038	573,516	573,516	573,516	573,516

Table 5.8-7 shows the annual greenhouse gas emissions in Washington State (not including Cowlitz County) from transportation for the preferred 2015 Energy Policy scenario is 364,162 metric tons of CO_2e. Emissions in Washington State (outside of Cowlitz County) are approximately nine times as high as emissions in Cowlitz County, largely driven by the greater distances traveled by trains and vessels outside of Cowlitz County. Rail transport constitutes about 88% of the emissions generated within Washington State and outside of Cowlitz County (Table 5.8-7).

Table 5.8-7. Total Greenhouse Gas Emissions in Washington State, Excluding Cowlitz County (metric tons of CO_2e)

	Scenario			
Period	2015 Energy Policy	Lower Bound	Upper Bound	Past Conditions (2014)
Annual Emissions, 2028[a]	364,162	364,162	244,169	364,162
Total Emissions, 2018–2038	4,686,634	4,912,768	3,723,459	4,822,082

Notes:

[a] The only emission source within Washington State that varies between scenarios comes from rail transportation. The Upper Bound scenario emissions from 2028 differ from the other scenarios because coal is transported from the Uinta Basin and the Powder River Basin as opposed to the other three scenarios that source coal solely from the Powder River Basin in 2028. Since in-state rail distances are significantly shorter for Uinta Basin coal, Upper Bound emissions are lower. Total emissions differ between all scenarios since the two coal basins are drawn from two different extents across the lifetime of the Proposed Action.

Table 5.8-8 summarizes the total *net* greenhouse gas emissions for each scenario compared to the baseline conditions for each scenario. The net greenhouse gas emissions for the preferred 2015 Energy Policy scenario is 3.2 million metric tons of CO_2e. The 2015 Energy Policy scenario most accurately represents current global conditions, including a close approximation of Clean Power Plan implementation.

Table 5.8-8. Total Net Emissions (metric tons of CO_2e)[a]

	Scenario			
Period	**2015 Energy Policy**	**Lower Bound**	**Upper Bound**	**Past Conditions (2014)**
Net Annual Emissions, 2028[b]	3,231,025	-1,104,301	31,345,757	935,574
Total Net Emissions, 2018–2038[b]	37,590,823	-24,637,454	442,692,386	-8,321,417

Notes:

[a] Net greenhouse gas emissions represent the difference between each Proposed Action scenario and the no-action specific to each scenario in the *SEPA Coal Market Assessment Technical Report*.

[b] Scenarios where net emissions are negative are due to domestic coal displacement. For scenarios with positive net emissions, emissions increases from Asian coal displacement are a more significant factor than domestic coal displacement

Assessing Significance

The scenarios described in the *SEPA Coal Market Assessment Technical Report* identify a range of net emissions attributable to the Proposed Action. The 2015 Energy Policy scenario is intended to represent existing conditions under which the Proposed Action would operate. Although the 2015 Energy Policy is based on the draft Clean Power Plan as proposed in June 2014, rather than the final Clean Power Plan promulgated in August 2015, this scenario is the most representative of current U.S. policy of the scenarios modeled, and consequently is the preferred scenario for the analysis (Table 5.8-9).

Table 5.8-9. Greenhouse Gas Emissions for the 2015 Energy Policy Scenario (metric tons of CO_2e)

Phase	Years	Greenhouse Gas Emissions	Average Annual Emissions
Construction Emissions	2018–2020	23,601	7,867
Total Net Emissions for Initial Operation	2021–2027	9,712,124	1,387,446
Total Net Emissions for Full Operations	2028–2038	27,855,098	2,532,282
Total Emissions	**2018–2038**	**37,590,823**	

The average annual amount of emissions for operations in Table 5.8-9 exceeds various intensity considerations that are proposed in federal and state regulations and guidance. For example, the draft Washington State Clean Air Rule establishes an initial compliance threshold for greenhouse gas emissions of 100,000 metric tons of CO_2e per year. Similarly, EPA's Tailoring Rule, 40 CFR Parts 51, 52, 70 et al. applies to sources that emit more than 75,000 short tons of CO_2e per year.

Draft guidance from the federal Council on Environmental Quality identifies a threshold of 25,000 metric tons of CO_2e per year for quantification of greenhouse gas emissions under the National Environmental Policy Act (Council on Environmental Quality 2014).

These standards provide guidance on assessing the significance of various levels of greenhouse gas emissions. Since the net greenhouse gas emissions attributable to the Proposed Action in the preferred scenario exceed these standards, the emissions are considered to be significant impacts. The climate change impacts resulting from this increase to greenhouse gases would persist for a long period of time, beyond the analysis period and are considered permanent and, while global in nature, would affect Washington State. Based on these considerations, emissions attributable to operations of the Proposed Action under the 2015 Energy Policy Scenario are considered adverse and significant.

Market Effects on Coal Combustion and Emissions

The Applicant proposes to export up to 44 million metric tons of coal each year. Modeling was done to identify the changes in the coal markets and the resulting changes in potential greenhouse gas emissions that could be attributed to the Proposed Action. This is because, based on the changes in the market, transportation pathways, use of natural gas to replace coal, and other factors described previously and in the *SEPA Coal Market Assessment Technical Report*, the emissions for each of these areas could result in the following.

- Add to and increase the overall amount of global greenhouse gases.
- Replace other emissions with no change in the overall amount of global greenhouse gases.
- Reduce and decrease the overall amount of global greenhouses gases.

The purpose of this analysis is to identify how these changes by modeling the shift in coal prices both domestically and internationally affect the resulting net greenhouse gas emissions for each scenario. In summary, the Proposed Action would have the following market impacts, regardless of scenario.

- It would increase coal supplied to international markets.
- The increase in supply would decrease international coal prices.
- The decrease in international coal prices would increase the international demand for U.S. coal.
- The increase in international demand would increase U.S. coal prices.
- The increase in U.S. coal prices would reduce domestic coal demand.

Table 5.8-10 compares how coal and natural gas combustion change in response to market and policy conditions.

Table 5.8-10. Impacts on Coal and Natural Gas Markets and Emissions Resulting from the Proposed Action

Scenario	U.S. Coal Markets	Asian Coal Markets	U.S. Natural Gas Markets
2015 Energy Policy	Decrease in domestic coal emissions in early years, followed by a slight increase from 2030. In 2030 and later, coal is not replaced by natural gas to the same extent as other scenarios.	Increase in Asian coal emissions. The Proposed Action causes a decrease in Asian coal prices from increased supply, creating induced demand. The magnitude is smaller than in the Past Conditions (2014) scenario because coal prices are already low in this scenario, and the market reacts less sharply.	Decrease in domestic natural gas emissions. Due to the high renewable penetration and the Clean Power Plan Policy.

Scenario	U.S. Coal Markets	Asian Coal Markets	U.S. Natural Gas Markets
Lower Bound	Decrease in domestic coal emissions. The Proposed Action causes an increase in domestic coal prices, reducing consumption. The magnitude is smaller than the Past Conditions (2014) scenario because coal prices are already low in this scenario, and the market reacts less sharply.	Increase in Asian coal emissions. The Proposed Action causes an increase in emissions due solely to changes in the coal mix consumed.	Increase in domestic natural gas emissions. The Proposed Action causes an increase in domestic coal prices, increasing natural gas substitution for coal to meet energy demands. The magnitude is lower than in the Past Conditions (2014) scenario because domestic coal markets are less sensitive to the Proposed Action.
Upper Bound	Decrease in domestic coal emissions. The Proposed Action causes an increase in domestic coal prices, reducing consumption. The magnitude is higher than the Past Conditions (2014) scenario because coal prices are already high in this scenario, and the market reacts more sharply.	Increase in Asian coal emissions. The Proposed Action causes a decrease in Asian coal prices from increased supply, creating induced demand. The magnitude is higher than in the Past Conditions (2014) scenario because coal prices and demand are already high; adding coal from The Proposed Action to Asian markets would create induced demand with low rates of coal substitution.	Increase in domestic natural gas emissions. The Proposed Action causes an increase in domestic coal prices, increasing natural gas substitution for coal to meet energy demands. The magnitude is higher than in the Past Conditions (2014) scenario because domestic coal markets are more sensitive to the Proposed Action.
Past Conditions (2014)	Decrease in domestic coal emissions. The Proposed Action causes an increase in domestic coal prices, reducing consumption.	Increase in Asian coal emissions. The Proposed Action causes a decrease in Asian coal prices from increased supply, creating induced demand.	Increase in domestic natural gas emissions. The Proposed Action causes an increase in domestic coal prices, increasing natural gas substitution for coal to meet energy demands.

The largest contributor to net emissions is the extent to which coal and natural gas combustion are influenced in Asia and the United States. In the Past Conditions (2014) and Lower Bound scenarios, the largest contributor to the net emissions is the displacement of coal combustion in the United States, driven by an increase in coal prices in response to the Proposed Action. Coal displacement results in a reduction of greenhouse gas emissions. In the Upper Bound scenario, the emissions induced demand from lower coal prices in Asia in response to the Proposed Action outweighs the emissions from domestic coal displacement, resulting in positive net emissions. For additional information on the impacts on the coal market and emissions across the four scenarios, see the *SEPA Greenhouse Gas Emissions Technical Report*.

Emissions in Context

Each coal market assessment scenario represents a range of greenhouse gas emissions estimates, based on economic and policy projections from 2020 to 2040. For each scenario, the net greenhouse gas emissions from Asian coal combustion, U.S. coal combustion, and U.S. natural gas combustion are influenced by factors such as coal prices, transportation costs, and competing energy sources.

To provide a frame of reference, net greenhouse gas emissions from the Proposed Action for the preferred 2015 Energy Policy scenario are compared to emissions from the transportation and coal combustion sectors in the United States, as well as to greenhouse gas reduction targets from state and federal programs.

Emissions in Cowlitz County and Washington State in Context

Across all scenarios, the total Cowlitz County emissions associated with the Proposed Action are 573,516 metric tons of CO_2e from 2018 to 2038, with annual emissions of 38,477 metric tons of CO_2e in 2028 when the coal export terminal reaches full export capacity. This is equivalent to adding about 8,100 passenger cars on the road each year (U.S. Environmental Protection Agency 2015b).

Washington State's total greenhouse gas emissions were 92.0 million metric tons of CO_2e in 2012, the most recent year for which a greenhouse gas inventory was published. Of that total, 42.5 million metric tons of CO_2e (46.2%) are attributable to the transportation sector and 12.1 million metric tons of CO_2e (13.2%) are attributable to coal combustion in the electricity sector (Washington State Department of Ecology, 2016). Based on 2012 emissions data, the Proposed Action's emissions in Cowlitz County of 38,477 metric tons of CO_2e in 2028 would be less than 0.05% of Washington State's total annual emissions of 92.0 million metric tons of CO_2e (Washington State Department of Ecology 2016). Based on 2012 emissions data, the Proposed Action's emissions in Washington State (excluding Cowlitz County) of 364,162 metric tons of CO_2e in 2028 would be less than 0.4% of Washington State's total annual emissions of 92.0 million metric tons of CO_2e (Washington State Department of Ecology 2016).

In 2015, the U.S. Environmental Protection Agency (EPA) finalized state-specific targets to reduce carbon dioxide emissions in the power sector by 32% below 2005 levels by 2030. The statewide mass-based carbon dioxide performance goal for Washington State is approximately 10.74 million short tons (U.S. Environmental Protection Agency 2015a). The 2028 emissions in Cowlitz County for the Proposed Action would be about 0.3% of that total. The 2028 emissions in Washington State (excluding Cowlitz County) would be about 3.4% of that total.

Washington State law requires annual greenhouse gas emissions to be reduced to 1990 levels (88.4 million metric tons of CO_2e) by 2020 (Revised Code of Washington [RCW] 70.235.050). The Washington State goal represents an annual reduction of 3.6 million metric tons of CO_2e below the 2012 state emissions levels. The statewide annual emissions associated with the Proposed Action under the 2015 Energy Policy scenario is approximately 0.4 million metric ton of CO_2e and represents about 11% of the emissions reduction goal.

U.S. and Worldwide Emissions in Context

The net annual emissions from the Proposed Action under the preferred 2015 Energy Policy scenario in 2028 would be 3.2 million metric tons of CO_2e (Table 5.8-8). This is equivalent to adding about 672,100 passenger cars on the road each year (U.S. Environmental Protection Agency 2015b).

Coal combustion emissions in the United States were 1,658.1 million metric tons of carbon dioxide in 2013, whereas the total transportation emissions in the United States were 1,718.4 million metric tons of carbon dioxide (U.S. Environmental Protection Agency 2015a).

The United States has committed to reduce its greenhouse gas emissions by approximately 17% from 2005 levels (7,350.2 million metric tons of CO_2e) by 2020—a decrease of about 1,250 million metric tons of CO_2e (Executive Office of the President 2013). As part of the nonbinding climate policy agreement with China and the Intended Nationally Determined Contribution levels submitted to the United Nations in 2015, the United States has set a target to reduce emissions 26 to 28% below 2005 emissions (6,428 million metric tons of CO_2e) by 2025 (White House Office of the Press Secretary 2015). This policy would reduce annual emissions to a level of 4,628 to 4,757 million metric tons of CO_2e by 2025. The reduction in annual emissions would range from 1,035 to 1,163 million metric tons of CO_2e below 2013 annual emissions. If the target were reached through consistent annual reductions, the United States would have to reduce annual emissions by 86 to 97 million metric tons of CO_2e each consecutive year, beginning in 2014. Under the 2015 Energy Policy Scenario, the Proposed Action would add 0.9 million metric tons of CO_2e annually to domestic emissions by 2028, and 3.2 million metric tons of CO_2e globally.[2]

No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

Alternative uses of the project area, as described in Chapter 2, *Project Objectives, Proposed Action, and Alternatives*, would be expected to result in an estimated annual increase of 1,242 metric tons of CO_2e relative to current conditions in Cowlitz County for locomotive combustion, vessel combustion, and truck transport (Table 5.8-11).

Table 5.8-11. No-Action Alternative Annual Average Emissions from Rail, Vessel, and Haul Trucks Operating within Cowlitz County

Source	Maximum Annual Average Emissions (metric tons of CO_2e)
Locomotive Combustion	593
Vessel Combustion	411
Haul Trucks	238
Total	**1,242**

5.8.1.7 Required Permits

No permits related to greenhouse gas emissions would be required for the Proposed Action.

[2] On the global scale, the International Energy Agency's 450 Scenario projects an energy pathway that is consistent with a stabilization of greenhouse gases at 450 ppm CO_2e and the internationally agreed target of limiting the long-term increase in average global temperature to no more than 2°Centigrade compared with preindustrial levels. The 450 Scenario results in energy-related carbon dioxide emissions decreasing from 31.6 billion metric tons in 2012 to 25.4 billion metric tons in 2030 (International Energy Agency 2014).

5.8.1.8 Potential Mitigation Measures

This section describes the mitigation measures that would reduce greenhouse gas emissions from construction and operation of the Proposed Action. These mitigation measures would be implemented in addition to project design measures, best management practices, and compliance with environmental permits, plans, and authorizations that are assumed as part of the Proposed Action and described below.

Applicant Mitigation

The Applicant will implement the following measures to mitigate greenhouse gas emissions.

MM GHG-1. Provide Fuel Efficiency Training to Equipment Operators.

To reduce greenhouse gas emissions from construction equipment, the Applicant will provide a fuel efficiency training program to locomotive, vessel, and construction equipment operators.

MM GHG-2. Implement an Anti-Idling Policy.

To reduce emissions from vessel and locomotive idling in the project area, the Applicant will implement an anti-idling policy.

MM GHG-3. Reduce Emissions from Cars.

The Applicant will evaluate the use of electric cars for company cars, incentivize the use of electric vehicles by providing charging stations, and develop an incentive program for carpooling.

MM GHG-4. Mitigate for Impacts on Washington State from Net Greenhouse Gas Emissions Attributable to the Proposed Action.

Under the 2015 Energy Policy scenario, which best reflects the existing policy requirements and conditions, the average net greenhouse gas emissions for operations from 2021 to 2027 would be 1,387,446 metric tons of CO_2e per year and from 2028 to 2038 would be 2,532,282 metric tons of CO_2e per year.

Washington State laws provide mitigation requirements for greenhouse gas emissions associated with electricity generation. These include RCW 80.70 (Carbon Dioxide Mitigation), which requires mitigation of 20% of the gross emissions from new thermal power plants and RCW 80.80 (Greenhouse Gas Emissions – Baseload Electric Generation Performance Standard), which sets an emissions performance standard for new power generation based on the performance of natural gas fired plants. In addition, RCW 70.235 establishes an emission reduction level for Washington State of 25% of 1990 levels by 2035. The mitigation requirements in RCW 80.70 and RCW 80.80 are not directly applicable to the Proposed Action, but these state laws establish a useful framework for comparison. If the coal transported by the Proposed Action was used for power plants located in Washington State, those standards would require mitigation of between 20% and approximately 55% of the gross emissions, depending on the efficiency of the plant and the standard chosen. The coal transported by the Proposed Action is for export to Asia to be combusted for power generation. Washington State standards would not apply to these facilities; however, the impact of the net greenhouse gas emissions attributable to the Proposed Action would affect Washington State regardless of the location of the facilities.

Under the Proposed Action, 44 million metric tons of coal would pass through the coal export terminal at full operation. Downstream combustion emissions from this coal equals approximately 90 million tons of CO_2e per year. However, not all of the emissions are attributable to the Proposed Action because some of the coal being shipped from the coal export terminal could displace other coal shipped from other areas and change transportation pathways. In particular, according to the model results from the preferred 2015 Energy Policy Scenario, average annual net emissions from the Proposed Action at full operation would be approximately 2.8% (i.e., 2.5 million metric tons of CO_2e) of the downstream combustion emissions from the coal that passes through the coal export terminal. By approximation to the standards in RCW 80.70, 80.80 and RCW 70.235, a mitigation rate of 50% of projected net emissions is reasonable and appropriate. This mitigation rate also takes into account potential variability in projected emissions.

To address the potential impacts of greenhouse gas emissions attributable to the Proposed Action, the Applicant will prepare a greenhouse gas mitigation plan that mitigates for 50% of the greenhouse gas emissions identified in the 2015 Energy Policy Scenario. For initial operations this is 693,723 metric tons of CO_2e (or 50% of 1,387,446) per year from 2021to 2027. For operations at maximum capacity this is 1.27 million metric tons CO_2e per year (or 50% of 2.53 million) from 2028 to 2038. The plan must be approved by the Washington State Department of Ecology. For mitigation that occurs in Cowlitz County, the plan will be approved by Cowlitz County and Ecology. The plan must be implemented prior to the start of operations. The measures described in the plan may include a range of mitigation options. The measures must achieve emission reductions that are real, permanent, enforceable, verifiable and additional. The emission reductions may occur in Washington State or outside of Washington State but must meet all five criteria.

5.8.1.9 Unavoidable and Significant Adverse Environmental Impacts

The mitigation measures identified above would substantially reduce, but not completely eliminate, the greenhouse gas emissions attributable to the Proposed Action. The Proposed Action’s remaining projected contribution to greenhouse gas emissions impacts, which are cumulative in nature, would still be significant and adverse under the greenhouse gas emissions intensity considerations previously noted.

5.8.2 Climate Change

The international scientific community is in agreement that human activities have contributed—and continue to contribute—to climate change. One of the primary causes of climate change is the emission of greenhouse gases, which trap heat in the atmosphere. The Applicant has stated that coal exported through the terminal would be combusted in Asia, and the combustion of coal would emit greenhouse gases. Analysis of greenhouse gas emissions related to the Proposed Action and potential mitigation measures from greenhouse emissions are discussed in Section 5.8.1, *Greenhouse Gas Emissions*. Studies have found, in general, that climate change could result in changes in precipitation, temperature, and storm intensity and could increase risks of damage from flooding, drought, heat waves, winds, and storm surge. This section discusses existing and future conditions.

The changing climate could affect the Proposed Action. This section describes potential climate change impacts in the study area related to the construction and operation of the Proposed Action and No-Action Alternative. This section does not discuss impacts impacts or mitigation for general climate change.

5.8.2.1 Regulatory Setting

Laws and regulations relevant to climate change are summarized in Table 5.8-12.

Table 5.8-12. Regulations, Statutes, and Guidelines for Climate Change

Regulation, Statute, Guideline	Description
Federal	
Clean Air Act of 1963 (42 USC 7401)	Directs the control of air pollutants nationally. The U.S. Supreme Court in 2007 established that greenhouse gases are air pollutants, and are therefore covered under this Act.
State	
Requirements of Strategy—Initial Climate Change Response Strategy (RCW 43.21M.020)	Directs state agencies to develop an integrated climate change response strategy to enable state, tribal, and local governments and public and private organizations to prepare for and adapt to the impacts of changing climate conditions. Outlines strategies for protecting human health, safeguarding infrastructure and transportation systems, improving water management, reducing losses to agriculture and forestry, protecting sensitive and vulnerable species, and supporting communities by involving the public.
Washington State Growth Management Act (WAC 365-195-920, RCW 36.70A)	Requires state and local governments to use "best available science" when developing policies and development regulations. Suggests using adaptive management as an interim approach for managing scientific uncertainty.
Local	
No local laws or regulations apply to climate change.	

Notes:
USC = United States Code; RCW = Revised Code of Washington; WAC = Washington Administrative Code

5.8.2.2 Study Area

The study area for potential impacts from climate change effects is defined as the project area for the Proposed Action and the access roads and rail leading to the project area.

5.8.2.3 Methods

This section describes the sources of information and methods used to identify projected changes in climate and to evaluate the impacts of climate change on the construction and operation of the Proposed Action and No-Action Alternative.

Information Sources

The following sources provided information on historical climate and projected changes in climate for southwestern Washington State.

- **National Climate Change Viewer.** The U.S. Geological Survey (USGS) National Climate Change Viewer (U.S. Geological Survey 2014a) contains historical and future climate projections at watershed, state, and county levels for the continental United States. The viewer contains *multimodel ensemble data* (*mean model*), combining the results from 30 independent climate models developed by researchers around the world under the coordination of the Fifth Coupled Model Intercomparison Project (CMIP5).[3] Multimodel data increase the robustness of projections and provide information on the level of uncertainty in the direction and magnitude of future climate trends. Climate information in the viewer has been *downscaled*, or processed using statistical analysis to provide projections with higher geographic resolution of temperature, precipitation, and snowfall. Historical values and future projections of temperature were examined for Cowlitz County where the Proposed Action would be located. Historical values and future projections of precipitation and snowfall were examined for the Lower Columbia River Basin.
- **2014 National Climate Assessment.** The 2014 National Climate Assessment was conducted by the U.S. Global Change Research Program (2014). This assessment summarizes the current and future impacts of climate change in the United States. Its findings, which have undergone extensive public and expert peer review, were compiled by a team of more than 300 experts guided by the 60-member Federal Advisory Committee of the National Academy of Sciences. The report uses multimodel ensemble projections developed under CMIP5, supplemented by information from an earlier phase of the project, CMIP3, where necessary.

Impact Analysis

The following methods were used to evaluate the potential impacts of climate change on the Proposed Action.

For each potential climate change impact, this analysis determined how changes in climate could affect the Proposed Action or No-Action Alternative by comparing climate change projections against the following data.

- Historical records of relevant events or climate hazards.
- Current maps and risk or hazard indices (e.g., flood rate insurance maps, wildfire hazard maps).
- Established temperature or precipitation thresholds at which climate impacts are expected to become more severe.
- Information on engineering, design, and operational characteristics of the coal export terminal.

[3] CMIP5 is the fifth phase of the World Climate Research Programme's Coupled Model Intercomparison Project, which has established a standard set of simulations for coordinated climate experiments among international climate modeling groups. CMIP5 data is accessible over the internet and has been used in the Intergovernmental Panel on Climate Change's Fifth Assessment Report, an internationally vetted and authoritative report on global climate change. A list of the climate models can be found in Appendix 5 of the National Climate Change Viewer Tutorial (U.S. Geological Survey 2014b).

5.8.2.4 Existing and Future Conditions

Temperatures have increased across the Pacific Northwest by 1.3 degrees Fahrenheit (°F) since 1895. Precipitation has increased but these increases are small and vary in location within the region. Under the changing climate, temperatures could rise by as much as 9.7°F by the end of the century. Future trends in average precipitation are very uncertain and could increase or decrease, but summer precipitation is projected to decrease by as much as 30% by 2100.

Snowpack averaged over the Cascade Mountains has declined by about 20% since 1950. In the future, snowpack is expected to continue its downward trend, causing declines in snowmelt. According to Elsner et al. (2010), the snow water equivalent on April 1 could decline by almost half (46%) by the 2040s and virtually disappear by the 2080s, greatly reducing streamflow in some areas.

The incidence of extreme precipitation may have increased over time, but it has not yet been demonstrated to be statistically significant. It varies with location within the region. Under the changing climate in the Pacific Northwest, the number of days with daily rainfall greater than 1 inch could increase by 13% between 2041 and 2070.

Sea levels are rising but uplift of the land in parts of the Pacific Northwest mitigates possible impacts from sea-level rise. By contrast, areas around Puget Sound are subsiding and causing larger-than-average increases in sea levels. For the Pacific Northwest, sea-level rise is expected to be as little as 5 inches or less to greater than 4 feet by the end of the century. The impacts of the El Nino South Oscillation phenomenon on climate variability can be significant. During El Nino years, regional sea levels can increase by 4 to 12 inches and last for many months.

Climatic changes in precipitation could have far-reaching effects for the Pacific Northwest. Reduced summer rainfall and reductions in snowmelt could result in reduced streamflow. Increases in extreme precipitation could lead to increased flooding, especially in basins that derive their water from both rainfall and snowfall. Rising sea levels could also lead to flooding. Increasing temperatures and reduced precipitation could lead to an increase in wildfires, which are driven, in part, by water deficits. By the 2080s, the median area burned annually in the Pacific Northwest could quadruple compared to the 1916-to-2007 period (Mote et al. 2014).

Ocean acidification is the decrease of pH of ocean water over an extended period caused by the uptake of carbon dioxide from the atmosphere. This results in changes in seawater carbonate chemistry that can affect marine organisms such as shellfish. Biological impacts from ocean acidification are expected to vary but could be significant.

This section describes the historical and projected climate conditions in the study area that include changes in temperature, precipitation, and snowfall.

Historical and Projected Changes in Temperature

One of the most notable characteristics of climate change is the increase in temperatures over time.

Historical Temperatures

Washington State has a varied climate with significant differences in temperature and precipitation on the east and west sides of the Cascade Mountains. Temperatures across the Pacific Northwest have increased from 1895 to 2011 by 1.3°F (Mote et al. 2014). West of the Cascades, where the study area is located, the climate is characterized by mild temperatures and heavy annual precipitation. From 1950 to 2005, the highest monthly average temperatures in Cowlitz County were more than 75°F, cooler than Washington State as a whole (77.5°F) but warmer than the lower Columbia River Basin of which it is part (73.4°F). The highest monthly average temperature in Cowlitz County over this period was a moderate 77.2°F (August) (U.S. Geological Survey 2014a). In general, the lowest monthly average temperatures in Cowlitz County during winter were below 31.6°F from 1950 to 2005. The area has experienced a warming trend in the past 50 years; the annual average maximum temperatures have increased by 0.9°F (U.S. Geological Survey 2014a).

Projected Temperatures—Near-Term Future

In the near-term future, seasonal temperatures in the study area are projected to increase. In Cowlitz County, hot summer temperatures could rise by as much as 4.3°F in the high greenhouse gas emissions scenario from 2025 to 2049,[4] compared to baseline (U.S. Geological Survey 2014a). Cold winter temperatures are projected to increase by 2.4 to 3.0°F in moderate and high greenhouse gas emissions scenarios over this period.

Projected Temperatures—Midterm Future

The warming trend continues into the midterm future (2050 to 2075), when hot summer temperatures in Cowlitz County are projected to increase by 5.4 to 7.2°F. Coldest temperatures are expected to increase by as much as 5.2°F. These increases will likely bring the coldest temperatures near to or above the freezing point. While some models project higher or lower increases in temperature, all 30 models agree that temperatures will increase in Cowlitz County. Table 5.8-13 summarizes these historical and projected changes in temperature.

Table 5.8-13. Historical and Projected Changes in Temperature in Cowlitz County, Washington

Historical Climate and Observed Changes (1950–2005)	Near-Term Projected Changes (2025–2049 Compared to 1950–2005)	Midterm Projected Changes (2050–2075 Compared to 1950–2005)	Level of Certainty in Projections
The average monthly summer and winter temperatures (approximately 75°F and 32°F, respectively) reflect the moderate climate of the area.	Summer and winter temperature extremes are projected to increase.	Summer and winter temperature extremes are projected to increase.	There is excellent agreement across models on the direction of change.
Highest average monthly summer temperatures (top 10%, or 90th percentile) were above 75.0°F. Max monthly average temperature for August was 77.2°F.	90th percentile temperature is projected to increase by 3.8 to 4.3°F under moderate and high emissions scenarios.	90th percentile temperature is projected to increase by 5.4 to 7.2°F under moderate and high emissions scenarios.	Monthly average temperature is projected to increase in all months across all models compared to 1950–2005.

[4] Greenhouse gas scenarios are based on the flow of coal from extraction points through transport to export terminals, distribution to local and global markets, and combustion. Section 5.8.1, *Greenhouse Gas Emissions*, provides a discussion of these scenarios.

Historical Climate and Observed Changes (1950–2005)	Near-Term Projected Changes (2025–2049 Compared to 1950–2005)	Midterm Projected Changes (2050–2075 Compared to 1950–2005)	Level of Certainty in Projections
Lowest monthly average winter temperatures (10th percentile) were below 31.6°F.	10th percentile temperature is projected to increase by 2.4 to 3.0°F under moderate and high emissions scenarios.	10th percentile temperature is projected to increase by 4.0 to 5.2°F under moderate and high emissions.	Monthly average temperature is projected to increase in all months across all models compared to 1950–2005.

Historical and Projected Changes in Precipitation

Precipitation in the Pacific Northwest affects Columbia River water levels. The Columbia River is the fourth largest river in North America. It is influenced by multiple river basins from multiple states and British Columbia, Canada. The geographic and hydrologic characteristics of the river, which drains an approximately 259,000-square-mile basin, are suited to beneficial multipurpose storage development. Since the 1930s, numerous dams, both federal and private, have been built to store water for flood control, to generate hydroelectric power, and for other purposes. Total storage capacity of these dams is about 25% of the 156-million-acre-foot average annual runoff volume for the Columbia River at the mouth of the river at the Pacific Ocean. Federal projects in the basin have 19,900 megawatts of existing hydroelectric capacity, and non-federal projects add 10,700 megawatts (U.S. Army Corps of Engineers 2015).

The primary concerns about precipitation are whether there is enough precipitation (e.g., drought conditions), when it occurs (winter snowpack levels), and whether the precipitation is delivered in extreme events, which can cause significant damage.

Washington State defines drought as 75% of normal water conditions (Revised Code of Washington [RCW] 43.83B.400). In the past century, drought occurred from 1928 to 1932, 1992 to 1994, and 1996 to 1997, and most recently in 2015. Drought has caused shipping costs to rise, sometimes requiring wheat growers to move their product by rail or truck instead of barge transport. Washington State estimates that it will experience severe or extreme drought 5% of the time in the future and more frequently east of the Cascade Mountains (Washington State Emergency Management Division 2012a). The 2015 drought emergency affected all of Washington State (Washington State Department of Ecology 2015).

Extreme precipitation, especially during the winter, has frequently led to flooding events in the Pacific Northwest. Major flooding in western Washington in January 2009 closed Interstate 5, heavily damaged the Howard Hanson Dam, and put tens of thousands of people at risk. (Warner et al. 2012). A key driver of these precipitation events is the phenomenon of atmospheric rivers that form in the Pacific Ocean and move eastward toward the Pacific Northwest. In December 2015, an atmospheric river formed and made landfall along the Washington coast, resulting in approximately 16 inches of precipitation over 3 days across Oregon, Washington, and British Columbia. Although future trends in average precipitation are very uncertain and could increase or decrease, summer precipitation is projected to decrease significantly.

The incidence of extreme precipitation events may have increased over time, but it has not yet been demonstrated to be statistically significant. It varies with location within the region. Under the changing climate in the Pacific Northwest, the number of days with daily rainfall of more than 1 inch could increase by 13% from 2041 to 2070.

Historical Precipitation

According to the National Climate Assessment (Mote et al. 2014), the anticipated change in annual precipitation in the Pacific Northwest (2030 to 2059) ranges from decreases (-11%) to increases (+12%) for scenarios ranging from low to high greenhouse gas emissions (Intergovernmental Panel on Climate Change 2000). This variability makes the analysis of potential impacts problematic. Typically, average monthly precipitation is greatest in winter (December through February) and least in summer (June through August) (U.S. Geological Survey 2014a). From 1950 to 2005, precipitation in the lower Columbia River Basin averaged 0.40 inch per day in winter (U.S. Geological Survey 2014a) and about half that in spring (0.22 inch) and fall (0.25 inch). By contrast, only 0.07 inch per day fell during the summer months.

Projected Precipitation—Near-Term Future

In the near term, the model indicates slight increases in the winter, spring, and fall compared to the 1950 to 2005 average. The largest increase in precipitation is projected to occur in fall (4.1 to 2.1%) and winter (2.3 to 4.8%). Very little increase is projected for the spring (0 to 1%) (U.S. Geological Survey 2014a). By contrast, summers in the near-term future are projected to become drier by 10 to 12%, although some climate models disagree and instead project that summer precipitation will remain the same or increase (U.S. Geological Survey 2014a). Overall, model agreement on precipitation is not strong. For example, in some cases, 19 models project decreases in June precipitation and 11 indicate increases for the near-term future. Agreement for the month of August, however, was closer, with 26 models showing decreases and only four demonstrating increases.

Projected Precipitation—Midterm Future

Similar changes are projected to continue in the midterm future: the winter, spring, and fall seasons could become wetter, while summers could become drier. In the lower Columbia River Basin, winter and fall precipitation levels are projected to increase by 4.9 to 7.1% and 3.6 to 1.5%, respectively, while spring levels remain relatively constant (0 to 1.8% increase) in moderate and high greenhouse gas emission scenarios compared to the 1950 to 2005 average. Extreme precipitation events could increase by 5.0 to 6.1% in the near-term future and 6.1 to 8.0% in the midterm future (U.S. Geological Survey 2014a), but studies of past trends in observed changes in extreme precipitation have yielded ambiguous results (Mote et al. 2014). Model discrepancies are similar with most models showing increases and others showing decreases. Table 5.8-14 summarizes these historical and projected changes in precipitation.

Table 5.8-14. Historical and Projected Changes in Precipitation in the Lower Columbia River Basin

Historical Climate and Observed Changes (1950–2005)	Near-Term Projected Changes (2025–2049 Compared to 1950–2005)	Midterm Projected Changes (2050–2075 Compared to 1950–2005)	Level of Certainty in Projections
Average annual precipitation was 0.24 inch/day.	Wetter winter, spring, and fall seasons; possible drier summers.	Wetter winter, spring, and fall seasons; possible drier summers.	Some models show increases in precipitation while others show decreases.

Historical Climate and Observed Changes (1950–2005)	Near-Term Projected Changes (2025–2049 Compared to 1950–2005)	Midterm Projected Changes (2050–2075 Compared to 1950–2005)	Level of Certainty in Projections
			Incidence of extreme precipitation is more likely to increase.
The highest (90th percentile) monthly average precipitation was 0.43 inch/day.	Change in average precipitation by season under moderate and high emission scenarios. Winter: +2 to 5% Spring: 0 to +1% Summer: -10 to -12% Fall: +4 to +2%	Change in average precipitation by under moderate and high emission scenarios Winter: +5 to +7% Spring: +0 to +2% Summer: -10 to -16% Fall: +4 to +2%	A majority of models (18 to 26 of 30, depending on the scenario and timeframe) project that precipitation will decrease in the summer.
The lowest (10th percentile) monthly average precipitation was 0.06 inch/day.	Intensity of extreme precipitation could increase. 90th percentile precipitation is projected to increase by 5 to 6% under moderate and high emissions scenarios	Intensity of extreme precipitation could increase. 90th percentile precipitation is projected to increase by 6 to 8% under moderate and high emissions scenarios	Most models (20 of 30) project an increase in extreme precipitation.

Historical and Projected Changes in Snowfall

Snowfall in the Canadian Rockies and the Cascade Mountains provides much of the water flowing in the Columbia River. In contrast to the variable projections in overall precipitation, the anticipated changes in snowfall are large and model agreement is very high. Significant projected declines in snowpack could greatly reduce stream flow in some areas.

Historical Snowfall

Average annual snowfall was 5.6 inches per month from 1950 to 2005. Average winter and spring snowfall, when virtually all snowfall occurs, was about 29.7 and 33.3 inches, respectively. However, since 1950, snowpack in the Pacific Northwest has declined by about 20%.

Projected Snowfall—Near-Term Future

Annual snowfall is expected to decline by 39 to 45% in the near-term future for the moderate and high greenhouse gas emissions scenarios. This substantial decrease is projected to occur within relatively narrow bands (winter: 33 to 40%; spring: 41 to 47%). All models indicate decreases in annual, winter, and spring snowfall (U.S. Geological Survey 2014a).

Projected Snowfall—Midterm Future

In the midterm future, declining snowfall is expected to intensify. Winter snowfall could decline by as much as 62% (ranging from 49 to 62% under the moderate and high emissions scenarios); spring snowfall could decrease by as much as 75% under the moderate emissions scenario and 68% under the high emissions scenario. All models agree that snowfall will decline over time. Table 5.8-15 summarizes these historical and projected changes in snowfall.

Table 5.8-15. Historical and Projected Changes in Snow in the Lower Columbia River Basin

Historical Climate and Observed Changes (1950–2005)	Near-Term Projected Changes (2025–2049 Compared to 1950–2005)	Midterm Projected Changes (2050–2075 Compared to 1950–2005)	Level of Certainty in Projections
Heaviest snowfall occurs in the winter and spring leading to high average annual snowfall totals	Average annual, winter, and spring snowfall will likely decline under the moderate and high emission scenarios in the near term	Average annual, winter and spring snowfall will likely decline under the moderate and high emission scenarios in the mid-term	All models agree on the direction of change
Average annual snowfall was 5.6 inches/month	Change in average monthly snowfall could decline by 39 to 45%	Change in average monthly snowfall could decline by 54 to 66%	All models agree on the direction of the change
Average winter and spring snowfall was 29.7 and 33.3 inches, respectively	Change in average winter and spring snowfall under moderate and high emission scenarios • Winter: -33 to -40% • Spring: -41 to -47%	Change in average winter and spring snowfall under moderate and high emission scenarios • Winter: -49 to -62% • Spring: -75 to -68%	All models agree that snowfall will decline in the winter and spring in near– and midterms

Sea-Level Rise

Sea levels are rising. However, some areas of the Pacific Northwest are experiencing uplift; by contrast, areas around Puget Sound are subsiding and experiencing larger-than-average impacts from rising sea levels. Sea-level rise in the Pacific Northwest is expected to be as little as 5 inches or less to more than 4 feet by the end of the century. The impacts of the El Niño Southern Oscillation phenomenon on climate variability can be significant. During El Niño years, regional sea levels can increase by 4 to 12 inches and last for many months.

5.8.2.5 Impacts

This section describes the potential impacts related to climate change that could affect construction and operation of the Proposed Action or No-Action Alternative in the study area.

Proposed Action

This section describes the potential impacts of climate change on the construction and operation of the Proposed Action that could occur within the study area.

Cause Possible Service Disruptions from Low Water Levels

Changes to precipitation could have far-reaching effects for the Pacific Northwest. Reduced summer rainfall and reductions in snowmelt will probably result in reduced stream flow. This trend could cause tradeoffs among the many water uses, including transport, agriculture, recreation, and others, and a possible reduction in hydropower. Decreased snowfall in the

Lower Columbia River Basin, especially in the winter and spring, coupled with potential declines in rainfall in the summer could lead to abnormally low levels of water in the Columbia River. Low water levels could impede the passage of large ships to and from the docks at the project area and could increase for electricity or otherwise force difficult choices on competing water usage.

Proposed Action-related Panamax ships would berth at two docks (Docks 2 and 3) to receive coal shipments. Panamax ships are midsized cargo ships, the largest that could fit through the Panama Canal prior to expansion. They have a capacity of 60,000- to 100,000-deadweight tonnage and require a draft of 42 to 49 feet. The depth of the Columbia River at the project area varies by season. If precipitation from snow and rain cause Columbia River water levels to decline, shipping could be restricted or more dredging could be required more frequently.

At the project area, the Columbia River experiences tidal fluctuation, although less than at the mouth of the river. Tidal forces could replace some or all of the water needed for ship passage in the event of low runoff from reduced snowmelt and rainfall. The potential for low water disruptions could also be reduced by future sea-level rise. Sea levels are expected to increase by as much as 4 feet in the Pacific Northwest, but this could be significantly less if the project area is—as much of the Pacific Northwest is—subject to uplift. The Columbia River is also highly managed to provide water for multiple competing uses. For example, low water levels upstream of the project area have constrained recreational boating at times.

Washington State is heavily dependent on hydropower for electricity. Approximately 75% of its electricity comes from hydropower generated by its systems of rivers and dams. The rivers also supply water for irrigation, municipalities, and industry. Drought-induced loss of hydropower could raise costs. As the supply of locally generated hydropower is reduced, utilities must seek additional sources of electricity, which could drive up electricity prices for construction and operation of the Proposed Action (Washington State Emergency Management Division 2012a).

Although the project area is located within the Columbia River estuary, is protected by levies, and therefore, the main impact of sea-level rise at the project area is expected to be minimal, but could reduce the potential for service disruptions from low water.

Cause Possible Damage and Service Disruptions from Flooding

Potential precipitation increases and intense downpours could cause flooding in basins that derive their water from both rainfall and snowfall, such as the Cowlitz River or Columbia River. Rising sea levels could also lead to flooding of public and private property, roads, and railways.

Water levels in the Columbia River vary by season and year, depending on the snow mass in the upper watershed. Historic crests on the Columbia River range from 13 to 24 feet with flood stage at 13.5 feet. Historic crests on the Cowlitz River range from 21 to 29.5 feet and have been recorded well above flood stage (21 feet). Above 28.5 feet, major flooding is expected. This flood stage could overtop the levee and increase erosion (ICF International 2016b). The project area is on the Columbia River, about 5 miles from the confluence of the Columbia and Cowlitz Rivers (ICF International 2016b). The study area is protected from flooding by a levee maintained by the Consolidated Diking Improvement District (CDID) #1, which is 34 feet above the Columbia River Datum. It is also protected by a system of sloughs, ditches, and drains. The Federal Emergency Management Agency classifies the project area as Zone B in its Flood Insurance Rate Map, meaning the area is expected to flood every 100 to 500 years.

Under current conditions, flooding is expected to be minimal at the project area (ICF International 2016b). In the future, flooding could be of concern, particularly from the Cowlitz River. In August 2014, the U.S. Army Corps of Engineers found that sediment buildup on the Cowlitz River was increasing the potential for flooding. Without further action, the flood risk level on the river (0.6%) would be exceeded by 2018 (U.S. Army Corps of Engineers 2014). While future precipitation is somewhat uncertain, the mean model indicates increases in fall and winter precipitation for both the near and midterm futures, which could increase flood risk. Because the project area is approximately 50 miles inland from the Columbia River estuary, the main impact of sea-level rise at the project area is expected to be minimal, but sea-level rise could exacerbate the potential for flooding at discrete locations.

The BNSF Spur and Reynolds Lead that would carry Proposed Action-related trains to the project area could be subjected to flooding. The rail line crosses the Cowlitz River near the confluence with the Columbia River and runs near the rivers for the 5 miles to the project area. Because historical and recent crests have been reported on the Cowlitz River, flood risk from sedimentation is increasing, and future precipitation could increase, flooding of the Reynolds Lead is possible. Cowlitz River flooding at this location would likely disrupt rail and terminal operations, and ballast supporting the rail line could be dislodged. Therefore, Proposed Action-related trains could be affected by a Cowlitz River flood.

Cause Possible Service Disruptions from Wildfires

Wildfire is a threat in Washington State. Cowlitz County is considered a high-risk area (Washington State Emergency Planning Division 2012c). A wildfire could affect the project area from the undeveloped areas adjacent to the project area or a Proposed Action-related train in the study area. Wildfires in Cowlitz County numbered more than 350 from 2004 to 2013, burning more than 561 acres. In late summer and early fall, dry easterly winds can produce extreme fire conditions. This threat has increased over time because of four climate-related factors: earlier snowmelt, higher summer temperatures, longer fire season, and an expanded vulnerable area of high-elevation forests (Washington State Emergency Planning Division 2012c). Increasing temperatures, extreme heat events, and drought could have an effect on fire regimes in Washington State by influencing the length of the fire season and contributing to drier conditions and the availability of readily combustible fuel for fires (Mote et al. 2014). By the 2080s, the median area burned annually in the Pacific Northwest could quadruple compared to the 1916 to 2007 period (Mote et al. 2014).

Maximum temperatures are predicted to increase while summer precipitation is predicted to decrease in the study area, although there is some disagreement among the models, and some indicate that summers could become slightly wetter. Hotter and drier summers would increase the likelihood of wildfires.

No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the coal export terminal and potential climate change impacts related to construction and operation of the Proposed Action would not occur. The Applicant would continue with current and future increased operations in the project area. The project area could be developed for other industrial uses, including an expanded bulk product terminal or other industrial uses. The Applicant has indicated that, over the long term, it would expand the existing bulk product terminal and develop new facilities to handle more products such as calcine petroleum coke, coal tar pitch, and cement.

Ongoing and expanded operations in the project area would be affected by climate change as described for the Proposed Action. These impacts could include possible service disruptions from low water levels, flooding, and wildfires.

5.8.2.6 Required Permits

No permits related to climate change would be required for the Proposed Action.

5.8.2.7 Potential Mitigation Measures

Potential climate change impacts on the Proposed Action in the project area are not considered significant and would not necessitate mitigation.

5.8.2.8 Unavoidable and Significant Adverse Environmental Impacts

There would be no unavoidable and significant adverse environmental impacts.