Chapter 4
Natural Environment: Existing Conditions, Project Impacts, and Potential Mitigation Measures

4.0 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 natural environment resource areas assessed for the Millennium Bulk Terminals—Longview project (Proposed Action).

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

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

4.0.1 Natural Environment Resource Areas

Chapter 4, *Natural Environment: Existing Conditions, Project Impacts, and Potential Mitigation Measures*, evaluates the natural habitat and biological communities near the Proposed Action. The resource areas reviewed as part of the natural environment analysis include geology and soils; surface water and floodplains; wetlands; groundwater; water quality; vegetation; fish; wildlife; and energy and natural resources (Table 4.0-1). Additional detailed information about these resources can also be found in their 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 4.0-1. 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

4.0.2 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. 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.

4.0.3 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

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

area and an indirect impacts study area. Table 4.0-2 explains the differences between these two study areas. In some cases, both study areas are the same.

Table 4.0-2. 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. • **Operation:** Impacts occurring in the project area resulting from rail unloading, coal storage, machinery operations, equipment, vessel loading, etc.
Indirect	An impact resulting from either construction or operation 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. • **Operation:** Impacts from activities beyond the project area during operations, such as rail, vehicle, and vessel traffic.

Table 4.0-3 provides a summary of the direct and indirect impacts study areas by Chapter 4 resource.

Table 4.0-3. Direct Impacts Study Areas and Indirect Impacts Study Areas by Resource

Resource	Direct Impacts Study Area	Indirect Impacts Study Area	
		Cowlitz County	**Washington State (beyond Cowlitz County)**
4.1, Geology and Soils	Project area	Project area and the broader area surrounding that could influence the project area	No additional study area[a]
4.2, Surface Water and Floodplains	• Surface Water: Columbia River and stormwater drainage ditches in the project area • Floodplains: Project area	• Surface Water: Stormwater system drainage ditches adjacent to the project area and the Columbia River 1 mile downstream from the project area. • Floodplains: Project area and surrounding 500-year floodplain on the north side of the Columbia River in the vicinity of the project area	No additional study area[a]
4.3, Wetlands	Applicant's leased area	Applicant's leased area	No additional study area
4.4, Groundwater	Project area	Applicant's leased area	No additional study area[a]
4.5, Water Quality	Project area and the area extending 300 feet from the project area into the Columbia River, and potential in-river dredged material disposal sites	Project area, stormwater system drainage ditches adjacent to the project area, the Columbia River 1 mile downstream from the project area, and potential dredged material disposal sites	No additional study area
4.6, Vegetation	Applicant's leased area	Area immediately adjacent to the Applicant's leased area and contiguous forestland and other intact vegetation communities, and vegetation within 1 mile of the project area.	Rail routes for Proposed Action-related trains[a,b]
4.7, Fish	Main channel of the Columbia River 3.92 miles upstream and downstream of the project area	Columbia River	Rail routes for Proposed Action-related trains[a,b]

		Indirect Impacts Study Area	
Resource	**Direct Impacts Study Area**	**Cowlitz County**	**Washington State (beyond Cowlitz County)**
4.8, Wildlife	• Terrestrial Species and Habitats: Project area and 0.5 mile from project area • Aquatic Species and Habitats: Main channel of the Columbia River to 5.1 miles upstream and 2.1 miles downstream of the project area	• Rail routes for Proposed Action-related trains • Columbia River	• Rail routes for Proposed Action-related trains[a] • Columbia River
4.9, Energy and Natural Resources	Project area	Area within 0.25 mile of project area	Not in the study area

Notes:

[a] Appendix F, *Rail and Vessel Corridor Information*, provides additional information for the Proposed Action-related rail and vessel corridors from the *Tesoro Savage Vancouver Energy Distribution Terminal Facility Draft Environmental Impact Statement* (Washington State Energy Facility Site Evaluation Council 2015).

[b] Study area for potential impacts related to coal spills only.

4.0.4 Mitigation Measures Development Approach

Applicable regulations, specific permit conditions, and required planning documents were evaluated to determine if they would address potentially significant adverse environmental impacts identified in this Draft EIS. When applicable, each section describes specific measures identified by the Applicant to be implemented during construction and operations. When potential significant adverse environmental impacts remained, other potential mitigation measures were identified that could reduce the identified 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 recommended mitigation measures that could be implemented 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.

4.1 Geology and Soils

Geology and soils are resources with defining characteristics (such as soil structure, composition, or geologic formations) that are unique or valuable or support unique habitats. Geology and soils can also influence the potential for geologic hazards, such as landslides, earthquakes, seismic effects (e.g., surface fault ruptures, strong ground shaking, liquefaction, lifting and lowering of the surface, and tsunamis), and volcanic activity. Understanding the types of soils and the underlying geologic conditions is important in determining whether a project would be exposed to increased risks related to these conditions.

This section describes the geology and soils in the study areas. It then describes potential impacts on geology and soils that could result from construction and operation of the Proposed Action and under the No-Action Alternative, as well as the geologic conditions that exist in the study areas that could pose a risk to the project area. This section also presents the measures identified to mitigate impacts resulting from the Proposed Action.

4.1.1 Regulatory Setting

Laws and regulations relevant to geology and soils are summarized in Table 4.1-1.

Table 4.1-1. Regulations, Statutes, and Guidelines for Geology and Soils

Regulation, Statute, Guideline	Description
Federal	
Clean Water Act Section 402 General Permit for Stormwater Discharges Associated with Construction Activities	Primarily deals with water quality but includes eroded soils potentially delivered offsite via runoff. Mandates that certain types of construction activities (and operations) comply with the EPA NPDES program. The EPA has designated Washington State Department of Ecology the nonfederal authority for the NPDES program in Washington State. Includes development of a stormwater pollution prevention plan.
Local	
Cowlitz County Critical Areas Protection Ordinance (19.15)	Designates geologically hazardous areas (including seismic, volcanic, erosion, and landslide hazards) and defines performance standards and specific requirements for development within these areas.
Cowlitz County Grading (16.35)	Grading plan requirement and standards including the protection of water quality from adverse impacts of erosion and sedimentation.
Cowlitz County Building Code (16.05)	Cowlitz County has adopted the 2012 International Building and Residential Codes.

Notes:
EPA = U.S. Environmental Protection Agency; NPDES = National Pollutant Discharge Elimination System

4.1.2 Study Area

The study area for direct impacts on geology and soils is the project area for the Proposed Action.

The study area for indirect impacts on geology and soils is the project area and the broader geologic environment in the area surrounding the project area that could influence the project area. These broader geologic influences include earthquakes (seismicity) and their associated impacts (ground shaking), as well as tsunamis (large earthquake-generated waves that can affect coastal zones and could travel some distance up large rivers) or landslides that might reach the project area. Figure 4.1-1 shows the study areas for the geology and soils analysis.

4.1.3 Methods

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

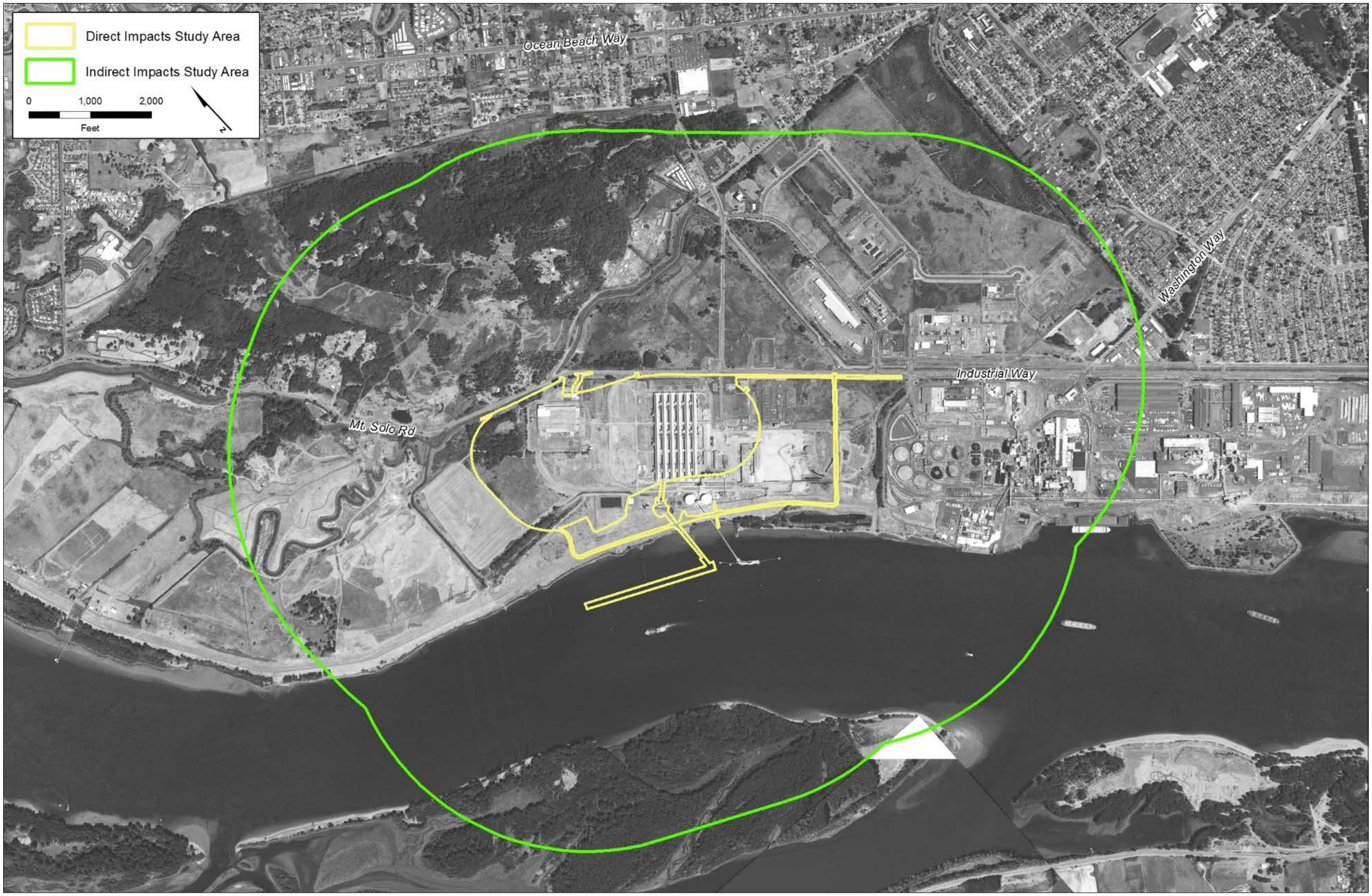
4.1.3.1 Information Sources

Information with respect to geology and soils was collected through review of information and reports provided by the Applicant as well as other sources of information and scientific literature, including Washington Department of Natural Resources Division of Geology and Earth Resources materials, U.S. Geological Survey (USGS) maps and reports, U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil information, and geological and soil literature. Additionally, a site visit by a professional geologist conducted on January 29, 2014, provided an overview of existing conditions at the project area.

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

- USGS National Seismic Hazard Maps and associated report (U.S. Geological Survey 2013)
- Cascadia Region Earthquake Workgroup (2013) report on the Cascadia Subduction Zone earthquakes
- Washington Department of Natural Resources Division of Geology and Earth Resources geologic mapping and geologic hazards of the Longview area (various)
- NRCS soil mapping (2013)
- Geotechnical engineering reports and geotechnical engineering data reports prepared for the project area (GRI 2011 , 2012)
- Professional workshop and refereed scientific journal materials on tsunamis in the Columbia River
- Geology and soil report prepared for the project area by the Applicant (URS Corporation 2013)

Figure 4.1-1. Geology and Soils Study Areas



4.1.3.2 Impact Analysis

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

The analysis of potential impacts related to geology and soils reviewed the following.

- Regional and site characteristics (bedrock, unconsolidated sediment, and soil characteristics) and how they could influence site or structure stability through soil erosion, landslides, and settling.
- Potential ground shaking and ground settling that could occur due to earthquakes and the stability of the underlying materials.
- The potential for impacts related to volcanic hazards and tsunamis.

4.1.4 Existing Conditions

This section describes the existing environmental conditions in the study area related to geology and soils that could be affected by the construction and operation of the Proposed Action and No-Action Alternative. Broader geologic context is provided as a foundation for the site-specific analysis presented in the following section.

4.1.4.1 Geology in the Project Area and Vicinity

The project area is located on the north shore of the Columbia River, approximately 5 miles downstream of the confluence of the Cowlitz and Columbia Rivers (at approximately river mile 63 in the Columbia River). Levees were constructed along the river side of the project area (Figure 4.1-2) around 1920, and the area has been used as an industrial site since the 1940s (Anchor QEA 2011). The project area is relatively level with some steep slopes that descend into drainage ditches on the northern part of the project area and to the Columbia River on the south side. Soils consist mostly of alluvium (i.e., river deposits of gravel, sand, and silt) as well as human-made sources of fill. The project area is at an elevation approximately 16 feet above sea level.

The adjacent Columbia River navigation channel is approximately 43 feet deep at low tide (National Oceanic and Atmospheric Administration Chart 18524) and from 28 to 42 feet deep at low tide at the location of the proposed docks (Dock 2 and Dock 3). No unique geologic physical features, such as unique geologic formations, rock outcroppings, cliffs, or soil formations, occur at the project area.

The study area exhibits attributes that are typical of the lower Columbia River valley. The regional geology is dominated by events related to the eastward movement of the Juan de Fuca tectonic plate against the North American plate (Evarts et al. 2009; Parsons et al. 2005). As these plates shift, the Juan de Fuca plate descends below the North American plate and it liquefies at depth. The associated magma (lava) rises to the surface to form the volcanic Cascade mountain range.

Areas of exposed bedrock are present near the project area. These areas include Mount Solo to the immediate north of the project area (Figure 4.1-3) and Mount Coffin approximately 0.5 mile upstream of the project area (Washington Department of Natural Resources 2014). The outermost bedrock on Mount Solo is mapped as volcanic rocks (basalt). At the study area scale, landslides are also mapped along the slopes of Mount Solo.

Figure 4.1-2. Levees in the Project Area and Vicinity

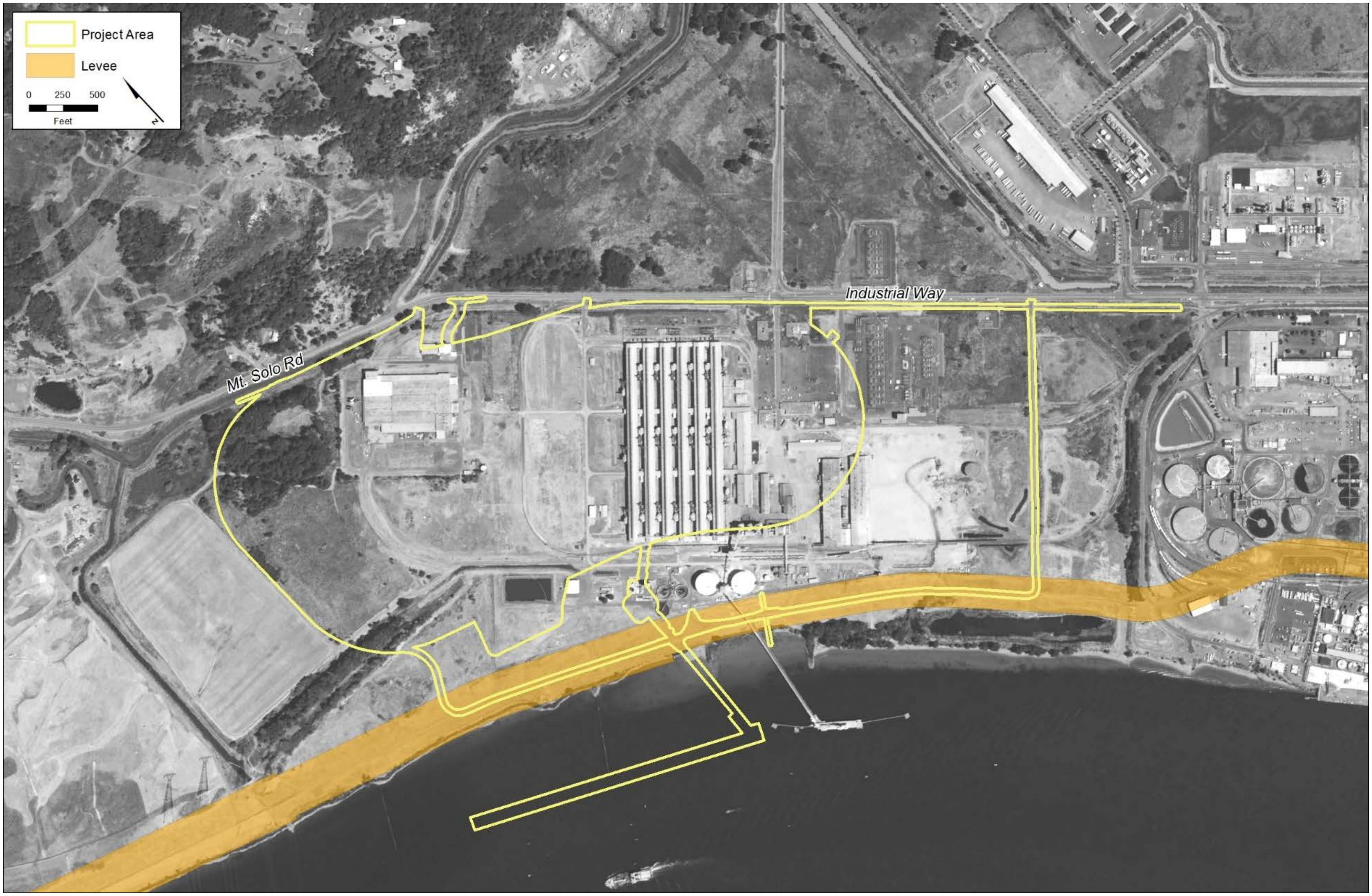
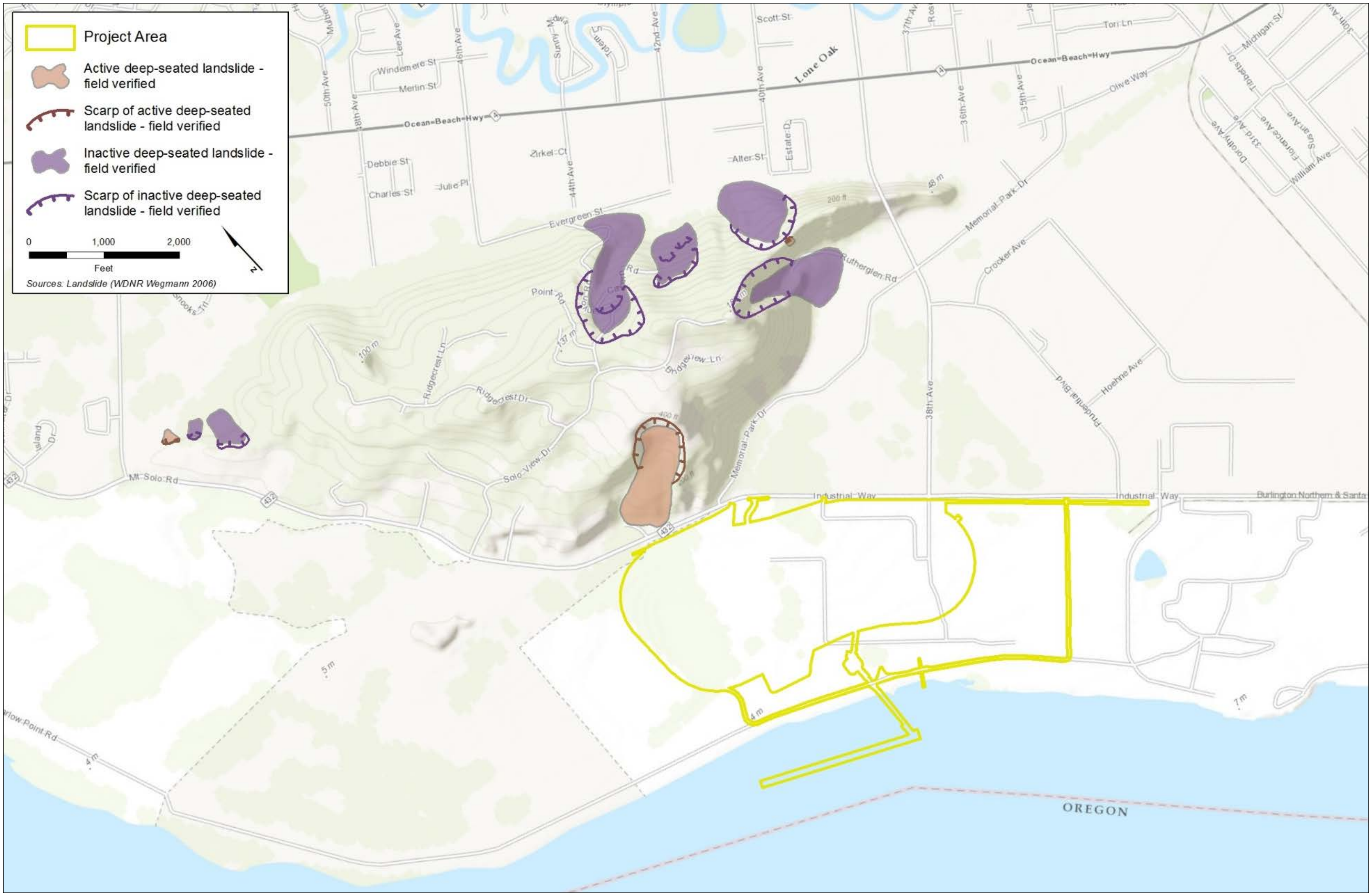


Figure 4.1-3. Landslides in the Project Area and Vicinity



Subsurface Conditions

The soil material beneath the project area is derived from the interaction of the river and the floodplain during high flow events, which deposit sediments consisting of sand, silt, and clay, as well as areas of peat (Anchor 2007; Anchor QEA 2011; GRI 2012; URS Corporation 2014a). Groundwater is found between 3 and 20 feet below the ground surface, so sediments have varying amounts of water content (Anchor QEA 2011, 2013; GRI 2012; URS Corporation 2014a). Geotechnical investigations indicate that the surface and near-surface sediments are soft or loose (URS Corporation 2014a). These conditions indicate the potential for some settlement under the weight of certain project features, such as stockpile pads, buildings, and rail loops. Field tests indicate the potential for relatively significant settlement of these underlying materials over a long period of time (URS Corporation 2014a).

Because of saturated sandy soil conditions that exist at the project area, liquefaction of soils could result from an earthquake. Geotechnical reports prepared for a previously proposed asphalt plant at the site identified the potential for post-earthquake liquefaction of soils to cause settlement of 7 to 16 inches (GeoEngineers 2007) and 12 to 16 inches (Shannon and Wilson 2008).

Landslides and Slope Stability

Landslides were not identified as a potential risk for the Proposed Action in local slope instability reports or on-site investigations (Figure 4.1-3) (Fiksdal 1989; Wegmann 2006; Anchor 2007; GRI 2011, 2012). The project area for the Proposed Action is flat; therefore, there is a low likelihood of landslides occurring. Much of the shoreline of the Columbia River has been armored with riprap along the length of the levee adjacent to the Proposed Action. The riprap protects the levee from erosion, while the levee itself disconnects the floodplain from the river.

Landslides have been identified on Mount Solo. Fiksdal (1989) identified two landslide areas on the eastern flanks of Mount Solo, as well as one on the north side and another on the south side (Figure 4.1-3). More detailed mapping by Wegmann (2006) identified multiple landslides around Mount Solo. Wegmann (2006) also determined whether the features were inactive or active. One of the active landslides is on the south side of Mount Solo, meaning that it could affect the project area. This landslide is formed by the exposed bedrock that is discussed in Section 4.1.4.1, *Geology in the Project Area and Vicinity*. Landslides on Mount Solo could be caused by strong ground shaking from earthquakes or by significant rainfall.

Seismicity

Pacific Northwest earthquakes are caused by one of four possible geologic events: movements between the tectonic plates on the coastal Cascadia Subduction Zone (CSZ), subduction of the Juan de Fuca plate sinking beneath the North American tectonic plate, shallow crustal movements in the North American tectonic plate, and movements related to volcanic activity.

No great earthquakes (magnitude 8.0 to 9.0[1] or higher) have occurred on the CSZ during the historical record but reconstructions from the geologic record show that more than 10 great earthquakes have occurred in Oregon and Washington over the last 5,000 years (Cascadia Region Earthquake Workgroup 2013; URS Corporation 2014a). The interval in which these earthquakes

[1] The Richter scale is used to define the scale for earthquake magnitudes presented in this section.

reoccur is estimated at approximately 250 to 900 years with the last occurrence in 1700 (Atwater et al. 1994; Jacoby et al. 1997).

Based on the historical record, plate movement due to the sinking of the Juan de Fuca plate under the North American plate is considered capable of causing earthquakes as large as magnitude 7.5 (URS Corporation 2014a). These earthquakes generally do not have faults that reach ground level and the recurrence time is unknown. Earthquakes that were caused by this type of plate movement in Washington include the 1949 Olympia 7.1 magnitude, the 1965 Seattle 6.5 magnitude, and the 2001 Nisqually 6.8 magnitude. These earthquakes did not cause significant damage in the Longview area (Noson et al. 1988; Washington Department of Natural Resources 2001; Washington State Seismic Safety Committee 2012; URS Corporation 2014a).

Shallow earthquakes in the earth's crust occur over large areas. Based on data gathered and historical records in the Pacific Northwest, these earthquakes can be greater than magnitude 6.0 and perhaps as high as magnitude 7.0 to 7.5 (URS Corporation 2014a). The 1872 North Cascade (Lake Chelan, Washington, area) magnitude 6.5 to 7.0 earthquake is considered the largest historical shallow crustal earthquake (Bakun et al. 2002; URS Corporation 2014a). Shallow faults in southwestern Washington and northwestern Oregon have the potential to generate magnitude 6.0 and greater earthquakes (Wong et al. 2000; Lidke et al. 2003; Personius et al. 2003; URS Corporation 2014a).

Volcanic earthquakes occur beneath the Cascade volcanoes; Mount St. Helens is about 40 miles east of the project area. These earthquakes are associated with magma movement or volcanic faults within the Mount St. Helens seismic zone. The largest recorded earthquake beneath Cascade volcanoes was a magnitude 5.1 earthquake in 1981 (U.S. Geological Survey 2013).

Surface Fault Rupture

No shallow crustal faults are active or potentially active within the immediate vicinity of the project area (Lidke et al. 2003; Personius et al. 2003; Barnett et al. 2009; Czajkowski and Bowman 2014.). The closest faults are the Portland Hills and Frontal Fault–Lacamas Lake Faults that are about 40 miles to the southeast near Portland, Oregon (Wong et al. 2000; URS Corporation 2014a). The Mount St. Helens Seismic Zone is a fault line about 45 miles to the east and offshore faults are about 60 miles to the west.

Strong Ground Shaking

Between 1872 and 2014, earthquakes ranged in magnitude from 5.0 to 7.3 for all of Washington (URS Corporation 2014a). Large earthquakes that would have affected the Longview area primarily took place in the Puget Sound area and Portland, Oregon. They range in magnitude from 5.0 to 7.1 (URS Corporation 2014a). Large earthquakes would cause severe ground shaking in the Longview area including the project area.

The USGS National Seismic Hazard Maps determine earthquake ground motions for different seismic thresholds that are used for seismic requirements in building codes. These values come from evaluating all of the potential earthquakes (including their locations, depths, and likelihoods) that could affect an area. The maps display peak ground acceleration, the measure of the ground's acceleration from no motion at all to a peak motion during ground shaking. This acceleration causes shaking and stress on structures. A peak ground acceleration in the range of 0.34 to 0.65 gravity (g) is regarded as severe shaking and could cause moderate to heavy damage to buildings or structures, depending on the duration of the event, the types of underlying materials, and the structural integrity of the affected buildings or structures (Petersen et al. 2014). The USGS map shows a peak ground acceleration in the study area between 0.4 to 0.5 g, which has a 2% chance of being exceeded in 50 years (Petersen et al. 2014).

Ground shaking is also stronger in areas of soft soils or loose deposits such as sand and silt. The Site Class Map of Cowlitz County, Washington, shows the project area as site class E, which has the softest soil conditions and highest level of potential ground shaking (Palmer et al. 2004).

Cascadia Region Earthquake Workgroup (2013) notes that underwater landslides, which could disrupt the Columbia River navigation channel and adjacent industrial and commercial berthing areas, also pose a ground shaking and liquefaction hazard to the area.

Secondary Seismic Hazards: Liquefaction and Subsidence

Liquefaction occurs when stress such as ground shaking causes saturated or partially saturated soil to lose its strength and act like a fluid. The project area has potential for liquefaction during ground shaking. The Liquefaction Susceptibility Map of Cowlitz County, Washington, shows the area as having high liquefaction potential (Palmer et al. 2004). The area is underlain by hundreds of feet of gravel, sand, silt, and organic layers. The sandy layers can liquefy during strong ground shaking and then could flow or lose stability, and no longer support the ground above them. The flowing layers could flow horizontally or vertically depending on the adjacent layers and whether the liquefying layer could exit the ground (e.g., by flowing out of an adjacent slope or river channel or coming out at the surface by forming one or more sand volcanos[2]).

The geologic record provides evidence of liquefaction potential along the Columbia River. Previous investigations at the site for a proposed asphalt plant resulted in similar estimates for settlement from liquefaction that range from 7 to 16 inches for a CSZ earthquake ranging from magnitudes 7.4 to 8.3, though this varies with location.

Volcanic Hazards

The main volcanic hazard at Longview is from airborne fragments, ash fall, and lahars (volcanic mudflows) reaching, and continuing down, the Columbia River. Active volcanoes within the Cascade Range lie to the east of Longview, with the closest active volcano being Mount St. Helens about 40 miles to the east. The project area does not lie within the Cowlitz County designated volcanic flowage hazard zone 1 (within a 5-mile radius of volcanic activity). USGS estimates the annual chance of ash fall greater than 4 inches at Longview to be between 0.01% and 0.02% or between 1 in 10,000 to 1 in 5,000 (Wolfe and Pierson 1995).

Lahars originating from the south flank of Mount Rainier in the upper Cowlitz River are unlikely to reach the lower Cowlitz River (Cakir and Walsh 2012). Lahars have been documented upstream along the Sandy River draining from Mount Hood in Oregon (Pierson et al. 2009) at approximately 55 miles upstream of Longview. Lahars from Mount Adams could reach the Columbia River via the White Salmon River; its confluence is more than 100 river miles upstream of Longview. The

[2] A sand volcano is a cone of sand formed by the ejection of sand onto the surface from a central point. The cone looks similar to a volcano. The process is often associated with earthquake liquefaction and the ejection of fluidized sand that can occur in water-saturated sediments during an earthquake.

Longview area is not within the Cowlitz County-designated volcanic flowage hazard zone 3, which would require an evacuation and emergency management plan.

Mine Hazard Areas

Mine hazard areas in Cowlitz County are mainly associated with historical coal mining and areas affected by mine workings such as adits, tunnels, drifts, or airshafts. There is no bedrock with coal along the Columbia River in the Longview area.

Tsunamis

Washington and Oregon tsunamis could result from CSZ earthquakes along their coastline or similar major earthquakes in areas such as southern Alaska, Japan, or Indonesia. Tsunami hazard and evacuation maps for Washington and Oregon only extend up the Columbia River to a point just east of Astoria, Oregon (river mile 15, approximately 50 miles downstream of the project area)(Walsh et al. 2000; Washington Department of Natural Resources 2010; Oregon Department of Geology and Mineral Industries 2012). Modeling calculations found that an 18-foot-high tsunami at the Columbia River mouth decreased to less than 8 inches at Longview (Yeh et al. 2012).

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 project area is approximately 60 miles inland from the mouth of the Columbia River, and sea level rise at the project area is expected to be minimal. Further, the project area is behind Columbia River levees of approximately 36 feet above sea level, and since this is higher than the potential sea level rise, there would not be any impacts on soils on the project area or an increased risk of erosion. Sea level rise is discussed further in Chapter 5, Section 5.8, *Greenhouse Gas Emissions and Climate Change.*

4.1.4.2 Soils in the Project Area and Vicinity

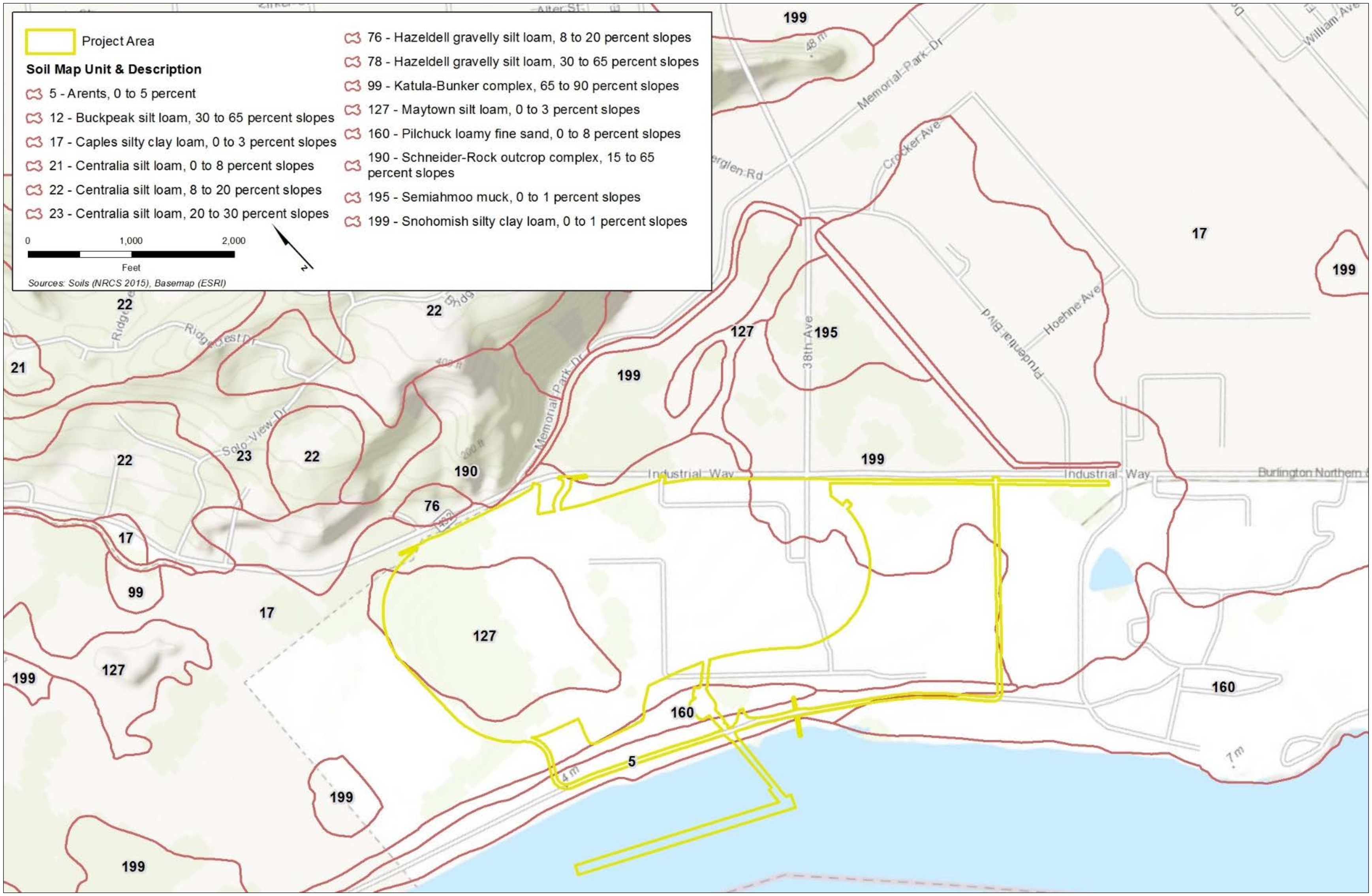
Cowlitz County soils have been mapped by NRCS (2013). These soil units and some of their characteristics are shown in Table 4.1-2. Excluding water, five soil units are mapped at the project area (Figure 4.1-4). All of these soil units reflect the alluvial (river deposit) origin of the soil material and are relatively fine-grained.

The erosion hazard is considered slight for all of the soils in the study area. The K factor[3] indicates a soil's vulnerability to erosion. The higher the soil's K factor, the higher its erosion potential. Based on the K factor, the Caples silty clay loam (Map Unit Number 17), the Maytown silt loam (Map Unit 127), and Snohomish silty clay loam (Map Unit Number 199) have a higher erosion hazard under bare soil conditions. These soils have a low susceptibility to wind erosion.

The site soils are all moderate in regards to their potential for corrosion of concrete. Several engineering measures address concrete and steel corrosion, such as improving drainage and replacing native soil with fill (Washington State Department of Transportation 2014).

[3] K factor is a soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff.

Figure 4.1-4. Soil Types in the Project Area and Vicinity



A soil's linear extensibility is the measure of its potential to expand during wetting and to contract during drying. The more a soil expands the more potential it has to affect overlying materials such as structure foundations. The soil expansion classes for the project area range from low (Arents, Pilchuck loamy fine sand), to moderate (Maytown silt loam, Snohomish silty clay loam), to high (Caples silty clay loam). The values in Table 4.1-2 are provided as a percent expansion and a descriptive classification (class).

The above discussion relates to the naturally occurring soils at the project area. However, the project area has been an industrial site since the 1940s and has had various amounts of surface disturbance and fill material (sand, silt, mixed silt and sand, large gravel, and crushed rock [Anchor QEA 2011; GRI 2011, 2012]) placement. Due to the industrial use, site-specific surface soil materials could vary from NRCS mapping. Data reports for the project area indicate varying areas of fill materials, particularly under existing structures.

Table 4.1-2. Soils and Soil Properties in the Project Area

Map Unit Number[a]	Soil Map Unit Name	Drainage Class	K Factor[b]	Erosion Hazard	Corrosion of Concrete[c]	Corrosion of Uncoated Steel[d]	Linear Extensibility (Class)
5	Arents, 0 to 5% slopes	Moderately well drained	0.28	Slight	Moderate	Moderate	1.5% (Low)
17	Caples silty clay loam, 0 to 3% slopes	Somewhat poorly drained	0.43	Slight	Moderate	High	7.0% (High)
127	Maytown silt loam, 0 to 3% slopes	Moderately well drained	0.49	Slight	Moderate	High	3.6% (Moderate)
160	Pilchuck loamy fine sand, 0 to 8% slope	Not defined	0.20	Slight	Moderate	Low	1.5% (Low)
199	Snohomish silty clay loam, 0 to 1% slopes	Poorly drained	0.37	Slight	Moderate	High	4.5% (Moderate)
263	Water	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

[a] Higher K factor values indicate greater potential for erosion: K factor values below 0.13 have low erosion potential; values 0.13 to 0.26 have medium erosion potential; values greater than 0.26 have high erosion potential.

[b] The potential for concrete corrosion increases decreasing water and soil acidity and increases in sodium, magnesium sulfate, and sodium chloride.

[c] The potential for corrosion of uncoated steel increases with soil water saturation, greater water acidity and conductivity.

Source: Natural Resources Conservation Service 2013

N/A = not applicable

4.1.5 Impacts

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

4.1.5.1 Proposed Action

This section describes the potential impacts that could occur in the study area[4] as a result of construction and operation of the Proposed Action.

Construction activities could affect geology and soils directly through ground disturbance associated with construction of the coal export terminal and preloading of the coal stockpile areas. Operational activities could affect geology and soils indirectly through exposure of people and structures to potential effects from catastrophic events

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).

Enlarge Land, Affect a Unique Physical Feature, or Cause Substantial Soil Erosion

Construction of the Proposed Action would not result in the enlargement of land area by placing fill in the Columbia River or by depositing sediments in the Columbia River. There are no unique physical features at the project area that would be affected by the Proposed Action. Although steep slopes occur along drainage ditches and the Columbia River banks, there are no indications of instability and project activities are not expected to cause instability at these locations.

Construction of the Proposed Action would involve ground-disturbing activities such as grading, railroad construction, excavating for foundations, and road construction that would affect about 190 acres of land. Approximately 2.1 million cubic yards of material would be imported for compressing soils on site, as well as about 130,000 cubic yards of ballast rock for rail-related structures and infrastructure. Approximately 2.5 million cubic yards of material would be moved around the project area during the compression of on-site soils.

As discussed in Section 4.1.4.2, *Soils in the Project Area and Vicinity*, and shown in Table 4.1-2, although the soils in the project vicinity have a moderate to high potential for erosion, the on-site soils have a slight erosion hazard mainly due to the site's flat, low gradient. Bare soil could be exposed for varying periods of time due to construction activities over several years. This could lead to potential soil erosion due to rainfall or wind. Soil erosion would have the potential for off-site transport of eroded soil materials to waterways such as the Columbia River and adjacent ditches. However, imported preload and rail ballast materials would be washed prior to delivery to the project area, which would avoid and minimize sediment transport within surface waters. Wind erosion potential would be limited—because of the precipitation levels that occur at the site and proposed dust suppression during construction to control wind erosion—but could occur during summer dry periods. Dust from coal stockpiles is addressed in Chapter 5, Section 5.6, *Air Quality*. When build-out is complete, the project area would be approximately 90% impervious surfaces, which would reduce soil erosion potential to near zero.

[4] Acreages presented in the impacts analysis were calculated using geographic information system (GIS) technology, thus, specific acreage of impacts are an estimate of area based on the best available information.

Dredging would occur at Docks 2 and 3. This activity is discussed in the *SEPA Water Quality Technical Report* (ICF International 2016a) and *SEPA Surface Water and Floodplains Technical Report* (ICF International 2016b).

Affect Project Structures from Soil Materials Underlying the Site

As discussed in Section 4.1.4.2, *Soils in the Project Area and Vicinity*, and shown in Table 4.1-2, the on-site soils have moderate potential to corrode concrete, low to high potential to corrode steel, and have an expansion-contraction (wet-dry) class of low to high. Impacts related to corrosion of project-related structures and infrastructure would be avoided through standard engineering and construction methods. Washington State Department of Transportation (2014) uses a variety of standard engineering measures to address concrete and steel corrosion such as improving drainage and replacing native soil with fill. Such standard engineering measures would be employed by the Applicant to ensure potential soil related corrosion would not occur.

The sediments beneath the project area are relatively fine-grained and water-saturated, and the water table is near the ground surface. These characteristics make the sediments vulnerable to compaction from the weight of overlying materials and structures. This vulnerability is mainly a concern for the coal stockpile areas on the project area due to the coal's weight. Thus, preloading and installing wick drains is required to expel the groundwater and consolidate soils beneath the stockpile areas prior to operations. Compaction would be less of a concern for other project components because they involve much less weight.

Compaction and settlement of underlying sediments in the coal stockpile areas are addressed in the project design through preloading. Preloading involves importing material to compact the underlying soil to improve its load-bearing capacity. Approximately 2.1 million cubic yards of material would be imported into the coal stockpile areas in stages over a period of up to 7 years. Preloading would provide soil compaction to avoid potential impacts associated with soil settlement during operations.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on geology and soils because construction impacts would be immediate and would be limited to the project area. Therefore, no construction impacts would occur later in time or farther removed in distance from the direct impacts on the project area as discussed previously.

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*.

Expose People or Structures to Potential Effects Involving Catastrophic Events

Operation of the Proposed Action could expose people or structures to potential effects involving catastrophic events such as; rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (liquefaction), landslides, and tsunamis. Thus, potential effects from these types of catastrophic events were evaluated.

Earthquake Faults

There are no earthquake faults in the study area that reach the ground surface. Therefore, no ground surface ruptures could directly damage structures or buildings in the study area.

Ground Shaking

The project area and surrounding area could be subject to strong ground shaking from earthquakes. The USGS National Seismic Hazard Maps estimate earthquake probability in the area with a peak ground acceleration of greater than 0.4 g at a 2% probability of occurrence (Petersen et al. 2014). This amount of shaking could directly damage proposed structures and buildings. As per the Cowlitz County Critical Areas Protection Ordinance (Cowlitz County Code 19.15), construction of the Proposed Action would be required to comply with International Building Code 16.05 and Cowlitz County Grading Ordinance 16.35, as applicable. Additionally, a geotechnical report would be prepared as part of the Proposed Action and would inform project design and construction techniques, which would likely reduce potential impacts associated with ground shaking.

Seismic-Related Ground Failure (Liquefaction)

The study area could be subject to liquefaction during strong ground shaking. Palmer et al. (2004) characterizes the area as having high liquefaction susceptibility. An investigation of the area that was conducted for a previously proposed asphalt plant indicated that settlement after liquefaction would vary with earthquake location and earthquake magnitude. The investigations concluded that ground settling due to post-liquefaction settlement could damage the proposed structures and buildings. The Proposed Action would comply with the adopted International Building Code (per Cowlitz County Code 16.05 and 16.35 Grading Ordinance). Preloading the stockpile area would expel groundwater and consolidate soils in the immediate vicinity of the coal stockpile areas, which would reduce the susceptibility of the soils to liquefaction. This would also likely reduce the potential for damage to proposed structures that occur in the immediate vicinity of the preloading area. Preparation of a geotechnical report would identify the specific soil conditions pre- and post-project construction, and would inform project design and construction techniques to further reduce potential impacts based on the potential susceptibility of liquefaction.

Landslides

There are no existing landslides in the study area. Strong ground shaking associated with earthquakes would have minimal potential to cause new landslides in the study area, because the area is level and there is only about 40 feet of elevation difference between the site surface and the adjacent Columbia River bottom.

The project area is near the active deep-seated landslide on the south side of Mount Solo, but it is approximately 250 feet from the edge of the estimated greatest extent of the landslide, more than the 50 feet required by the Cowlitz County Critical Areas Ordinance 19.15 for landslide hazards. However, as with all landslides, periods of prolonged and intense rainfall (including multiyear periods) or earthquake-caused ground shaking could trigger this landslide. However, because the project area is approximately 200 feet beyond the minimum distance required by the Cowlitz County Critical Areas Ordinance (CCC 19.15) and it is physically isolated from the landslide, the Proposed Action would not increase the risk that a landslide would occur.

Tsunamis

Large earthquakes in the Pacific Ocean or on the CSZ could cause a tsunami, which could affect the coastal zone of Washington and Oregon. Large tsunamis have been detected as far up the Columbia River as Portland, Oregon. Modeling calculations found that an 18-foot-high tsunami at the Columbia River mouth decreased to less than 8 inches at Longview (Yeh et al. 2012). Tsunami levels at the project area would be similar and would not affect project-area structures or operations, including ships at the docks.

Operations—Indirect Impacts

Operation of the Proposed Action would not result in any indirect impacts on geology or soils because operations would not result in any further changes to soils or geology that may occur later in time of further removed in distance than the direct impacts.

4.1.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal and ongoing operations in the project area would continue and additional storage and transfer activities might occur using existing buildings and structures and impacts on geology and soils related to the Proposed Action would not occur. The Applicant would continue with current and future increased operations in the project area. The project area for the Proposed Action could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. However, no activities that would require a U.S. Army Corps of Engineers permit or shoreline permit would occur as part of the No-Action Alternative. New construction, demolition, or related activities to develop the project area into an expanded bulk terminal could occur on previously developed upland portions of the area.

4.1.6 Required Permits

The Proposed Action would require the following permits for geology and soils.

- **Fill and Grade Permits/Building Permits—Cowlitz County**. Fill and grade permits and building permits would be required from Cowlitz County to ensure that final design and construction follow the County and engineering requirements.
- **Critical Areas Permit—Cowlitz County**. The Proposed Action would require a Critical Areas Permit to address compliance with Cowlitz County's Critical Areas Ordinance related to the presence and protection of Critical Aquifer Recharge Areas located on site.
- **Construction Stormwater General Permit—Washington State Department of Ecology.** A Construction Stormwater General Permit would be required from the Washington State Department of Ecology to address erosion control and water quality during construction.
- **Industrial Stormwater General Permit—Washington State Department of Ecology.** An industrial Stormwater General Permit would be required from the Washington State Department of Ecology to address erosion control and water quality during operations. The permit and stormwater pollution prevention plan control adverse impacts through the application of best management practices. Best management practices are defined as schedules of activities, prohibitions of practices, maintenance procedures, and structural and managerial practices, that when used singly or in combination, prevent or reduce the release of pollutants

and other adverse impacts on waters of Washington State. The types of best management practices are source control, treatment, and flow control.

The following permit requirements would be required for construction of the Proposed Action.

- A qualified geologist or engineer would monitor the fill placement during construction and conduct appropriate field tests to verify proper compaction of the fill soils.
- A site-specific preloading plan would be developed prior to initiating construction of the Proposed Action by the geotechnical engineer working with the civil and structural engineers. The plan would include measures to maintain proper site drainage, collection and treatment of water generated, volumes, and sources of fill sources, and staging of fills, setbacks from existing structures. The plan would also consider the short- and long-term impacts on adjacent structures and features, including but not limited to, railroads, existing streets and utility connections, utilities, drainage features, landfills, existing hazardous materials, and buildings.
- Visual inspection would be conducted following abnormal seismic activity. These inspections would document whether the seismic activity resulted in changes to the surface conditions (i.e., soil settlement, structural damage).
- Best management practices would minimize the potential for erosion. A stormwater pollution prevention plan would be required and implemented. Clearing, excavation, and grading would be limited to the areas necessary for construction and would not be completed far in advance of facility construction.
    - **BMP C107: Construction Road/Parking Area Stabilization**. Roads, parking areas, and other on-site vehicle transportation routes would be stabilized to reduce erosion caused by construction traffic or runoff.

4.1.7 Potential Mitigation Measures

The Applicant has not identified any voluntary mitigation measures beyond those that would likely be permit terms or conditions, as described above. No impacts on geology and soils from construction and operation of the Proposed Action have been identified that would require mitigation. Nor have impacts on the Proposed Action from geologic events been identified that would require mitigation. Thus, no mitigation measures are proposed for geology and soils.

4.1.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and required plans described above would reduce impacts on geology and soils. There would be no expected unavoidable and significant adverse environmental impacts on geology and soils in the study area related to the Proposed Action.

4.2 Surface Water and Floodplains

Surface waters such as rivers, lakes, and coastal waterways provide natural beauty and sustain the health of human and natural communities. Floodplains are lowland areas adjacent to surface water features that are periodically inundated by water during flood events. Floodplains carry and store floodwaters, thus protecting human life and property from flood damage. Floodplains often contain areas vital to a diverse and healthy ecosystem. Undisturbed, they have high natural biological diversity and productivity, and support many waterfowl species and migrating birds.

The quality of surface waters and floodplains refers to the physical, chemical, biological, and aesthetic characteristics of water, which are used to measure the ability of water to support aquatic life and human uses. Surface water and floodplain quality can be diminished by contaminants introduced by domestic, industrial, and agricultural practices.

This section describes the surface waters and floodplains in the study area. It then describes potential impacts on surface waters and floodplains 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.

4.2.1 Regulatory Setting

Laws and regulations relevant to surface water and floodplains are summarized in Table 4.2-1.

Table 4.2-1. Regulations, Statutes, and Guidelines for Floodplains

Regulation, Statute, Guideline	Description
Federal	
Rivers and Harbors Act of 1899	Authorizes the Corps to protect commerce in navigable streams and waterways of the United States by regulating various activities in such waters. Section 10 of the Act (33 USC 403) specifically regulates construction, excavation, or deposition of materials into, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.
Clean Water Act (33 USC 1251 *et seq*.)	Establishes the basic structure for EPA to regulate discharges of pollutants into the waters of the United States and regulate quality standards for surface water.
Section 404 of the Clean Water Act	Regulates the placement of dredged or fill material into waters of the United States, including special aquatic sites such as sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes. EPA is the agency responsible for enforcing this act.

Regulation, Statute, Guideline	Description
Section 401 of the Clean Water Act	Requires that a Water Quality Certification be obtained from Ecology for any activity that requires a federal permit or license to discharge any pollutant into a water of the United States. This certification attests that the state has reasonable assurance that the proposed activity will meet state water quality standards.
Sections 301 and 402 of the Clean Water Act	Prohibits the discharge of any pollutant to a water of the United States without a permit. Section 402 (33 USC 1342) establishes the NPDES permitting program, under which such discharges are regulated.
National Flood Insurance Act of 1968	Established the NFIP, a federal floodplain management program designed to reduce future flood losses nationwide through the implementation of community-enforced building and zoning ordinances in return for the provision of affordable, federally backed flood insurance to property owners. FEMA is the agency responsible for enforcing the National Flood Insurance Act.
EO 11990, Protection of Wetlands	Applies to all agencies managing federal lands, sponsoring federal projects, or providing federal funds to state or local projects. EPA is the agency responsible for enforcing this EO.
EO 11988, Floodplain Management	Requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative (42 FR 26951). FEMA is the agency responsible for enforcing this EO.
State	
Water Resources Act of 1971 (RCW 90.54)	Sets forth fundamental policies for the state to ensure that waters of the state are protected and fully utilized for the greatest benefit. Ecology is the agency responsible for enforcing the Water Resources Act.
Water Pollution Control (RCW 90.48)	Policy to maintain the purity of waters of the state consistent with public health and public enjoyment, as well as propagation and protection of wildlife and industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state.
Water Quality Standard for Surface Waters of the State of Washington (WAC 173-201A)	Establishes water quality standards for surface waters of the state of Washington.
Shoreline Management Act	Regulates and manages the use, environmental protection, and public access of the state's shorelines. The SMA (RCW 90.58) was passed by the Washington State Legislature in 1971 and adopted in 1972. Ecology is the agency responsible for enforcing the Shoreline Management Act.

Regulation, Statute, Guideline	Description
Local	
Cowlitz County Stormwater Drainage Ordinance (CCC 16.22)	The Cowlitz County Stormwater Drainage Ordinance is a requirement of the NPDES Phase II Municipal Stormwater Permit issued to Cowlitz County by Ecology. The permit requires Cowlitz County to reduce stormwater runoff and pollution in unincorporated areas of Cowlitz County adjacent to the Cities of Longview and Kelso. The Proposed Action is not within the area affected by the NPDES Phase II Municipal Stormwater Permit.
Cowlitz County Phase II Municipal Stormwater Management Plan (CCC 19.15)	Requires Cowlitz County to develop a SWMP. The SWMP must incorporate best management practices to reduce the discharge of pollutants from the regulated area to the maximum extent practicable to protect water quality. Cowlitz County is responsible for enforcing the SWMP.
Cowlitz County Critical Areas Ordinance (CCC 19.20)	Requires Cowlitz County, in compliance with the GMA, to adopt development regulations based upon the best available science that assure the protection of critical areas such as wetlands, aquifer recharge areas, geologically hazardous areas, fish and wildlife habitat, and frequently flooded areas. Cowlitz County is responsible for enforcing this ordinance.
Cowlitz County Shoreline Master Program	Requires Cowlitz County to provide for the enhancement of shorelines and protection against adverse effects to vegetation, wildlife, and waters of the state, and their aquatic life.

Notes:
USC = United States Code; EPA = U.S. Environmental Protection Agency; Ecology = Washington State Department of Ecology; NPDES = National Pollutant Discharge Elimination System; NFIP = National Flood Insurance Program; FEMA = Federal Emergency Management Agency; EO = Executive Order; FR = *Federal Register*; WAC = Washington Administrative Code; RCW = Revised Code of Washington; SMA = Shoreline Management Act; GMA = Washington State Growth Management Act; CCC = Cowlitz County Code; SWMP = Stormwater Management Plan

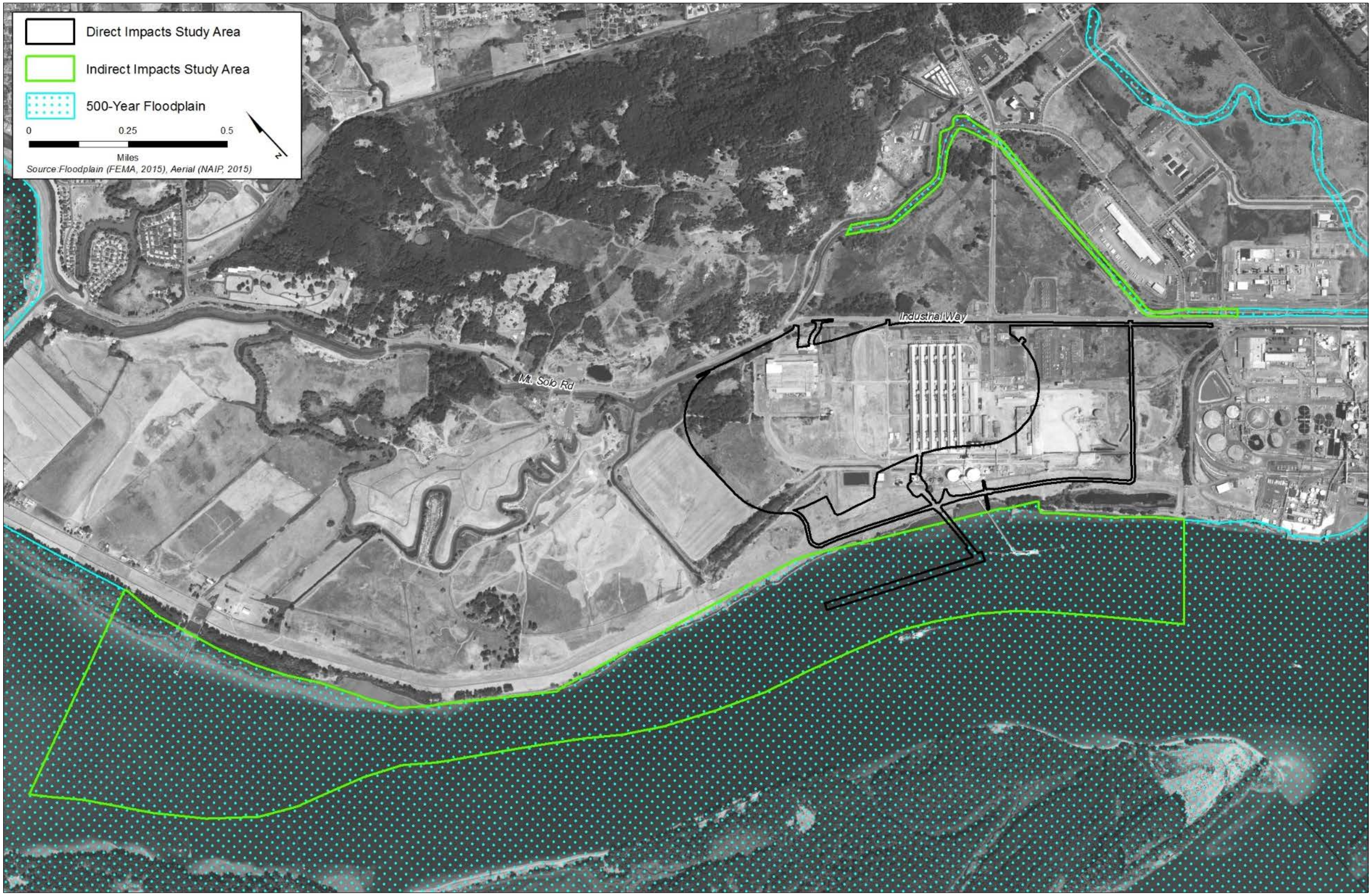
4.2.2 Study Area

The study area for direct impacts, i.e., the extent of impact evaluation on surface waters, is the Columbia River and stormwater drainage ditches in the project area. The study area for indirect impacts on surface waters encompasses the Consolidated Diking Improvement District (CDID) #1 stormwater system drainage ditches adjacent to the project area and the Columbia River downstream 1 mile from the project area. Figure 4.2-1 shows the study areas for surface water.

The study area for direct impacts on floodplains is the project area. The study area for indirect impacts on floodplains is the project area and surrounding 500-year floodplain on the north side of the Columbia River in the vicinity of the project area. Figure 4.2-2 shows the study areas for floodplains.

Figure 4.2-1. Surface Waters Study Area

Figure 4.2-2. Floodplains Study Area



4.2.3 Methods

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

4.2.3.1 Information Sources

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

- *Engineering Report for NPDES Application Millennium Bulk Terminals—Longview, LLC* (Anchor QEA 2011)
- *Engineering Report Update for NPDES Application Millennium Bulk Terminals—Longview, LLC* (Anchor QEA 2014)
- *Columbia River Basin: State of the River Report for Toxics* (U.S. Environmental Protection Agency 2009)
- *Diminishing Returns: Salmon Declines and Pesticides* (Ewing 1999)
- *Columbia River Estuary ESA Recovery Module for Salmon and Steelhead* (National Marine Fisheries Service 2011)
- Columbia River Estuary Operational Forecast System website
- *Designated Beneficial Uses Mainstem Columbia River 340-41-0101* (Oregon Department of Environmental Quality 2003)
- *303(d)/305(b) Integrated Water Quality Assessment Report* (Oregon Department of Environmental Quality 2012)
- USGS water-quality data, Columbia River Estuary, 2004–2005 (U.S. Geological Survey 2005)
- USGS water-quality data, Columbia River at The Dalles, Oregon, 2012 (USGS 14105700)
- *Stormwater Management Manual for Western Washington* (Washington State Department of Ecology 2012)
- Grays-Elochoman, Cowlitz River Basins Water Resource Management Programs (Washington State Department of Ecology 2014)
- Reports and analysis provided by the Applicant

4.2.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on surface waters and floodplains. The impact analysis also evaluated how surface water conditions could affect the study areas.

Potential surface waters and floodplains impacts have been evaluated regarding general parameters, such as changes to surface water drainage, surface water discharge, and floodplain connectivity, and how the Proposed Action and the No-Action Alternative could affect these parameters.

For the purpose of this analysis, construction impacts are based on peak construction period and operations impacts are based on maximum throughput capacity (up to 44 million metric tons per year). The assessment of impacts also considers regulatory controls, such as those required in the National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater Permit and NPDES Construction Stormwater General Permit required for the Proposed Action.

4.2.4 Existing Conditions

This section describes the existing environmental conditions in the study areas related to surface waters and floodplains that could be affected by construction and operation of the Proposed Action and the No-Action Alternative.

The project area is along the Columbia River near river mile 63 near Longview. The topography of the study areas is relatively flat; in the vicinity of the project area it is protected by a levee system operated and maintained by CDID #1, which also operates and maintains a series of ditches and pump stations in the vicinity of the project area. The Applicant operates and maintains independent stormwater and facility process water treatment and conveyance facilities for the project area.

4.2.4.1 Surface Water and Floodplain Features

Columbia River

The Columbia River basin comprises 260,000 square miles from its headwaters in British Columbia, Canada, to its mouth near Astoria, Oregon, bordering Washington and Oregon. The river's annual discharge rate fluctuates with precipitation and ranges from 63,600 cubic feet per second in a low water year to 864,000 cubic feet per second in a high water year (U.S. Geological Survey 2014). The Columbia River has been identified as a flow exempt waterbody, which means it is exempt from flow control requirements associated with the detention/retention and discharge of stormwater. Water quality criteria must still be met for all stormwater discharges.

The lower Columbia River is tidally influenced by the Pacific Ocean from the estuary near Astoria, to Bonneville Dam, located upstream of Portland (Bonneville Power Administration 2001). Tidal fluctuations are diurnal, meaning there are two high tides and two low tides in each 24-hour tidal cycle. Tidal ranges vary along the lower Columbia River and are reported to have a mean range of 3.78 feet at Longview. The Columbia River experiences seasonal variation in flow from year to year depending on snow mass in the upper watershed.

All surface waters from the study area are ultimately discharged to the Columbia River, either as groundwater, surface water, or treated stormwater discharge. The project area is on the right-bank floodplain of the Columbia River near river mile 63 near Longview (Figure 4.2-2). The project area is protected from Columbia River flooding by the CDID #1 levee (see *Columbia River Levee*, below).

Water Resource Inventory Area 25

A watershed generally has a topographic boundary that defines an area draining to a single point of interest. The Washington State Department of Ecology (Ecology) and other state natural resources agencies have divided Washington State into 62 Water Resource Inventory Areas (WRIAs) to delineate and manage the state's major watersheds. The project area is located in the WRIA 25 Grays/Elochoman Basin.

Consolidated Diking Improvement District #1

Other than the Columbia River levee, the study areas are surrounded and protected by the levees, ditches and pump stations of CDID #1. CDID #1 consists of 19 miles of levees; over 35 miles of sloughs, ditches, and drains for flood protection; a stormwater collection and routing system; and seven pump stations for removing and discharging stormwater to receiving waters outside of the levee system, such as the Columbia River. These pump stations are instrumental for removing stormwater and preventing local and area-wide flooding.

Columbia River Levee

The CDID#1 levee system can be divided into three major segments, but the study areas are primarily protected by the Columbia River levee. This levee protects the study areas from flooding along the Columbia River and from related backwater elevations in Coal Creek Slough. It extends from the main pump station and office complex around the western edge of Longview and unincorporated portions of Cowlitz County, up the Columbia River to its confluence with the Cowlitz River. The levee is a mixture of well-defined rural levees and overbuilt sections associated with urbanized levees through industrial areas.

Pump Stations

In addition to the CDID #1 levee, the study areas are surrounded and protected by smaller levees, ditches, and pump stations maintained by CDID #1 as described below.

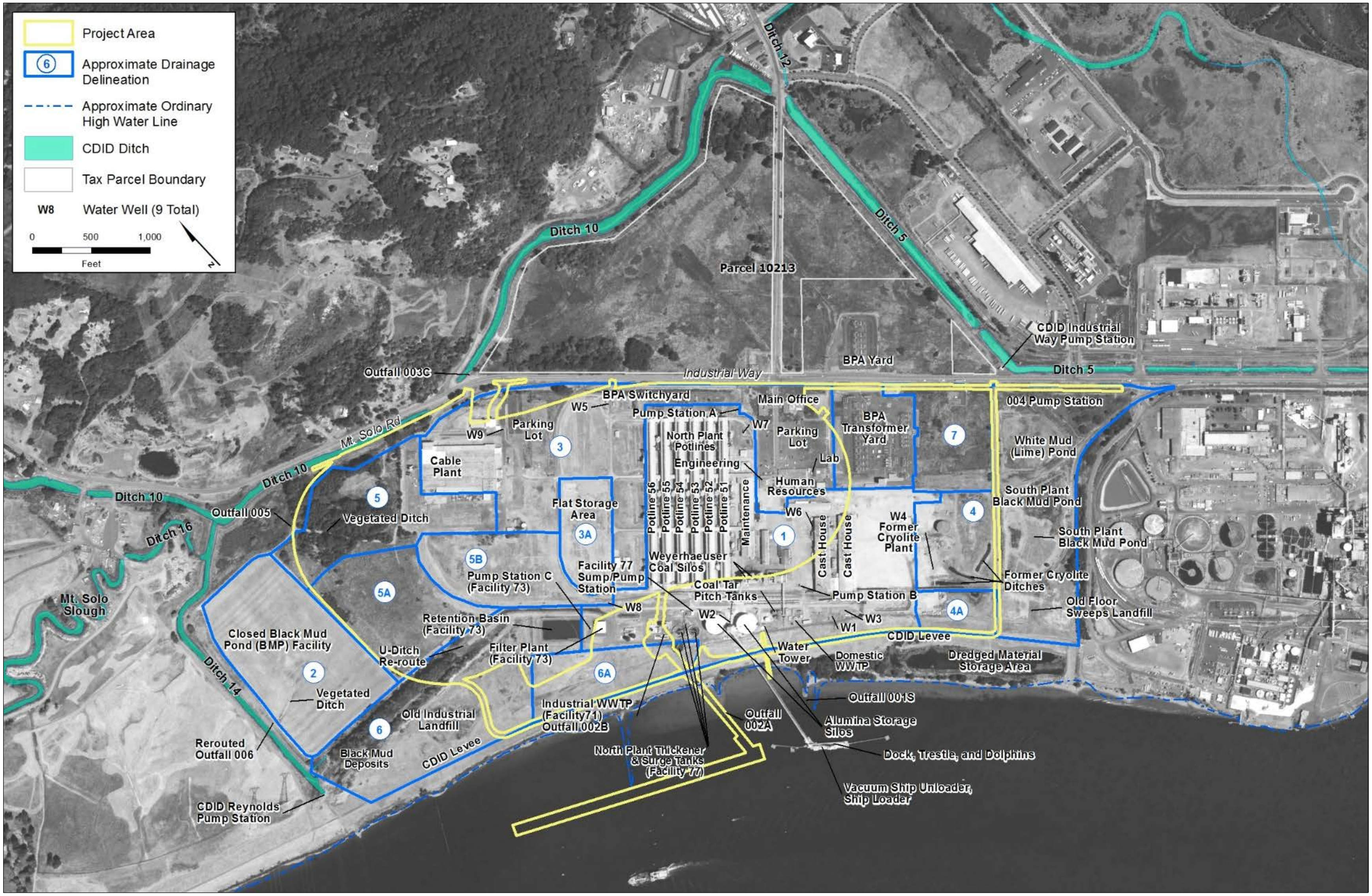
The two pumps of primary interest in the project vicinity are the Reynolds Pump Station and the Industrial Way Pump Station.

- **Reynolds Pump Station**. The Reynolds Pump Station is located at the terminus of Ditch 14; this pump station draws water from Ditch 10 and pumps directly to the Columbia River. Total pumping capacity is 80,000 gallons per minute.
- **Industrial Way Pump Station**. The Industrial Way Pump Station is located adjacent to Ditch 5 and Industrial Way. It has a pumping capacity of 90,000 gallons per minute and pumps water a distance of nearly 0.5 mile, where it discharges to the Columbia River through the levee at the east end of the project area.

Ditches

CDID #1 maintains approximately 35 miles of sloughs, ditches, and drains that collect and convey stormwater to the CDID #1 pump stations. The ditches have a dual function, acting as a conveyance system to transport stormwater to the pumping stations and as a storage reservoir for intense rainfalls exceeding the capacity of the pumps. The Columbia River is the ultimate destination of the drainage water. Below is a description of the CDID #1 ditches that are on or adjacent to the project area (Figure 4.2-3).

Figure 4.2-3. Existing Drainage Systems in the Project Area



- **Ditch 5.** Ditch 5 borders the eastern edge of Parcel 10213 and extends toward the south from 38th Avenue to the Industrial Way Pump Station along Industrial Way, which pumps water to the Columbia River via an underground pipeline. A second branch of Ditch 5 extends from the pump station toward the southeast along the north side of Industrial Way down to Washington Way. It connects with other drainage ditches (Ditches 1 and 3) and conveys flow to the pump station.
- **Ditch 10.** North of Industrial Way, Ditch 10 forms the northern boundary of Parcel 10213 and extends toward the west from 38th Avenue. It continues toward the west, crosses under Industrial Way through a culvert, and extends toward the northwest, eventually connecting to other segments of the drainage system including Ditch 14 and Ditch 16. Ditch 14 conveys flow to the south to the Reynolds Pump Station, which discharges to the Columbia River through an underground pipeline. South of Industrial Way, Ditch 10 is to the north of the former cable plant and remnant forested area. Ditch 10 intersects with Ditch 14 (see below) just north of the closed Black Mud Pond (BMP) facility.
- **Ditch 14.** Ditch 14 is located along the western boundary of the project area and consists of a trapezoidal-shaped drainage ditch that receives flow from Ditch 10 and Ditch 16 and other privately owned ditches located both on site (e.g., Cable Plant Ditch) and off site. It conveys flow south toward the Reynolds Pump Station, which pumps water under the CDID #1 levee.

Stormwater and shallow groundwater drainage for the project area is controlled by a system of ditches, pump stations, treatment facilities, and outfalls. All of these facilities currently operate under a single NPDES permit. As shown in Figure 4.2-3, all of the project area drainage is either held on site until it evaporates, is discharged to CDID #1 ditches that eventually flow and discharge to the Columbia River, or is treated and discharged through Outfall 002A (operated by the Applicant) to the Columbia River. Table 4.2-2 lists the drainage basins in the project area; and drainage basins are shown in Figure 4.2-3.

Table 4.2-2. Existing Drainage Basins in the Project Area

Area	Description
1	Stormwater runoff gravity drains to Facility 77 and is pumped to Facility 73 for treatment prior to discharge through Outfall 002A.
2	Stormwater runoff gravity drains to a vegetated conveyance swale and is pumped into the U-Ditch, where it drains to the Facility 77 and is pumped to Facility 73 for treatment prior to discharge through Outfall 002A as designed. Larger runoff events may overflow the sump and discharge into CDID Ditch 14 through Rerouted Outfall 006.
3	Stormwater runoff ponds locally and/or gravity drains to a vegetated ditch and is discharged through Outfall 003C into CDID Ditch 10.
3A	Stormwater runoff ponds locally and infiltrates/evaporates and/or is pumped to the U-Ditch, where it drains to Facility 77 and is pumped to Facility 73 for treatment prior to discharge through Outfall 002A.
4	Stormwater runoff gravity drains to ditches and is pumped via Pump Station 004 to Facility 77, where it is pumped to Facility 73 for treatment prior to discharge through Outfall 002A.
4A	Stormwater runoff ponds locally and infiltrates/evaporates.

Area	Description
5	Stormwater runoff from improved areas pond locally and infiltrates/evaporates; runoff from the larger events may gravity drain to a vegetated ditch and discharge through Outfall 005 to CDID Ditch 14. Stormwater runoff from unimproved areas may gravity drain towards the vegetated ditch.
5A	Stormwater runoff ponds locally and infiltrates/evaporates.
5B	Stormwater runoff ponds locally and infiltrates/evaporates.
6	Stormwater runoff ponds locally and infiltrates/evaporates. Larger runoff events may sheet flow to the U-Ditch, which discharges to Facility 77, and is then pumped to Facility 73 for treatment prior to discharge through Outfall 002A.
6A	Stormwater runoff ponds locally and infiltrates/evaporates. Unimproved areas may gravity drain toward the vegetated ditch.
7	Stormwater runoff ponds locally and infiltrates/evaporates.

Drainage Components

Stormwater and shallow groundwater drainage for the study areas are controlled by a system of ditches, pump stations, treatment facilities, and outfalls. All of these facilities currently operate under a single NPDES permit. All of the project area drainage is either held on site and evaporates, discharged to CDID #1 ditches that eventually flow to the Columbia River, or treated and discharged through Outfall 002A to the Columbia River. The following is a brief description of the drainage components of the study areas (Figure 4.2-3).

- **Sheetflow and infiltration.** Subbasins 4A, 5, 5A, 5B, 6A, and 7 receive sheetflow from storm events. The water remains in the subbasins until it infiltrates or evaporates.
- **Columbia River discharge.** Subbasins 1, 2, 3A, 4, and 6 are conveyed via pumped systems or gravity to Facility 73 where they are treated and then discharged to the Columbia River via #1 Outfall 002A.
- **CDID #1 discharge.** Subbasin 3 flows through a vegetated ditch that discharges to Ditch 10 through Outfall 003C. During larger storm events, a portion of the flows from Subbasin 2 and Subbasin 5 (both described above) can discharge to the CDID #1 ditch system. Subbasin 2 will overflow the rerouted 006 pump station and be discharged to Ditch 14 through Outfall 006. This is a designed overflow system and it is equipped with a high-flow alarm to alert staff when it is activated. Subbasin 5 flows can enter a vegetated ditch that discharges to Ditch 10 through Outfall 005. Ultimately, all CDID #1 ditch flows discharge to the Columbia River.
- **Drainage features on Parcel 10213.** These features include three vegetated ditches, two unvegetated ditches, and a shallow stormwater pond. Two of the vegetated ditches run north-south across the two larger portions of Parcel 10213. They are narrow and linear and convey stormwater to a culvert approximately 16 inches in diameter located on the north end of these ditches, which then empties into CDID Ditch 10. The third vegetated ditch consists of three segments of linear vegetated ditches adjacent to Industrial Way. These three ditch segments are connected by two culverts that are beneath the site's access roads. This feature likely collects stormwater from Industrial Way and adjacent areas and conveys it to CDID Ditch 10.

  One unvegetated ditch runs parallel to Ditch 10 and consists of two sections of a narrow ditch that was likely constructed to intercept shallow groundwater that was affecting agricultural use of the site. This unvegetated ditch is several feet deep, nearly vertical along its sides, and is bisected by one of the vegetated ditches that runs parallel across the site; however, there is no surface hydrology connection between these two ditches. The other unvegetated ditch serves as the outlet channel for the stormwater pond. This ditch is located at the northeast end of the stormwater pond and conveys excess stormwater from the pond to CDID Ditch 10 through a 16-inch culvert. All six features are privately owned and are not managed by CDID #1.

- **Off-site privately owned ditch.** This ditch is located near the northwest corner of the former Reynolds Metals Company facility (Reynolds facility). It conveys flow into Ditch 14 at a point just north of the Closed BMP Facility.
- **Outfall 002A**. This is a 30-inch outfall to the Columbia River that discharges water received from Facility 73 (the site's stormwater treatment system). Typical flow rates through the outfall are currently less than 2,000 gallons per minute. The maximum flow rate is 14,000 gallons per minute.

4.2.4.2 Columbia River and Cowlitz River Floodplain

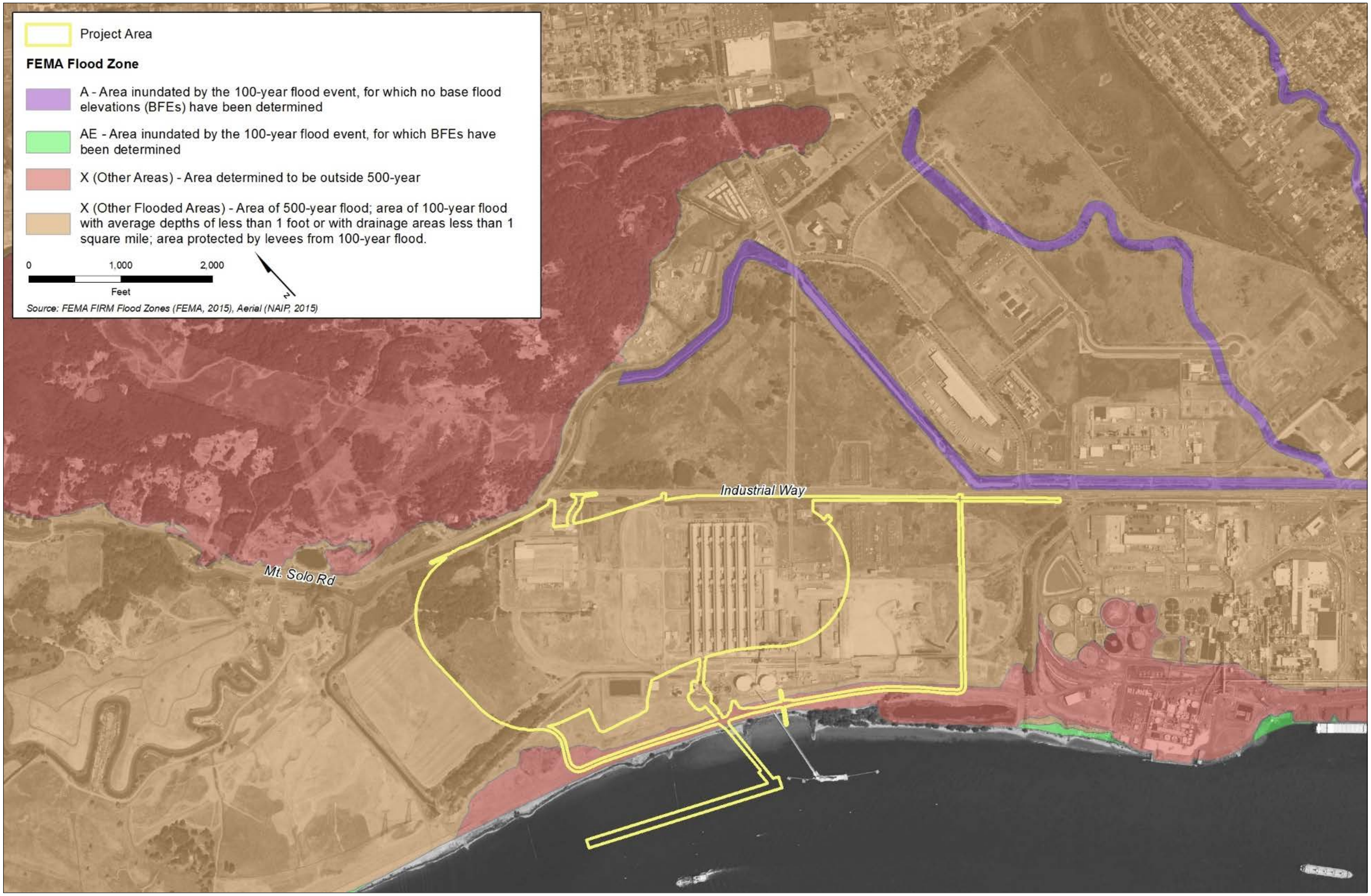
The project area is on the right bank floodplain of the Columbia River approximately 5 miles downstream of the confluence of the Cowlitz River and the Columbia River. Longview and Kelso were developed on the floodplain of the Columbia and Cowlitz Rivers. The majority of the project area is located behind the CDID #1 levee that is operated and maintained by CDID #1. The average elevation of the project area is 13.9 feet North American Vertical Datum of 1988 (NAVD88) (16.4 feet Columbia River Datum), and the levee averages 33.9 feet NAVD88 (36.4 feet Columbia River Datum) (Anchor QEA 2014). The portion of the project area waterward of the CDID #1 levee is within the floodway of the Columbia River. Construction and operational changes associated with the proposed new docks and trestle would occur on the river side of the existing levee system, where the floodplain is constrained by the levee alignment.

CDID #1 operates the slough, ditch, and drain system several feet lower than the low-flow elevation of the Columbia River throughout the year. This strategy provides necessary stormwater storage capacity and allows the pump system to maximize the flood control potential of the levee's interior drainage. The combined capacity of the seven CDID #1 pump stations (a total of 19 pumps) is 700,000 gallons per minute. These pump stations are instrumental for removing stormwater and preventing local and area-wide flooding. The need for this pumping capacity is apparent when considering that 1 inch of rainfall on the 16,000-acre watershed is equivalent to 434 million gallons of water. Removal of 4.8 inches of rain deposited in a 1986 storm required 54 hours of continuous pumping.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) maps the project area landward of the CDID #1 levee as Zone X – Other Flooded Areas (Figure 4.2-4) (Federal Emergency Management Agency 2015). Zone X – Other Flooded Areas is described by FEMA as follows.

> Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood (Medium shading).

Figure 4.2-4. FEMA Flood Insurance Rate Map for the Proposed Action



The FEMA FIRM maps the CDID #1 levee and areas waterward of the project area Zone X – Other Areas (Figure 4.2-4) (Federal Emergency Management Agency 2015). Zone X – Other Areas is described by FEMA as follows.

> Areas determined to be outside the 500-year floodplain;

The current FIRM delineates the project area in “medium shading” and maps the current levee that protects the area.

Flooding at the project area is expected to be minimal under existing conditions. Events that could cause flooding would include pump station failures, precipitation events that exceed pumping capacity, levee failure, and levee overtopping.

The portions of the project area located waterward of the levee are within the floodway. The project area improvements would need to consider the flood inundation limits and velocities for this condition.

4.2.5 Impacts

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

4.2.5.1 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. The Applicant identified the following best management practices to be implemented; these were considered when evaluating potential impacts of the Proposed Action.

- **BMP C107: Construction Road/Parking Area Stabilization**. Roads, parking areas, and other on-site vehicle transportation routes would be stabilized to reduce erosion caused by construction traffic or runoff.

The following were identified by the Applicant as actions that would be implemented during construction and/or operations.

- Based on site grading and drainage areas, five water quality ponds (Wetponds) will treat runoff based on Ecology’s requirements. In general, the ponds are sized for treatment of the volume and flow from the water quality design storm event (72% of the 2-year storm). Additional storage will be provided within the coal storage area so that the runoff is always treated within the stockyard area, even for larger storm events. The ponds are designed to provide settlement as the water passes through. Subsequently, water released from these ponds will be conveyed downstream to the existing pump station Outfall 002A that discharges into the Columbia River via an existing 30-inch steel pressure line. The ponds that treat runoff from the coal stockyard will harvest water for circulation around the project area for multiple uses, including dust-control measures.

  Ecology’s criteria will be used as the basis of design, which uses the Western Washington Hydrology Model computer simulation for facility sizing. Because of the project area’s flat nature, some surface ponding will occur in both the yard areas and open conveyance systems. The piped conveyance systems will be sloped at a 0.50% minimum.

- Additional water storage would be provided in the coal storage area in the event of a larger storm event. Water volumes exceeding the demands for reuse would be discharged off site via the existing Outfall 002A into the Columbia River. Water released off site would be treated and would meet the requirements of Ecology and required discharge permits.

Construction activities that could affect surface water and floodplains include the following.

- Disturbance of surface soils during construction of the coal export terminal.
- Redirection of drainage and sheet flow during construction.
- Removal of vegetation from leveed floodplain.

Operational activities that could impact surface water and floodplains include the following.

- Use of water from rainfall runoff and on-site wells for dust suppression, washdown water, and fire-protection systems.
- Redirection of stormwater via a new pump station.

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).

Construction-related activities at the project area that could affect surface water and floodplains include the following.

- Preparing the project area and preloading the coal stockpile areas.
- Regrading the project area to drain toward specific collection areas.
- Constructing the rail loop.
- Installing coal processing equipment (unloading facilities, transfer towers, conveyors).
- Constructing offices, maintenance buildings, and other structures.
- Constructing water-management and storage facilities.
- Constructing Docks 2 and 3 and removing existing pile dikes.

Alter Drainage from Heavy Equipment and Staging Areas

The placement of heavy equipment and establishment of on-site staging areas could redirect sheetflow and potentially lead to localized flooding on or off site. The potential for localized flooding and increased erosion from redirected sheetflow increases with higher density of heavy equipment placement on site. Redirection of sheetflow has the potential to create rivulet and gully flow across bare soil, which could result in erosion and introduce sediment to the surrounding drainage channels and basins. Introduction of increased sediment loads to the drainage system could change the sediment deposition and transport characteristics of that system, resulting in potential changes in downstream channel morphology, including a reduction in channel sinuosity (i.e., channel bends and meanders) and storage, increased channel gradient, and reduced pool depth. The potential for localized flooding and increased erosion from redirected sheet flow increases with higher density of heavy equipment placement on site. This could result in the need for additional channel maintenance. However, this is unlikely because the Applicant must comply with erosion and sediment control best management practices and the requirements of the NPDES Construction Stormwater General Permit, which would be obtained for the Proposed Action as described in the *SEPA Water Quality Technical Report* (ICF International 2016), would avoid and minimize potential impacts during construction. All measures would also be monitored to ensure effectiveness. Weekly inspection and an inspection within 24 hours of a rain event would likely be required under the NPDES Construction Stormwater General Permit. The inspections must be performed by a Certified Erosion and Sediment Control Lead.

Decrease Floodplain Floodwater Retention

Site preparation would require clearing of vegetation within a Zone X flood zone. However, because the project area is protected by levees, it does not currently function as a floodplain. Vegetation that would be removed from the project area does not currently contribute to the Columbia River floodplain's ability to retain or absorb floodwaters. Activities that occur landward of the levee would not modify conditions in the Columbia River. Thus, no decrease in the ability of the Columbia River to retain floodwaters within the floodplain would result from constructing the Proposed Action.

Temporarily Increase Turbidity and Affect Benthic Habitat

The Columbia River would be permanently altered and benthic (i.e., river bottom) habitat removed by the placement of piles. A total of 610 of the 630 36-inch-diameter steel piles required for the trestle and docks would be placed below the ordinary high water mark, permanently removing an area equivalent to 0.10 acre (4,312 square feet) of benthic habitat (Refer to Section 4.7, *Fish*, for further information regarding impacts on benthic habitat).

Creosote-treated piles would be removed from the deepest portions of two existing timber pile levees. In total, approximately 225 linear feet of the levees would be removed. Removal of creosote-treated piles would result in a temporary increase in turbidity and would temporarily affect benthic habitat. Refer to Sections 4.5, *Water Quality*, and 4.7, *Fish,* for further information regarding impacts on water quality and fish, respectively.

Use Water for Construction

Construction of the Proposed Action would use water from rainfall runoff and on-site groundwater wells for dust suppression, washdown water, and fire-protection systems. This would be regulated under the NPDES Construction Stormwater General Permit. Rainfall would be collected and treated and either stored in a detention pond to be constructed as part of the Proposed Action, or discharged to the Columbia River through the existing Outfall 002A. The Proposed Action would not withdraw water from the Columbia River or other surface waters in the study area to meet construction water demands. Thus, no impacts on surface water and floodplains are anticipated related to water needs or use during construction.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on surface waters or floodplains because construction of the coal export terminal would be limited to the project area.

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*.

Use Water for Operations

Operations of the Proposed Action would use water from rainfall runoff and on-site groundwater wells for dust suppression, washdown water, and fire-protection systems. Rainfall would be collected and treated and either stored in a detention pond to be constructed as part of the Proposed Action, or discharged to the Columbia River through the existing Outfall 002A. The Proposed Action would not withdraw water from the Columbia River or other surface waters in the study area to meet operations water demands. Thus, no impacts on surface water and floodplains are anticipated related to water needs or use during operations.

Alter Water Collection and Discharge

Currently, stormwater runoff at the project area is managed by infiltration or evaporation and by a complex stormwater collection and treatment system in conformance with the Applicant's existing NPDES permit (WA-000008-6). The NPDES system includes 12 stormwater basins and five outfalls that the Applicant manages under its NPDES permit, which discharge to the Columbia River. The existing stormwater collection and treatment system configuration would not adequately serve the needs of the future conditions resulting from the Proposed Action. The Proposed Action would include modifications to the existing stormwater management system to address the anticipated need. Information on stormwater is included in Section 4.5, *Water Quality,* and the *SEPA Water Quality Technical Report*.

The proposed modifications to the water management system would collect all stormwater and surface water (washdown water) from the stockpile areas, the rail loop, office areas, the dock and other paved/impervious surface areas at the project area and direct these waters to a series of vegetated ditches and ponds, then to a collection basin or sump. Similar to existing conditions, collected water would be pumped to an existing on-site treatment facility consisting of settling pond(s) with a flocculent addition to promote settling as needed. Chemical treatments must be identified as part of the NPDES permit process. Treated water would be pumped to a surface storage pond for reuse to support operations, or, if storage is not necessary, the excess treated water would be discharged to the Columbia River via Outfall 002A in accordance with the NPDES permit limits.

Discharge Less Water to CDID #1 Ditches

Basins 2, 3, and 5 of the existing water management system at the project area currently discharge to CDID #1 drainage ditches. Once constructed, most of the project area would no longer drain to the CDID #1 ditches, with the exception of a portion of the access overpass and frontage improvements, which would continue to drain to the ditches. All stormwater and excess dust suppression water within the footprint of the project area would be collected, conveyed, treated, and either stored on site for reuse or discharged to the Columbia River. The ditches would remain as they exist today. Therefore, no negative impacts on the CDID #1 ditches would occur under the Proposed Action. However, less water would be discharged to the ditches from the project area. As discussed below, this could have a beneficial indirect impact on the CDID #1 ditches.

Instigate Flooding from Interior Drainage System Failure

A new pump station and 18-inch outfall line is proposed to convey stormwater from the project area to the existing Facility 77 sump, and then all waters from the project area would go through Facility 73.

Failure of the interior drainage pumps could result in flooding of Basin 3A. However, redundancy would be built into the system to avoid flooding associated with pump failure, i.e., interior drainage pumps would have backup systems. Thus, the potential that both systems would fail simultaneously would be low.

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*.

Modifications to the existing water management system would be unlikely to have any measurable impact on the Columbia River. The Columbia River is a single receiving water with a mean annual discharge of 171.4 million acre-feet per year (55.85 trillion gallons per year).[1] The proposed changes to the volume and velocity of surface water discharged to the Columbia River associated with the Proposed Action would be negligible within the Columbia River. Annual discharge to the river is estimated to decrease from 276 million to 138.5 million gallons per year, which would equate to a decrease in average annual flow in the Columbia River of 0.0000025 ($2.5 * 10^{-6}$ %). A decrease in flow of this magnitude would essentially be undetectable in the lower Columbia River.

The CDID #1 ditches are much smaller than the Columbia River; therefore, changes to the volume of surface water discharged from the project area could potentially have a measurable effect on the capacity of the ditches. However, the proposed changes would reduce flow to the ditches from 88 million to 26.3 million gallons per year. This could be beneficial to the ditches because there would be additional capacity for drainage. As mentioned in Section 4.2.4.2, *Columbia River and Cowlitz River Floodplain*, the combined capacity of the CDID #1 pump stations is 700,000 gallons per minute. These pump stations are instrumental for removing stormwater and preventing local and area-wide flooding. Any reduction in discharge to the CDID #1 ditch system could provide a benefit during significant rain events.

4.2.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal and impacts on surface waters and floodplains related to the Proposed Action would not occur. The Applicant would continue with current and future increased operations in the project area. The

[1] U.S. Geological Station 14246900 Columbia River at Beaver Army Terminal, near Quincy, Oregon: Average Discharge for Period of Record, 23 years (water years 1969, 1992–2013).

project area for the Proposed Action could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses.

No activities that would require a U.S. Army Corps of Engineers (Corps) permit or shoreline permit would occur as part of the No-Action Alternative; thus no impacts on surface waters or floodplains would occur. New construction, demolition, or related activities to develop the project area into an expanded bulk terminal could occur on previously developed upland portions of the area. Additionally, the quantity of impervious surface could change but drainage patterns would be similar to existing conditions. Any new or expanded industrial uses that could substantially alter drainage patterns would trigger a new NPDES permit or modification to the permitting process. Impacts related to being located in a Zone B flood zone would be similar to those stated for the Proposed Action.

4.2.6 Required Permits

The Proposed Action would require the following permits for surface waters and floodplains.

- **Shoreline Substantial Development Permit—Cowlitz County Department of Building and Planning.** The Proposed Action would result in new development in the shoreline area regulated by the Washington State Shoreline Management Act and *Cowlitz County Shoreline Master Program* (Cowlitz County 2012). Therefore, the Proposed Action would require a Shoreline Substantial Development Permit. This permit is administered by the Cowlitz County Department of Building and Planning.
- **Critical Areas Permit—Cowlitz County Department of Building and Planning.** The Proposed Action would result in development in designated critical areas because the project area contains a frequently flooded area, an erosion hazard area, and a critical aquifer recharge area. Therefore, it would require a Critical Areas Permit from the Cowlitz County Department of Building and Planning.
- **Floodplain Permit – Cowlitz County Building and Planning.** A floodplain permit would be required from Cowlitz County to address development in any areas designated as Frequently Flooded Areas.
- **NPDES Construction Stormwater General Permit—Washington State Department of Ecology.** A Construction Stormwater General Permit would be required from Ecology to address erosion control and water quality during construction.
- **NPDES Industrial Stormwater Permit—Washington State Department of Ecology**. An Industrial Stormwater Permit would be required from Ecology for discharge of industrial use water during operations.
- **Hydraulic Project Approval—Washington Department of Fish and Wildlife.** The Proposed Action would require a hydraulic project approval from WDFW because project elements would affect the Columbia River.
- **Clean Water Act Authorization, Section 404—U.S. Army Corps of Engineers.** Construction and operation of the Proposed Action would affect waters of the United States, including wetlands. Because impacts would exceed 0.5 acre, Individual Authorization from the Corps under Section 404 of the Clean Water Act and appropriate compensatory mitigation for the acres and functions of the affected wetlands would be required.

- **Rivers and Harbors Act—U.S. Army Corps of Engineers.** Construction and implementation of the Proposed Action would affect navigable waters of the United States (i.e., the Columbia River). The Rivers and Harbors Act authorizes the Corps to protect commerce in navigable streams and waterways of the United States by regulating various activities in such waters. Section 10 of the RHA (33 USC 403) specifically regulates construction, excavation, or deposition of materials into, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.

4.2.7 Potential Mitigation Measures

Impacts resulting from the Proposed Action on surface waters and floodplains are considered low and would not necessitate mitigation that exceeds the minimum requirements specified by applicable laws and regulations.

4.2.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the mitigation and design features described above would reduce impacts on surface waters and floodplains. There would be no unavoidable and significant adverse environmental impacts.

4.3 Wetlands

Wetlands provide natural beauty, as well as functions and values that sustain the health of human and natural communities. They can form a regularly saturated transition between surface waters and uplands. These wet soils support a diversity of plants that are adapted to these conditions.

For the purposes of this assessment, wetlands refer to those areas that were determined to meet the federal definition of wetlands and were identified in the field between 2011 and 2013 by Grette Associates (Grette Associates 2014a, 2014b, 2014c, and 2014d) using the U.S. Army Corps of Engineers (Corps) *Wetlands Delineation Manual* (Environmental Laboratory 1987) as updated by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Environmental Laboratory 2010).

This section describes wetlands in the study area. It then describes impacts on wetlands 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.

Impacts on ditches and stormwater conveyance features or *other waters* are also presented as described in the Grette Associates documents referenced in Section 4.3.3.1, *Information Sources*. No determination of federal jurisdiction over these types of features is implied by their inclusion herein. The existing conditions and impacts within the Columbia River are assessed in Section 4.2, *Surface Water and Floodplains*.

4.3.1 Regulatory Setting

Laws and regulations relevant to wetlands are summarized in Table 4.3-1. This section is largely focused on wetlands as a subset of waters of the United States, and thus, subject to Section 404 of the Clean Water Act as described in Table 4.3-1. Ditches, channels, and stormwater conveyance features that may also be considered jurisdictional waters of the United States by the Corps in some circumstances, and thus, may be subject to the same regulatory setting relative to the Clean Water Act.

Table 4.3-1. Regulations, Statutes, and Guidelines for Wetlands

Regulation, Statute, Guideline	Description
Federal	
Clean Water Act (33 USC 1251 *et seq.*)	Section 401 (water quality certification) requires that a Water Quality Certification be obtained from Ecology for any activity that requires a federal permit or license to discharge pollutants into a water of the United States. This certification attests that the state has reasonable assurance that the proposed activity will meet state water quality standards. Section 402 (NPDES permits) prohibits the discharge of any pollutant to a water of the United States without a permit. Section 402 (33 USC 1342) establishes the NPDES permitting program, under which such discharges are regulated. Section 404 regulates

Regulation, Statute, Guideline	Description
	discharges into waters of the United States and special aquatic sites, such as wetlands. Also regulates impacts on other vegetated areas such as shoreline vegetation at and below ordinary high water, and vegetated shallows waterward of the shoreline along the Columbia River.
State	
Washington State Shoreline Management Act (RCW 36.70A)	Requires cities and counties, in partnership with Ecology, (through their SMPs) to protect shoreline natural resources against adverse impacts.
Hydraulic Code Rules (RCW 77.55, WAC 220-660)	Issued by WDFW for projects with elements that may affect the bed, bank, or flow of a water of the state or productive capacity of fish habitat. Considers effects on riparian and shoreline/bank vegetation in issuance and conditions of the permit, including for the installation of piers, docks, pilings and bank armoring and crossings of streams and rivers (including culverts).
Local	
Cowlitz County Critical Areas Ordinance (19.15)	Regulates activities within and adjacent to critical areas including vegetation occurring in wetlands and their buffers, fish and wildlife habitat conservation areas (including streams and their buffers), frequently flooded areas, and geological hazard areas.
Cowlitz County Shoreline Master Program (19.20)	Regulates development in the shoreline zone, including the shoreline of the Columbia River, a Shoreline of Statewide Significance.

Notes:
USC = United States Code; NPDES = National Pollutant Discharge Elimination System; RCW = Revised Code of Washington; SMP = Shoreline Management Program; WDFW = Washington Department of Fish and Wildlife

4.3.2 Study Area

The study area for direct impacts on wetlands is defined as the 540-acre Applicant's leased area on the north bank of the Columbia River, just downstream from the City of Longview, in Cowlitz County.

Indirect impacts were considered for those wetlands that would be partially impacted by the Proposed Action. A general discussion related to vegetation and potential impacts from coal spills can be found in Section 4.6, *Vegetation.*

4.3.3 Methods

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

4.3.3.1 Information Sources

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

- Two reconnaissance level site visits conducted by ICF International wetland biologists on April 8 and December 11, 2014, to view the areas determined to be wetland by Grette Associates.
- Reports prepared by Grette Associates and provided by the Applicant as part of the permit application materials.
    - *Coal Export Terminal Wetland and Stormwater Ditch Delineation Report–Parcel 619530400 and associated appendices* (Grette Associates 2014a)
    - *Bulk Product Terminal, Wetland and Stormwater Ditch Delineation Report–Parcel 10213* (Grette Associates 2014b)
    - *Bulk Product Terminal Wetland and Stormwater Ditch Delineation Report–Parcel 61953* (Grette Associates 2014c)
    - *Coal Export Terminal Wetland Impact Report–Parcel 619530400* (Grette Associates 2014d)

The Grette Associates documents report the presence of field-delineated wetlands in the study area using methods as per the *Regional Supplement to the U.S. Army Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0* (U.S. Army Corps of Engineers 2010).

Wetlands were classified by vegetation type using the U.S. Fish and Wildlife *Classification of Wetlands and Deep Water Habitat* (Cowardin et al. 1979). The regulatory category of wetlands in Washington State is determined per the Washington State Department of Ecology (Ecology) *Washington State Wetland Rating System for Western* (or *Eastern*) *Washington* (Rating System), as applicable (Hruby 2006).

The regulatory category and functions of wetlands were evaluated by Grette Associates per the Rating System. Functions evaluated included water quality functions (the ability to filter sediment and pollutants), habitat functions (a place for plants and animals to live and grow), and hydrologic functions (the interaction between ground or surface water and the landscape). Based on the Rating System, wetlands are rated as providing low, moderate, or high functions depending on the following characteristics.

- The ability to retain water for sufficient periods to filter out pollutants.
- How diverse the wetlands vegetation and structure is to provide wildlife habitat and its connectivity to other wetlands or upland habitat.
- The position of the wetland in the landscape relative to its ability to store and retain surface water (i.e., the wetland's ability to act as a natural sponge to store water to prevent flooding and to gradually release water back to streams and other aquatic areas).
- The ability to prevent erosion caused by moving water.

Information regarding the existing conditions relative to ditches and stormwater conveyance features or other waters is presented in Section 4.2, *Surface Water and Floodplains*.

4.3.3.2 Impact Analysis

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

All quantitative and qualitative impacts on wetlands are summarized as described in the Grette Associates documents referenced in Section 4.3.3.1, *Information Sources*. Direct construction impacts on wetlands were reported where delineated wetlands fell within the project area. All wetlands within the project area were considered permanently impacted, because they would be removed during construction and replaced with gravel pads, stockpiles, railroad tracks, buildings, pavement, and other project features. Impacts on wetland functions were qualitatively based on the wetland functions under current conditions and what functions would be lost due to direct construction impacts on those wetlands.

Impacts on ditches, stormwater conveyance features or other waters are also summarized as described in the Grette Associates documents referenced in Section 4.3.3.1, *Information Sources*. No determination of federal jurisdiction over these types of features is implied by their inclusion herein.

4.3.4 Existing Conditions

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

The existing conditions related to wetlands in the study area are described below. Wetlands, as defined by the Corps' wetland delineation manual (Environmental Laboratory 1987, 2010) are areas that are inundated or saturated by surface or groundwater at a frequency and duration to support a prevalence of plants that are typically adapted for life in such conditions.

The Washington State definition of wetlands under the Growth Management Act is

> those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands.

To identify areas that meet these definitions, scientists look for specific field characteristics of soil, hydrology (i.e., flooding, ponding, or groundwater saturating the soil), and vegetation that indicate an area is a wetland. Typically, indicators of all three conditions (soil, hydrology, and vegetation) must be present for an area to be considered a wetland.

Although the Corps' manual notes that wetlands include areas such as swamps, marshes, and bogs that are typically wet year round, there are areas that may be flooded, ponded, or saturated for a relatively short period of time (i.e., at least 14 consecutive days) during the growing season that still meet the definition of a wetland and the Corps' criteria for evidence of wetland hydrology based on observable field characteristics (Environmental Laboratory 2010).

Approximately 86.95 acres of wetlands were identified in the study area, which is approximately 15% of the study area. The distribution of wetlands in the study area is shown in Figures 4.3-1 through 4.3-4. Wetlands in the study area are identified using letters. Table 4.3-2 summarizes the wetlands by their location, vegetation classification, hydrogeomorphic classification (i.e., where the wetland fits on the landscape position and associated hydrology), regulatory category, and acreage.

Regulatory category refers to the system of ascribing a ranked regulatory protection category from one to four (I to IV) to wetlands based on their functions, as derived from the *Washington State Wetland Rating System for Western Washington* (Hruby 2006). Category I wetlands are considered to have the highest level of function, are afforded the widest buffers, and impacts on such wetlands require the largest amount of compensatory mitigation. Category IV wetlands are considered to have the lowest level of function, are afforded more narrow buffers, and impacts on such wetlands require a lower amount of compensatory mitigation.

All wetlands, except for one (Wetland X) are considered depressional from a hydrogeomorphic classification perspective, i.e., a classification based on where the wetlands occur on the landscape and their resulting physical characteristics. Wetland X is a riverine wetland as it is located in the active Columbia River floodplain and periodically affected by river flows.

Per the Cowardin system, wetlands are typically classified based on their dominant vegetation as to whether they support forested vegetation (woody plants over 20 feet tall), scrub-shrub vegetation (woody plants up to 20 feet tall), and emergent vegetation (non-woody plants like grasses, sedges, rushes, and herbaceous flowering plants). Individual wetlands may contain more than one of these habitat types. The following discussion of wetlands in the study area is organized by this vegetation classification.

Figure 4.3-1. Wetlands in the Study Area

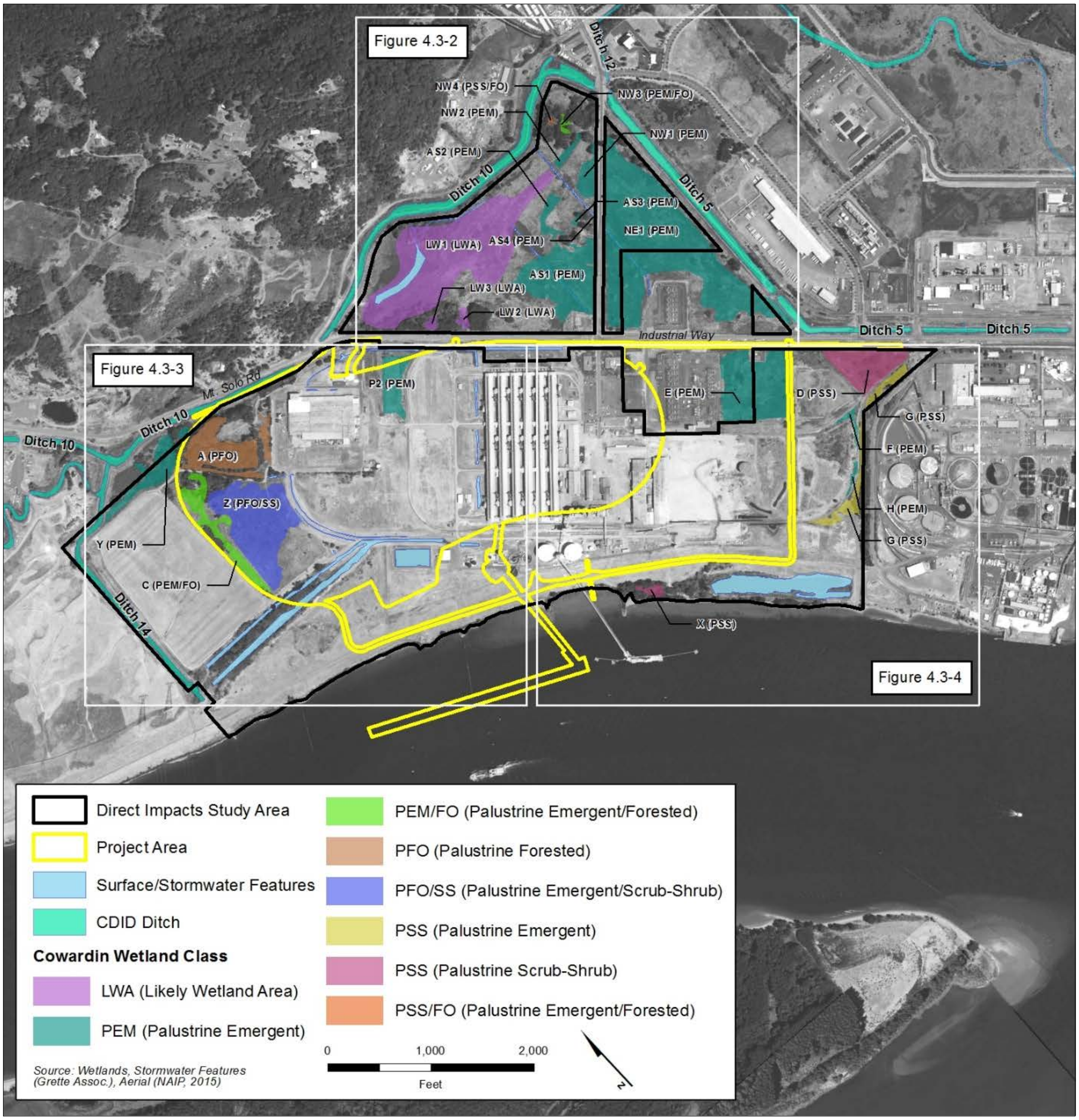


Figure 4.3-2. Wetlands in the Study Area—East

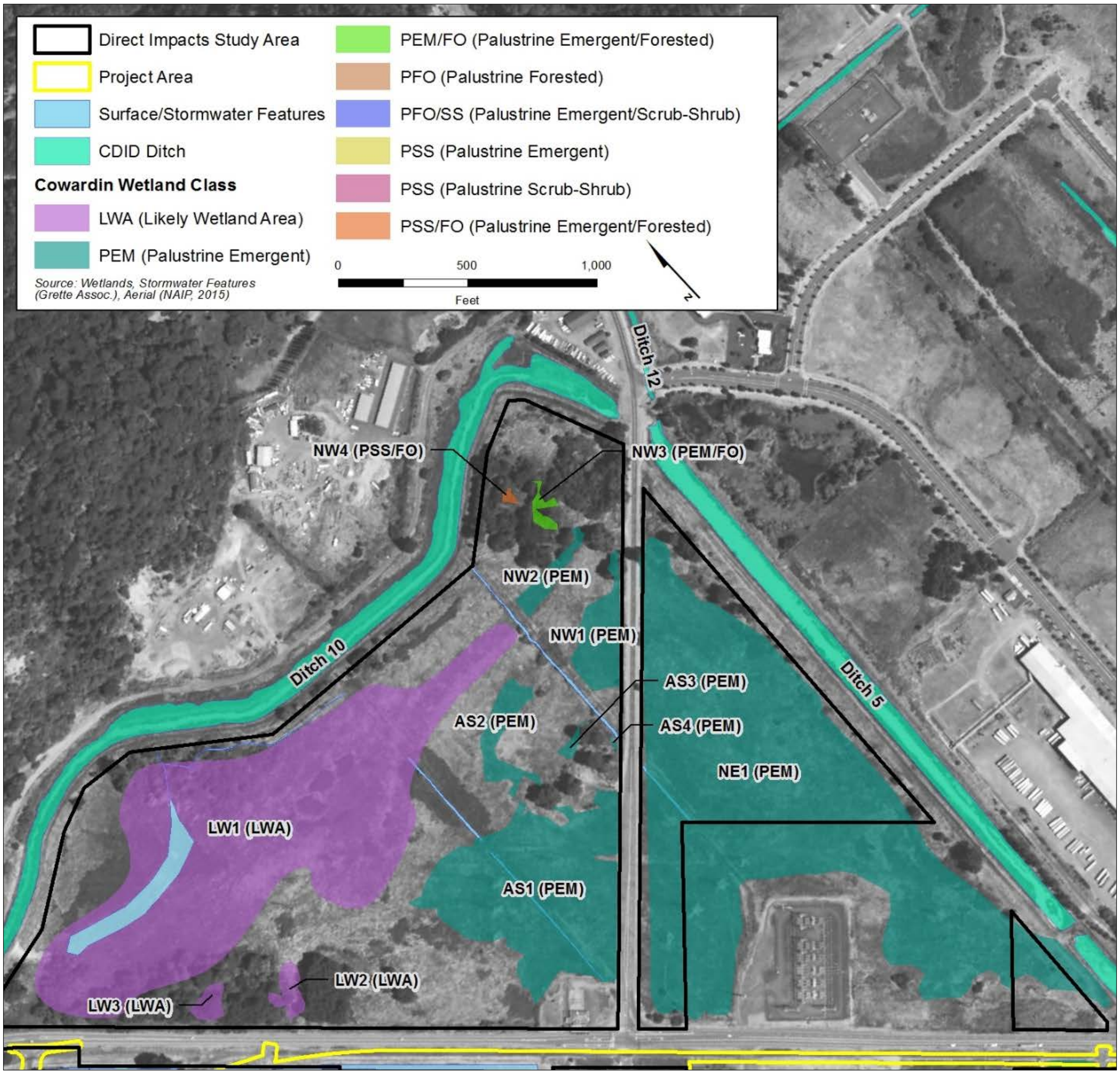


Figure 4.3-3. Wetlands in the Study Area—North

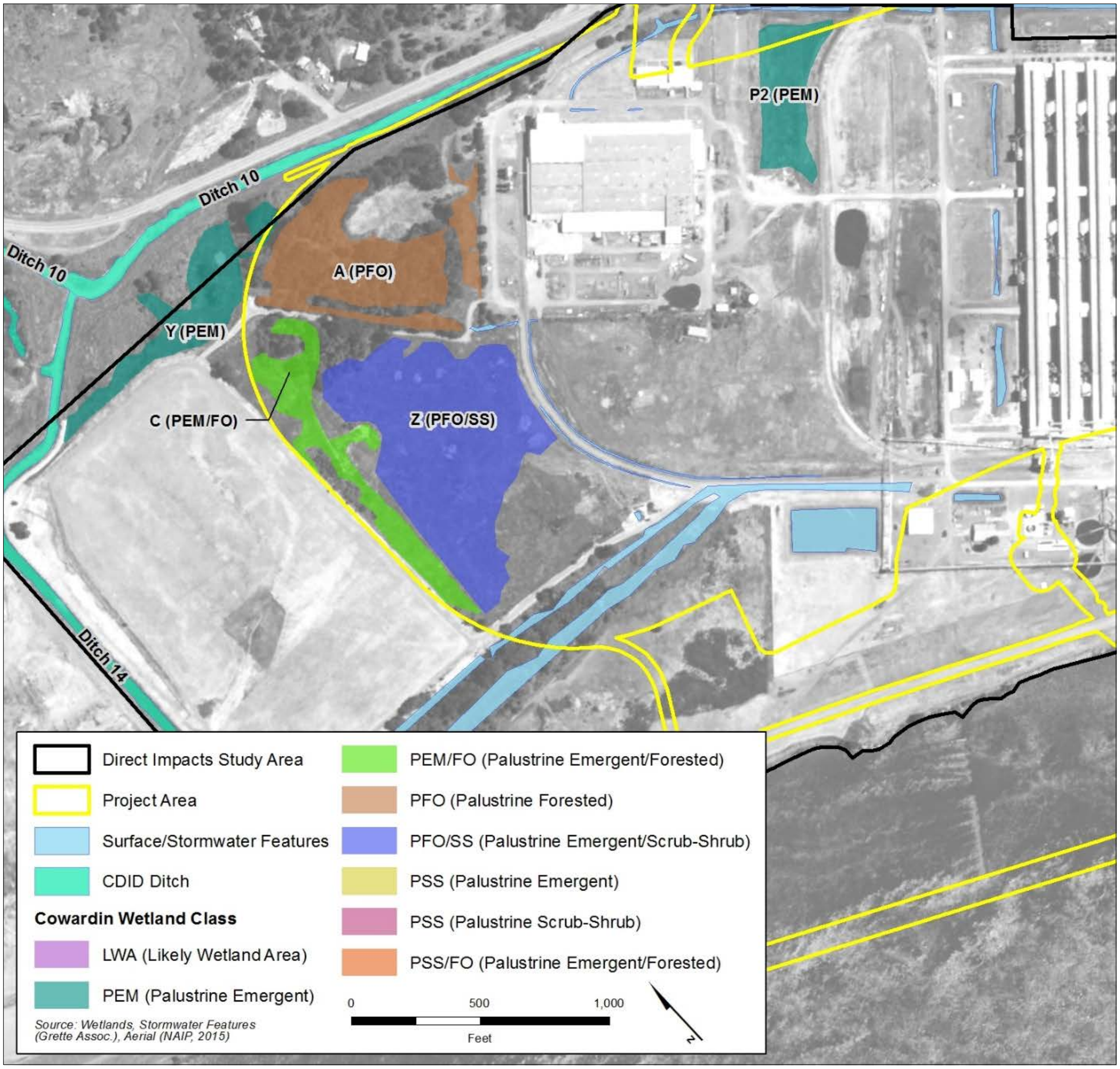


Figure 4.3-4. Wetlands in the Study Area—South

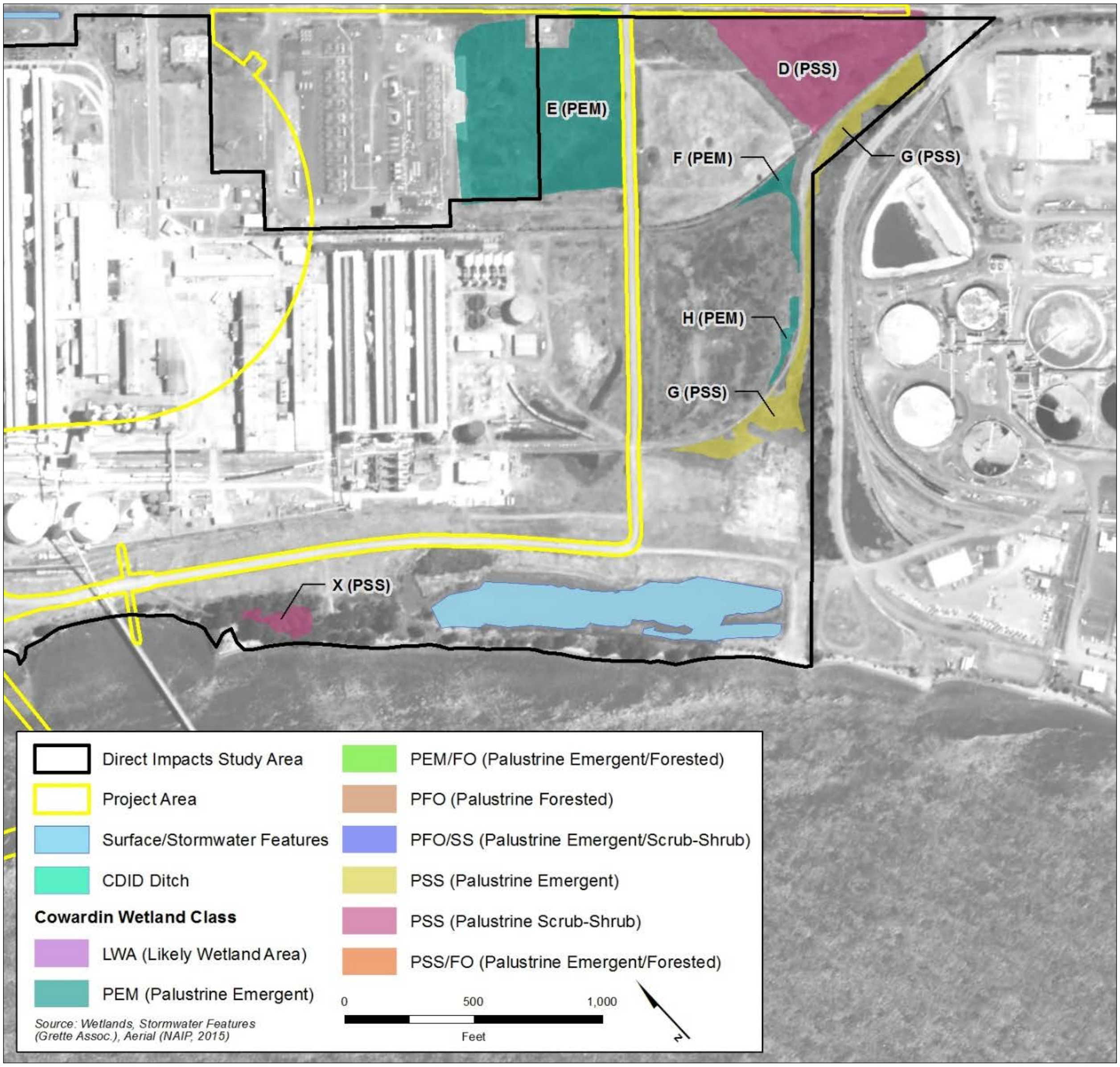


Table 4.3-2. Wetlands Identified in the Study Area

Wetland	Location (Parcel)	Cowardin Classification[a]	HGM Classification[b]	Category[c]	Area (acres)[d]
A	619530400	PFO	Depressional	III	6.28
C	619530400	PEM/PFO	Depressional	III	3.38
D	61953	PEM/PSS	Depressional	III	5.43
E	61953, 61954	PEM	Depressional	III	9.46
F	61953	PEM	Depressional	III	0.45
G	61953	PSS	Depressional	III	2.60
H	61953	PEM	Depressional	III	0.24
X	61950	PSS	Riverine	III	0.44
Y	619530400	PEM/PSS	Depressional	III	3.40
Z	619530400	PEM	Depressional	III	11.22
P2	619530400	PEM	Depressional	IV	2.65
AS1	10213	PEM	Depressional	III	8.72
AS2	10213	PEM	Depressional	IV	0.94
AS3	10213	PEM	Depressional	IV	0.12
AS4	10213	PEM	Depressional	III	0.02
NW1	10213	PEM	Depressional	III	1.38
NW2	10213	PEM	Depressional	III	0.50
NW3	10213	PFO	Depressional	IV	0.19
NW4	10213	PSS/PFO	Depressional	IV	0.05
NE1	10213	PEM	Depressional	III	29.48
LW1[e]	10213	PEM/PFO/PSS	Depressional	III	-
LW2[e]	10213	PFO	Depressional	III	-
LW3[e]	10213	PFO	Depressional	III	-
Total					**86.95**

Notes:

[a] Cowardin classification per Classification of Wetland and Deepwater Habitats of the United States (Cowardin et al. 1979). Values include PFO = palustrine forested; PSS = palustrine scrub-shrub; and PEM = palustrine emergent

[b] Hydrogeomorphic (HGM) classification per the Washington State Wetland Rating System for Western Washington (Hruby 2006).

[c] Wetland category determined by Grette Associates using the Washington State Wetland Rating System for Western Washington (Hruby 2006).

[d] Acreages as reported by Grette Associates 2014 a, b, c.

[e] These wetlands correspond to the three areas on Parcel 10213 that Grette Associates identified as *likely wetland* areas. Grette Associates did not report acreages for these areas.

4.3.4.1 Forested Wetlands

Approximately 8.18 acres of forested wetland occur in the study area.[1] The largest forested wetland (Wetland A) in the project area was delineated within the study area. A small forested portion of Wetland C is also located in project area (Figure 4.3-3). These wetlands are supported primarily by

[1] For wetlands consisting of multiple vegetation classes as reported by Grette (2014a), forested wetlands were calculated by estimating the area of vegetation greater than 20 feet tall (Cowardin et al. 1979).

high groundwater and direct precipitation. Additional forested wetlands (Wetlands NW3 and NW4) occur primarily in the northern portion of the study area within the Bonneville Power Administration [BPA] parcels. Small areas reported as *likely wetland* areas occur north of Industrial Way (i.e., LW2 and LW3 and portions of LW1) (Figure 4.3-2). These areas were visually assessed by Grette Associates but not formally delineated as they are outside the project area.

Common plant species observed in the forested wetlands include a predominately native overstory of black cottonwood (*Populus balsamifera*), Pacific willow (*Salix lucida*), red alder (*Alnus rubra*), and Oregon ash (*Fraxinus latifolia*) trees, overlying a shrub layer dominated by salmonberry (*Rubus spectabilis*) and nonnative Himalayan blackberry (*Rubus armeniacus*). Reed canarygrass (*Phalaris arundinacea*), an invasive grass, is the common herbaceous plant.

4.3.4.2 Scrub-Shrub Wetlands

Approximately 5.10 acres of the study area were identified as scrub-shrub wetlands (Table 4.3-2). Wetlands G and X and portions of Wetlands D and Y are scrub-shrub wetlands (Figure 4.3-1).

Dominant vegetation in Wetlands D and G includes Pacific willow over an herbaceous layer dominated by reed canarygrass; western bittercress (*Cardamine occidentalis*) is also a dominant component of the herbaceous layer in Wetland D. Wetland Y, which is north of the closed Black Mud Pond facility (the former Reynolds Metal Company facility [Reynolds facility) per Grette Associates 2014a), includes a scrub-shrub component that is dominated by Himalayan blackberry, red osier dogwood (*Cornus sericea*), Douglas spirea (*Spiraea douglasii*), and narrowleaf cattail (*Typha angustifolia*) (Figure 4.3-3).

One scrub-shrub wetland, Wetland X, was identified in Parcel 61950, riverward of the Consolidated Improvement Diking District (CDID) #1 levee (Figure 4.3-4). This wetland is dominated by red osier dogwood, Sitka willow, and Hooker's willow (*Salix hookeriana*). Nonnative indigobush (*Amorpha fruticosa*) is also present in the shrub layer. Dominant herbs include yellow-flag iris and reed canarygrass. For further information regarding vegetation, including native and nonnative vegetation, refer to Section 4.6, *Vegetation*.

Likely wetland LW-1 on the BPA-owned land (Parcel 10213) north of Industrial Way also supports a scrub-shrub community (Grette Associates 2014b) (Figure 4.3-2). Dominant vegetation includes Hooker's willow shrubs of various heights and reed canarygrass.

All of the wetlands are supported primarily by high groundwater and direct precipitation.

4.3.4.3 Emergent (Herbaceous) Wetlands

Approximately 73.67 acres of the study area were identified as emergent wetlands (Table 4.3-2, Figure 4.3-1), the most commonly occurring type of wetland in the study area.

Wetlands E and Z are emergent wetlands; portions of Wetlands C, D, and Y as also emergent (Figures 4.3-3 and 4.3-4). Wetland E is dominated by a near monoculture of broadleaf cattail (*Typha latifolia*), with some haired bentgrass (*Agrostis scabra*) and blue wildrye (*Elymus glaucus*) along the wetland boundary. Wetland Z is dominated by reed canarygrass and soft rush (*Juncus effusus*) and contains several brush piles left over from past clearing activities. Wetland C consists of a mix of emergent and forested vegetation, with the emergent portion dominated by reed canarygrass. Wetland D includes a mix of emergent and scrub-shrub vegetation, with the emergent portion dominated by reed canarygrass and western bittercress. Wetland Y also consists of a mix of emergent and scrub-shrub vegetation. The emergent component is dominated by reed canarygrass and an unidentified bryophyte. Some nonnative narrowleaf cattail is also present.

Herbaceous wetlands on BPA Parcel 10213 north of Industrial Way include Wetlands AS1, AS2, AS3, AS4, NW1, NW2, and NE1 (Figure 4.3-2), and the majority of the area described as "probably wetland" (Grette Associates 2014b). These areas are located throughout this parcel. All are dominated by a near monoculture of reed canarygrass that has formed a dense mat over the ground surface.

All of the wetlands are supported primarily by high groundwater and direct precipitation.

4.3.4.4 Wetland Ratings and Functions

The wetlands in the study area were rated as either Category III or Category IV wetlands, based on their generally low to moderate level of functions (Grette 2014a, 2014c).

Wetlands A, C, Z, Y and P2 generally provide low to moderate water quality, habitat, and hydrology functions (Grette 2014a). These wetlands filter out sediments from stormwater runoff and retain stormwater and overland flows during heavy rain events. Some of the wetlands also provide pollutant filtration and groundwater infiltration functions. Wildlife functions include habitat for large and small mammal foraging and cover; passerine, waterfowl, and raptor foraging and nesting; and amphibian foraging, breeding and refuge. Wetland Y provides the most potential to retain stormwater during heavy rain events due to its depth of storage.

Wetlands D, E, F, and G provide high water quality functions as a result of stormwater retention due to their lack of a surface water outlet, which creates a relatively large area for seasonal ponding. Hydrologic functions were rated as moderate for all of these wetlands as a result of the amount of water they can store during wet periods within their drainage basin. Habitat functions vary between moderate and low, as all of the wetlands lack special habitat features, connectivity to habitat corridors, and intact buffers. Additionally, none of the wetlands are near or adjacent to priority habitats listed by the Washington Department of Fish and Wildlife Priority Habitats and Species (WDFW PHS) (Grette 2014c).

Wetland functions for the wetlands located on the BPA-owned parcels within the portion of the study area north of Industrial Way were determined by Grette Associates based on a reconnaissance survey. These wetlands were determined to provide low to moderate water quality functions, low to high hydrologic functions, and low to moderate habitat functions (Grette 2014c). The large emergent Wetland NE1 was rated as providing a high hydrologic function because it 1) has no outlet, which increases its ability to store surface water, 2) is relatively deep to store water, and 3) is a large wetland relative to the size of the overall basin, increasing its importance in storing water (Grette 2014c).

4.3.4.5 Ditches and Stormwater Conveyance Features or Other Waters

Ditches and stormwater conveyance features present within the study area include CDID Ditch 10, Ditch 14, the Interceptor Ditch/U Ditch, and several narrow stormwater ditches that cross through the study area (Figure 4.3-1). These features, as well as the Columbia River, are described for the Proposed Action in Section 4.2, *Surface Waters and Floodplains*.

4.3.5 Impacts

The following impacts on wetlands could result from the construction and operation of the Proposed Action and No-Action Alternative.

4.3.5.1 Proposed Action

The following sections describe the potential impacts related to wetlands from the construction and operation of the Proposed Action.

Construction activities that could directly affect wetlands include ground disturbance and placement of fill associated with construction of the coal export terminal. Operational activities that could indirectly affect wetlands include potential indirect impacts on wetland functions and values from the partial filling of wetland.

Construction—Direct Impacts

Construction of the Proposed Action would result in the following direct impacts. Construction would occur on currently developed and disturbed lands and within the Columbia River. Potential construction impacts on wetlands would include permanent fill/removal of wetlands and temporary alteration of vegetation/habitat conditions associated with construction of the coal export terminal.

Permanently Fill Wetlands and Other Waters Resulting in Loss of Acreage

Construction of the Proposed Action would extend into the undeveloped portions of the project area and would result in 24.10 acres of permanent impacts on wetlands (Table 4.3-3). Construction activities would permanently fill all of Wetlands A, C, Z, and P2 and a portion of Wetland Y (Figure 4.3-5) (Grette Associates 2014d). Loss of wetland acreage would be associated with the placement of fill material to construct rail lines and associated facilities.

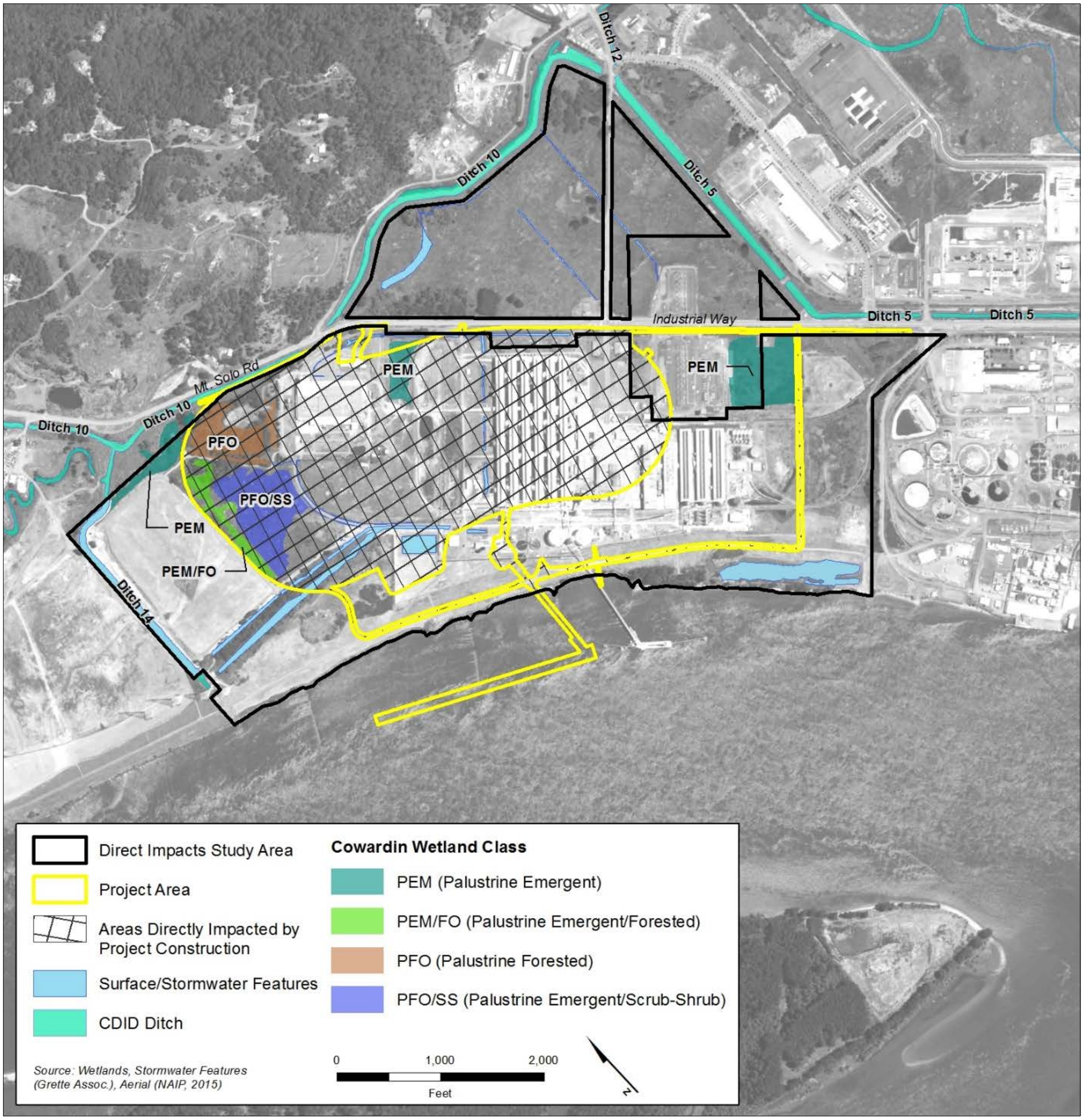
Construction of the Proposed Action would not directly affect the wetlands in the northern portion of the study area (i.e., north of Industrial Way), nor the majority of wetlands at the far eastern edge of the study area.

Table 4.3-3. Wetland and Other Waters Impacts from the Proposed Action

Wetland/Other Waters	Cowardin Classification	Category	Impact Type	Impact Area
A	PFO	III	Fill	6.28
C	PEM/PFO	III	Fill	3.38
Z	PEM	III	Fill	11.22
Y	PEM/PSS	III	Fill	0.57
P2	PEM	III	Fill	2.65
Total				**24.10**

Notes:
PFO = palustrine forested; PEM = palustrine emergent; PSS = palustrine scrub-shrub

Figure 4.3-5. Wetlands Affected by the Proposed Action



There are jurisdictional wetlands north of Industrial Way, which are outside the project area. These wetlands are considered Category III and IV wetlands (Grette Associates 2014b). The Cowlitz County Code (CCC) Critical Areas Ordinance 19.15.120.C (4)(a) requires buffers around wetlands, and buffers for Category III and IV wetlands can range from 25 to 150 feet depending on the wetland function and land use intensity (smaller distances for water quality functions with Category IV wetlands in low-intensity land use and larger distances for habitat functions with Category III wetlands in high-intensity land use areas). However, CCC 19.15.120.C (4)(a) does not require wetland buffers to extend beyond existing natural or human-made barriers (e.g., a paved road), which isolate the area of the wetland resource. Industrial Way serves as this human-made barrier for those off-site wetlands to the north of Industrial Way, and the associated buffers do not extend beyond that point. Therefore, construction of the Proposed Action would not result in impacts on these adjacent wetland buffers (Grette Associates 2014d).

In addition to impacts on wetlands, there would also be impacts on 5.17 acres of ditches that convey stormwater runoff (Grette Associates 2014d), including the eastern half of the Interceptor/U Ditch, portions of the ditch along the south edge of Industrial Way on the BPA parcel, as well as interior drainage ditches (Grette Associates 2014d).

Permanent Loss of Wetland Functions

Placement of fill material in wetlands would result in the permanent loss of wetland functions across the 24.10 acres of wetlands impacted by the construction of the Proposed Action (Table 4.3-3). The functions most affected would be water quality and wildlife habitat, as evidenced by the rating system scores for the affected wetlands (Grette Associates 2014d). Wetland scores for these Category III wetlands, as evaluated using Ecology's rating system (Hruby 2006) are highest for the water quality and wildlife habitat.

All water quality and hydrology functions would be lost from Wetlands A, C, Z, and P2, with a portion of those functions lost in Wetland Y. Construction of the Proposed Action would not displace water into the surrounding areas, and stormwater runoff that discharges into these wetlands would be redirected into an on-site stormwater treatment facility. Stormwater that currently discharges into Wetland Y through outfall 005 would be rerouted (i.e., collected and conveyed to proposed stormwater facilities; refer to Section 4.2, *Surface Water and Floodplains,* for more information). However, as this represents a minor source of hydrology compared with the ground and surface water influences from ditches, it is expected that the hydrology in the remaining portion of Wetland Y not filled by the Proposed Action would not be affected (Grette Associates 2014d).

While the wetlands in the study area do provide some wildlife habitat, this function is limited because of the existing heavy industrial land use on site and in adjacent areas (Grette Associates 2014d). Construction of the Proposed Action would permanently remove all of the wetland habitat functions for those wetlands permanently filled. The proposed fill would remove a forested portion of Wetland Y, which would reduce the wetland habitat value from moderate to low.

Construction—Indirect Impacts

As noted in Table 4.3-3, 0.57 acre of wetland in Wetland Y would be directly affected by the Proposed Action. In addition to the direct impact, indirect impacts could also occur at Wetland Y.

Indirect impacts on wetland vegetation in Wetland Y could include settling of coal dust as the movement of coal by rail could generate coal particles and fugitive coal dust, which could be deposited on vegetation. The impacts of dust on vegetation vary depending on dust load, climatic conditions, and the physical characteristics of the vegetation as reported in Section 4.6, *Vegetation*.

Indirect impacts on wildlife and hydrologic functions are expected to be minor based on the low ratings these functions received for the full wetland (Grette 2014a, 2014d). Wildlife use could be slightly reduced by the smaller size of Wetland Y and the activity associated with the coal export terminal that could disrupt wildlife use. Additionally, construction of the Proposed Action would remove Wetland A (Table 4.3-3) and Wetland Y would no longer have nearby habitat connectivity with this forested wetland. This reduced habitat connectivity would be an indirect impact.

Hydrologic functions may be slightly reduced although Wetland Y is supported primarily by groundwater and direct precipitation. Wetland Y is located in a topographically low area with high ground surrounding all sides of the wetland. Temporary fluctuations in groundwater could occur during construction activities if any trenching activities take place near Wetland Y. Dewatering effluent would be pumped to temporary containment tanks for settling, where it would be tested for pollutants before being discharged to receiving waters. Wetland Y's hydrology is not expected to vary during operations from existing conditions. As noted in Section 4.4, *Groundwater*, a nominal amount of groundwater recharge for the deeper aquifer occurs under existing conditions and would likely be similar during operations. Operations would not be expected to measurably affect groundwater recharge for the deeper aquifer. Groundwater flow is expected to be similar to existing conditions, but may be increase at greater depths and/or slow near the surface. Indirect impacts on water quality are not likely to occur as runoff from the site would be directed to on-site drainage systems and would be treated and reused on site, or discharged in accordance with the new National Pollutant Discharge Elimination System Industrial Stormwater Permit that would be required for the operation of the Proposed Action. Additionally, as reported in Section 4.4, *Groundwater*, operation of the Proposed Action would have a negligible impact on groundwater supply, which would likely have a negligible effect on groundwater associated with Wetland Y.

Operations—Direct Impacts

The Proposed Action would have no direct impacts on wetlands during operations.

Operations—Indirect Impacts

The Proposed Action would have no indirect impacts on wetlands during operations.

4.3.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal and would continue with current and future increased operations in the study area for the Proposed Action. The study area could be developed for other industrial uses including an expanded bulk product terminal or other industrial uses. If the study area is developed for another use, these activities may require permits from Ecology and the Corps (i.e., would not affect waters of the United States). Thus, potential impacts on wetlands from the No-Action Alternative are expected to be negligible. Wetlands would continue to provide functions as described in Section 4.3.4, *Existing Conditions*.

4.3.6 Required Permits

Permits to place fill in wetlands or other waters of the United States are required by federal, state, and local jurisdictions responsible for protecting waterways and water quality.

Permits and the agency issuing the permit associated with the Proposed Action would likely include the following.

- **Clean Water Act Authorization, Section 404—U.S. Army Corps of Engineers.** Construction and operation of the Proposed Action would affect waters of the United States, including wetlands. Because impacts would exceed 0.5 acre, Individual Authorization from the Corps under Section 404 of the Clean Water Act and appropriate compensatory mitigation for the acres and functions of the affected wetlands would be required.
- **Clean Water Act Section 401 Water Quality Certification—Washington State Department of Ecology.** An Individual Water Quality Certification from Ecology under Section 401 of the Clean Water Act and a National Pollution Discharge Elimination System permit under Section 402 of the Clean Water Act would also be required for construction of the Proposed Action.
- **Critical Areas Permit—Cowlitz County Department of Building and Planning.** The Proposed Action would result in development in designated critical areas because the project area contains wetlands, a frequently flooded area, an erosion hazard area, and a critical aquifer recharge area. Therefore, it would require a Critical Areas Permit from the Cowlitz County Department of Building and Planning.

Other permits and approvals not specific to wetlands may be required, but associated with the Proposed Action's location along the Columbia River, such as the State Shoreline Management Act, the Cowlitz County Shoreline Master Program, and the City of Longview Shoreline Master Program.

4.3.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce and compensate for impacts related to wetlands 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.

Wetlands mitigation falls under the jurisdiction of the Corps, Ecology, and Cowlitz County and will be coordinated through the National Environmental Policy Act (NEPA) and permitting processes.

4.3.7.1 Applicant Mitigation

The Applicant would implement the following measures to mitigate impacts on wetlands.

MM WTL-1. Prepare a Comprehensive Mitigation Plan

The Applicant will prepare a comprehensive mitigation plan in coordination with the Corps, Ecology, and Cowlitz County to address the impacts on wetlands affected by placement of fill from the Proposed Action. The mitigation will address impacts on 24.10 acres of wetlands to be permanently filled (Grette Associates 2014d).

Once developed, the mitigation plan will be subject to public review and comment. The mitigation plan will address the general requirements for mitigation planning consistent with all current local, state and federal guidance and regulations.

Mitigation actions may be implemented at one or several locations to ensure that the range of ecological functions are provided to offset identified, unavoidable project impacts and the types of wetland functions affected by the Proposed Action. The mitigation actions may include Applicant-sponsored (i.e., permittee-responsible) mitigation or use of credits from existing or proposed mitigation banks (Grette Associates 2014d). Any Applicant-sponsored mitigation will be consistent with the highest required compensatory mitigation ratios as stipulated by the Corps, Ecology, or Cowlitz County.

Historical habitat types in the study area vicinity will be used as templates for designing permittee-responsible mitigation actions. This will include careful consideration of the influence of physical processes on habitat succession and function. CCC 19.15.170 E(5) and the 2006 interagency guidance identify mitigation ratios that prescribe the acreage increases needed to compensate for unavoidable impacts on wetlands, depending on the type of mitigation and category of the affected wetland. The appropriate ratios will be followed for the preparation of the mitigation plan (Grette Associates 2014d). Mitigation will be developed consistent with current local, state and federal guidance and regulations. Approval of the mitigation plan will look at impacts and mitigation on a case-by-case basis.

Examples of potential mitigation could include, but would not be limited to the following.

- Wetland mitigation bank credits.
- Off-site permittee-responsible mitigation (e.g., wetland creation, enhancement, rehabilitation).

4.3.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the mitigation measures described above would reduce impacts on wetlands. There would be no unavoidable and significant adverse environmental impacts.

4.4 Groundwater

Groundwater, often stored in aquifers[1] formed of permeable rock or soil material, provides water for human and environmental well-being. Groundwater quality refers to the physical, chemical, biological, and aesthetic characteristics of water, which are used to measure the ability of water to support aquatic life and human uses. Groundwater quality can be degraded by contaminants introduced by domestic, industrial, and agricultural practices.

This section describes the groundwater resources in the study area. It then describes impacts on groundwater 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.

4.4.1 Regulatory Setting

Laws and regulations relevant to groundwater are summarized in Table 4.4-1.

Table 4.4-1. Regulations, Statutes, and Guidelines for Groundwater

Regulation, Statute, Guideline	Description
Federal	
Clean Water Act (33 USC 1251 *et seq*.)	Establishes the basic structure for regulating discharges of pollutants into waters of the United States and regulating quality standards for surface waters but not groundwater.
Safe Drinking Water Act	Requires the protection of groundwater and groundwater sources used for drinking water. Also, requires every state to develop a wellhead protection program.
National Pollutant Discharge Elimination System Permit	Authorized by the Clean Water Act, the permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Surface waters in the study area interacts with groundwater.
State	
Water Quality Standards for Groundwaters of the State of Washington (WAC-173-200)	Groundwater standards intended to preserve a level of quality for groundwater capable of meeting current state and federal safe drinking water standards.
Water Code (RCW 90.03)	Establishes rules for regulating and controlling water rights, and defines beneficial uses.
Regulation of Public Groundwaters (RCW 90.44)	Regulates and controls groundwater. Extends application of surface water statutes (90.02 RCW) to groundwater.

[1] An aquifer consists of underground layers of rock that are saturated with water that can be brought to the surface through natural springs or by pumping.

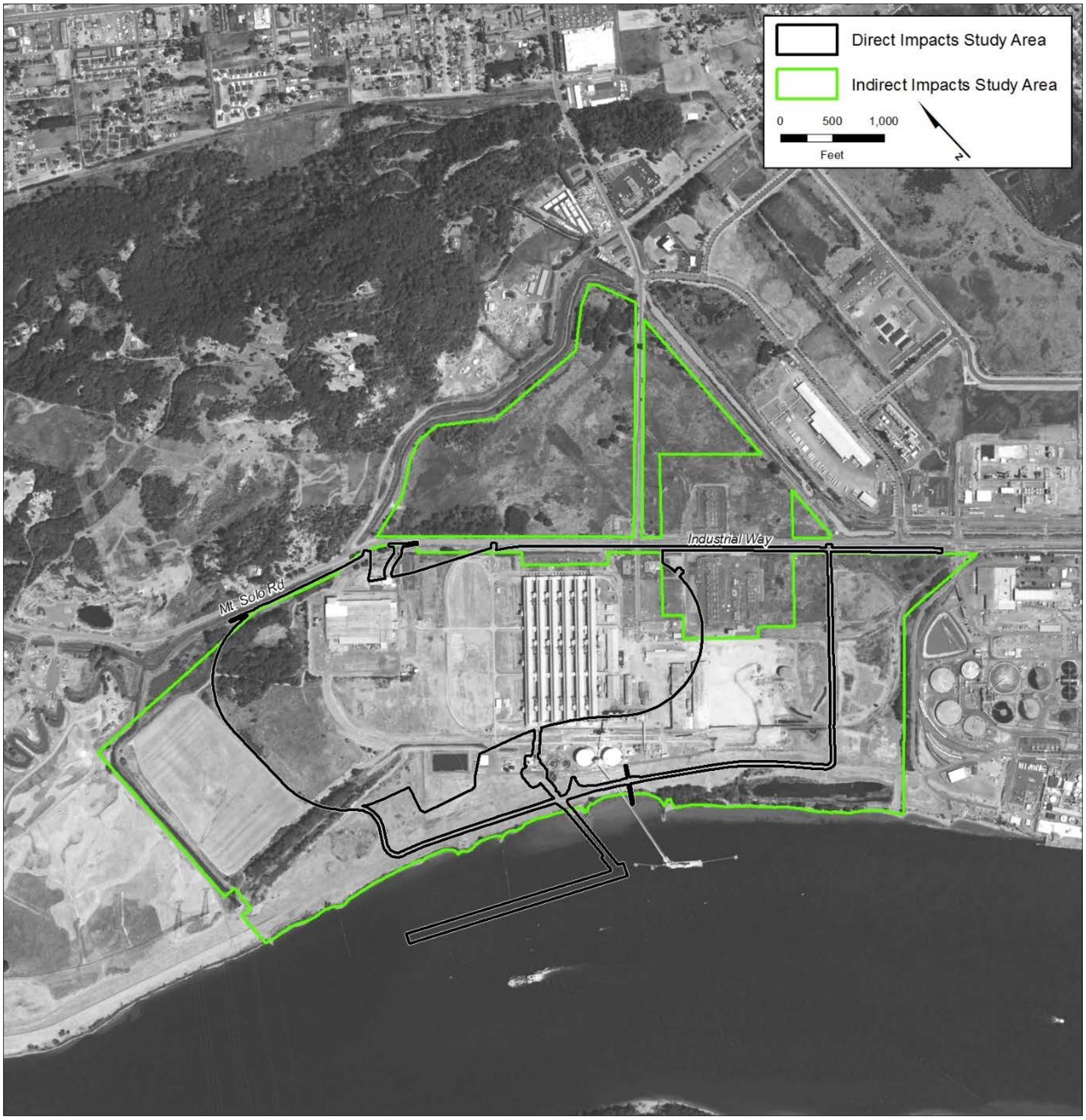
Regulation, Statute, Guideline	Description
Drinking Water/Source Water Protection (RCW 43.20.050)	Requires that the Washington State Department of Health assure safe and reliable public drinking water supplies in cooperation with local health departments and water purveyors.
Model Toxics Control Act (RCW 70.105D)	Requires potentially liable persons to assume responsibility for cleaning up contaminated sites.
State Water Pollution Control Law (RCW 90.48)	Grants Ecology the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland water, salt waters, water courses, and other surface and groundwater in the state.
Water Resources Act of 1971 (RCW 90.54)	Sets forth fundamental policies for the state to insure that waters of the state are protected and fully utilized for the greatest benefit.
Washington State Oil and Hazardous Substance Spill Prevention and Response (90.56 RCW)	Requires notification of releases of hazardous substances and establishes procedures for response and cleanup.
Model Toxic Control Act Cleanup Regulations (Chapter 173-340 WAC)	Establishes procedures for investigation and site cleanup actions. Requires potentially liable persons to assume responsibility for cleaning up contaminated sites.
Local	
Cowlitz County Critical Areas Ordinance (CCC 19.15)	Designates critical areas and development regulations to assure the conservation of such areas in accordance with best available science.
Longview Water Supply Protection Ordinance (LMC 17.100)	Establishes a WHPP to minimize the risk of groundwater contamination

Notes:
USC = United States Code; WAC = Washington Administrative Code; RCW = Revised Code of Washington; Ecology = Washington State Department of Ecology; LMC = Longview Municipal Code; WHPP = Wellhead Protection Program

4.4.2 Study Area

The study area for direct impacts on groundwater is the project area. The study area for indirect impacts is the 540-acre Applicant’s leased area (Figure 4.4-1).

Figure 4.4-1. Groundwater Study Area



4.4.3 Methods

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

4.4.3.1 Information Sources

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

- *Remedial Investigation Report* (Anchor Environmental, LLC 2007)
- *Former Reynolds Metals Reduction Plant—Longview, Draft Remedial Investigation and Feasibility Study* (Anchor QEA 2014)
- *Millennium Coal Export Terminal Longview, Washington, Water Resources Report* (URS Corporation 2014a)
- *Millennium Coal Export Terminal Longview, Washington, Water Resource Report* (URS Corporation 2014b)
- *Millennium Coal Export Terminal Longview, Washington, Surface Water Memorandum* (URS Corporation 2014c)
- *Millennium Coal Export Terminal Longview, Washington Surface Water Memorandum, Second Supplement to Water Resource Report Water Collection and Drainage* (URS Corporation 2014d)
- *Mint Farm Regional Water Treatment Plant, Preliminary Design Report, Part 2A, Hydrogeologic Characterization* (City of Longview 2010)
- Other scientific literature as cited in this section

4.4.3.2 Impact Analysis

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

Potential groundwater impacts have been evaluated regarding groundwater discharge and recharge, groundwater quality, and groundwater withdrawal. The assessment of impacts is based on the assumption that the Proposed Action would include the following.

- National Pollution Discharge Elimination System (NPDES) permits (both an NPDES Construction Stormwater General and Industrial Stormwater Permit) for stormwater discharges for the stormwater improvements.
- Remediation of any existing soil and groundwater contamination in the Applicant's leased area prior to and concurrently with project construction.
- Long-term monitoring as part of the remediation of the existing groundwater contamination to verify remedy effectiveness and natural attenuation of groundwater contamination.

4.4.4 Existing Conditions

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

4.4.4.1 Groundwater Resources

The study area is in Water Resource Inventory Area (WRIA) 25, also known as the Grays-Elochoman watershed. This watershed encompasses approximately 296,000 acres and is defined by five subbasins: Grays River, Skamokawa Creek, Elochoman River, Abernathy/Germany Creek, and the Coal Creek/Longview Slough.

Groundwater resources in the study areas include an upper alluvium aquifer (i.e., shallow aquifer) and a deeper confined aquifer from which industries, small farms, and domestic well users withdraw groundwater. An aquifer is the underground soil or rock through which groundwater can easily move. The amount of groundwater that can flow through soil or rock depends on the size of the spaces in the soil or rock and how well the spaces are connected. Aquifers that consist of gravel, sand, sandstone, or fractured rock such as limestone are made of materials that are permeable (or porous) and allow water to flow through. A confining, impervious unit consisting of clay and silt ranging in thickness from approximately 100 to 200 feet separates the two aquifer systems below the project area. The confining unit becomes appreciably thinner beyond the project area, to the north and east near residential areas. Shallow groundwater is present in the upper 25 to 100 feet of alluvium and is in direct hydraulic communication with the Columbia River. Preliminary hydrogeologic investigations conducted for the City of Longview indicate that shallow, unconfined groundwater does not contribute significantly to the deeper aquifer as the lower aquifer is primarily recharged by deeper aquifers below the Columbia River (Anchor QEA 2014).

Shallow Aquifer

Shallow groundwater flow in the study area is affected by operation of the Consolidated Diking and Improvement District (CDID) #1 drainage ditch system and, to a lesser extent, the stage (i.e., water surface elevation) of the Columbia River. Groundwater and stormwater discharged to the CDID #1 ditches are pumped from these ditches by the CDID #1 to maintain surface-water levels below those in the Columbia River. Water from the CDID #1 ditches is discharged to the Columbia River. In the vicinity of the project area, a CDID #1 pump station is located near the southwest corner of the project-area boundary.

Deep Aquifer

Recharge to the deep aquifer in the project areas is expected to be driven primarily by deeper aquifers below the Columbia River and insignificantly from shallow, unconfined aquifers (Anchor QEA 2014). Discharge from the deep aquifer is from seepage back to the Columbia River, direct discharge to the shallow aquifer, and pumpage from wells (URS Corporation 2014a).

Mint Farm Regional Water Treatment Plant

The Mint Farm Regional Water Treatment Plant is approximately 6,000 feet east of the eastern boundary of the project area. While the study area does not extend to the Mint Farm Regional Water Treatment Plant, the project area is within the Wellhead Protect Area (i.e., the 5-year Wellhead Protection Plan Source Area), thus the Mint Farm Regional Water Treatment Plant is considered. The treatment plant consists of four, 4,000-gallons per minute (gpm) groundwater wells and supplies the City of Longview and the Cowlitz County Public Utility District with municipal water. The plant draws from the deep aquifer, recharged by the Columbia River. Kennedy/Jenks Consultants (2010) completed a water quality and environmental risk assessment as part of the preliminary design report for the Mint Farm Regional Water Treatment Plant. The risk assessment included sampling and water quality analysis of the groundwater from the deeper aquifer of six wells. This study found no chemicals in the groundwater above their respective human health screening levels. Kennedy/Jenks Consultants (2012) repeated the water quality analysis from the same wells in November 2012 and found manganese and iron at levels above the Washington State Department of Health secondary water quality standards and arsenic in one of the wells but at levels below thresholds established by the U.S. Environmental Protection Agency (EPA) for drinking water quality standards). Groundwater gradients and monitoring well locations at the Mint Farm Regional Water Treatment Plant are shown in Figures 4.4-2 and 4.4-3.

4.4.4.2 Surface Water Interaction with Groundwater

This section addresses how and where surface water interacts with groundwater in the study areas.

Columbia River

The Columbia River flows along the entire south/southwest boundary of the project area. Tidal influence from the Columbia River tends to extend farthest in the deep aquifer and to a lesser degree within the shallow aquifer (Anchor QEA 2014).

Consolidated Dike Improvement District #1 Ditch System

The CDID #1 system of ditches controls flooding from the Columbia River and maintains surface water levels below the water surface elevation of the Columbia River, which influences the shallow aquifer. Groundwater flows away from the Columbia River (to the north, east, and west) (Figure 4.4-4) and toward the CDID #1 ditches (Anchor QEA 2014), except for one localized area: groundwater flow south of the axis of the Columbia River levee is toward the Columbia River (Anchor Environmental 2007). The CDID #1 ditch system discharges to the Columbia River through a network of pump stations and valves.

Drainage Basins and Stormwater System

The NPDES drainage ditch system collects all stormwater runoff in the Applicant's leased area. The system includes 12 drainage basins and five outfalls; four outfalls currently exist (Figure 4.4-5) that the Applicant manages under the NPDES Industrial Stormwater Permit (WA-000008-6) for the existing bulk product terminal. The outfalls discharge treated stormwater to the CDID #1 ditches and the Columbia River. One of the five outfalls, Outfall 004, has been closed since 1991. The major collection and treatment systems, drainage basins, outfalls, and discharge locations currently managed under the NPDES program are described in the *SEPA Surface Water and Floodplains Technical Report* (ICF International 2016a), and in Section 4.2, *Surface Water and Floodplains*, of this Draft EIS.

Figure 4.4-2. Shallow Aquifer Groundwater Gradients and Monitoring Well Locations

Figure 4.4-3. Deep Aquifer Groundwater Gradients and Monitoring Well Locations

Figure 4.4-4. Groundwater Gradients and Flow Direction

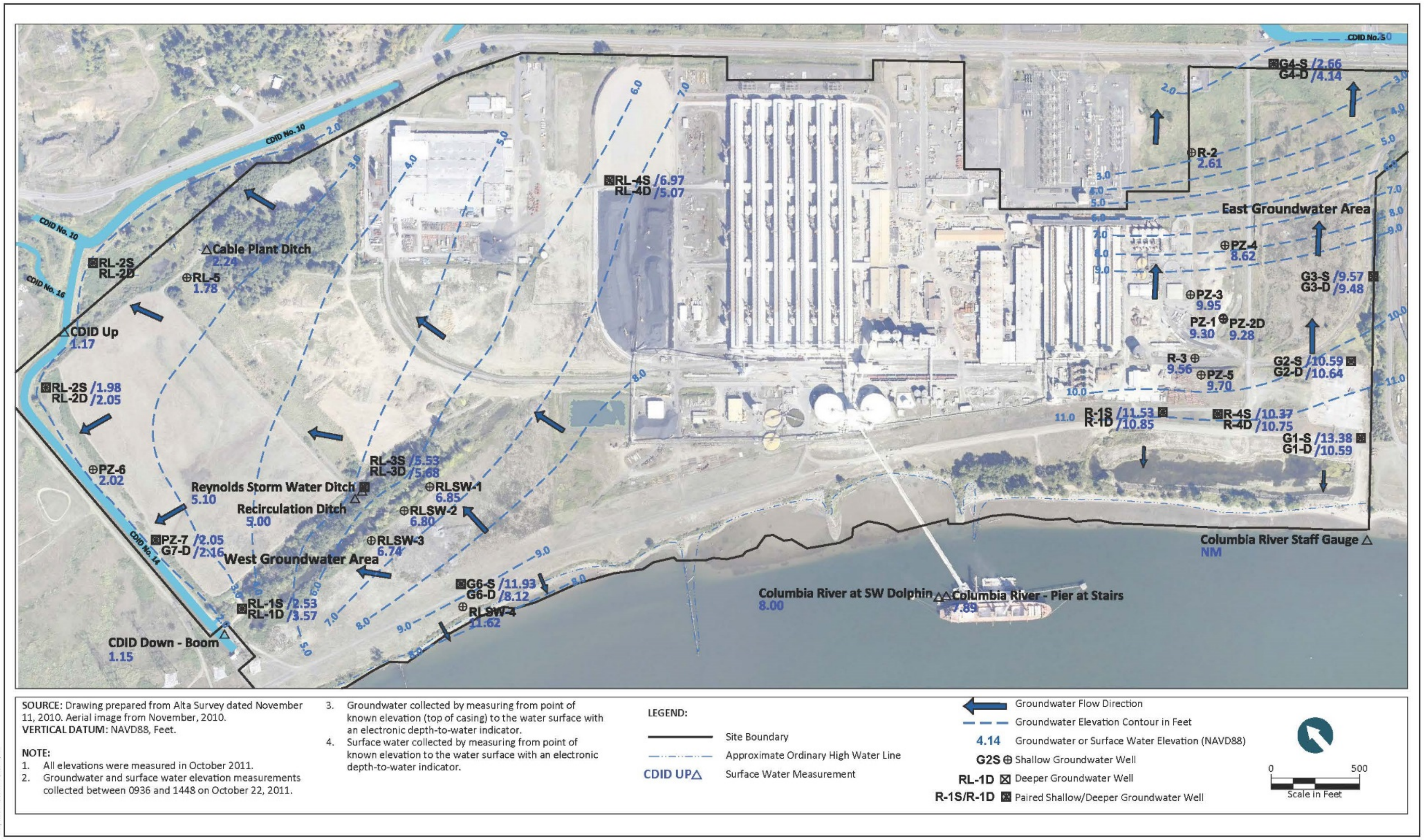
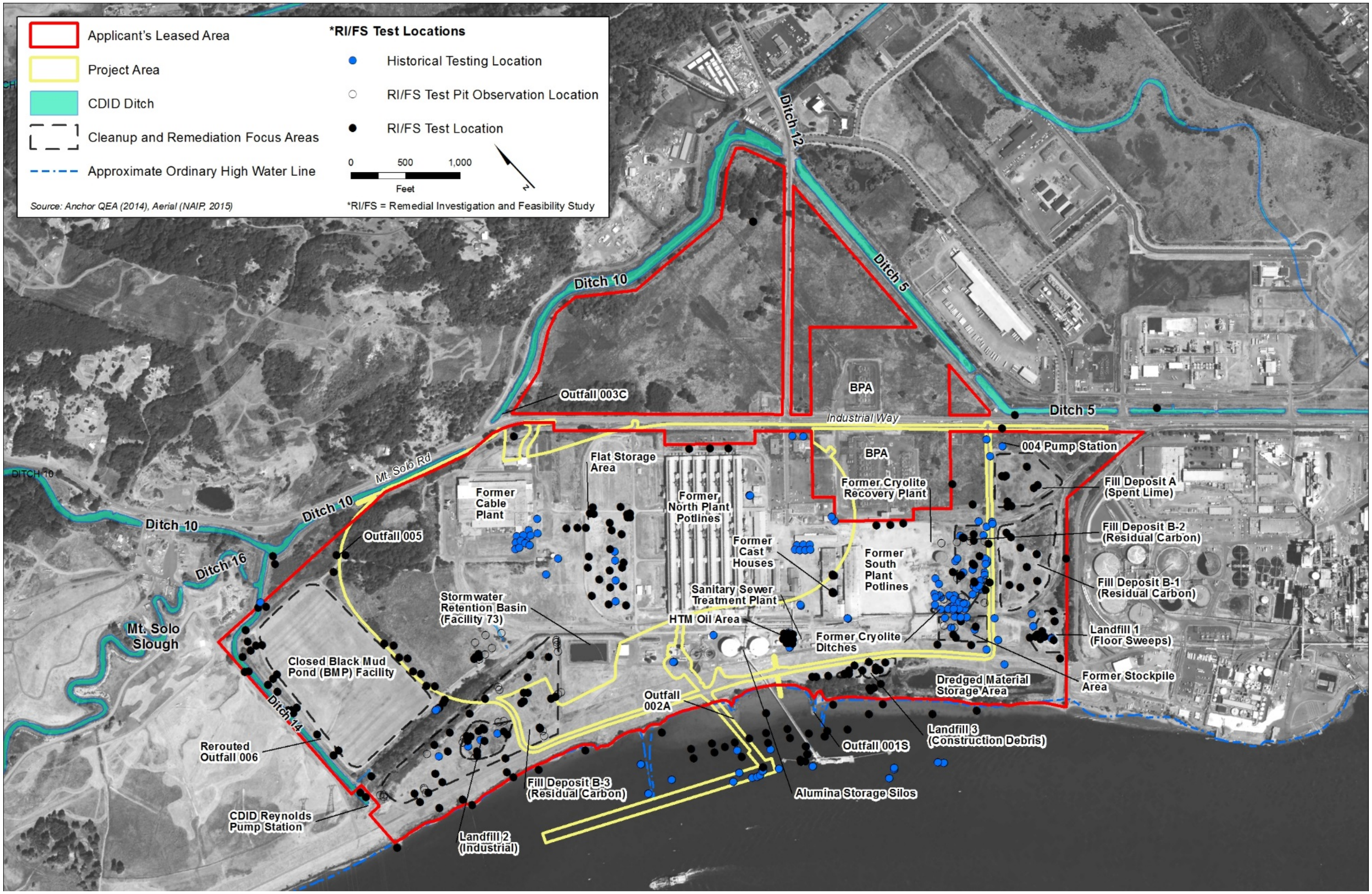


Figure 4.4-5. Remedial Investigation Environmental Testing (Geologic, Hydrogeologic, and Geochemical) Locations



Project Area

Localized groundwater recharge and quality in the project area are influenced by the Columbia River, the CDID #1 ditch system, and the NPDES ditch system in the Applicant's leased area. The project area is not considered to be a significant source of groundwater recharge through surface infiltration.

Similar to the shallow aquifer, groundwater in the deep aquifer flows from the Columbia River levee northward, then proceeds northwest toward the CDID Ditch 14 (Figure 4.4-4) (Anchor Environmental 2007). The one exception to this localized flow of deep groundwater away from the Columbia River (at least seasonally) is an area south of the levee where it flows toward the river.

An upward vertical gradient exists in areas near the CDID #1 ditches, causing groundwater in the deep aquifer to move upward into the shallow aquifer (Anchor Environmental 2007).

4.4.4.3 Groundwater Quality

Local groundwater quality in the study area is good, with pollutant concentrations below human health screening levels. Some samples taken from the study area contain manganese, iron, and arsenic levels above the Washington State Department of Health secondary water quality standards but at levels below thresholds established by the U.S. Environmental Protection Agency (EPA) for drinking water quality standards. These levels were found to be naturally occurring and are characteristics of the regional water supply aquifer (Anchor QEA 2014a).

Groundwater Contamination

Historical operations in the study area have included the operation of various facilities, e.g., an aluminum production facility, a cable plant, cryolite recovery, and industrial landfills.[2] Chapter 3, Section 3.6, *Hazardous Materials*, provides a history of contamination in the study areas. In the project area, groundwater samples show presence of cyanide, fluoride, polycyclic aromatic hydrocarbons, heavy metals and petroleum hydrocarbons.

In January 2015, a remedial investigation/feasibility study (RI/FS) (Anchor QEA 2014) was prepared per the requirements of the Model Toxics Control Act (MTCA), which is administered by the Washington State Department of Ecology (Ecology). The RI/FS provides a detailed description of cleanup and remedial actions conducted in the study area (Anchor QEA 2014). Figure 4.4-5 shows the locations of previous cleanup and removal activities and remedial investigation focus areas.

Source Areas and Chemicals of Concern (Deep and Shallow Aquifers)

Cyanide

Groundwater cyanide concentrations in the study area are very low and have been decreasing over time. Free cyanide concentrations in all samples taken in the western portion of the study areas were below the groundwater screening level of 0.2 milligram per liter.

[2] Landfills include six areas referred to as Landfills and Fill Deposits that were associated with the operation of the Reynolds aluminum smelter and were used for depositing such things as industrial waste, residual carbon, construction debris, floor sweeps and spent lime. Cleanup of these features is ongoing as a separate project.

Groundwater cyanide concentrations in samples collected in the eastern portion of the study area have also been decreasing over time. One groundwater sample, located near the Former Stockpile Area in the southeast corner of the study area in Figure 4.4-5, exceeded the groundwater Maximum Contaminant Level in 2006, but concentrations decreased significantly by the 2011 and 2012 sampling events. Free cyanide[3] concentrations in most of the eastern portion of the study area were below the groundwater screening level.

Fluoride

Fluoride concentrations in most of the Applicant's leased area are below groundwater screening levels. The exceptions are the shallow groundwater located in or immediately adjacent to Landfills 1 and 2 and fill deposits A, B-1, B-2 and B-3. Surface-water monitoring suggests that the fluoride present in the shallow groundwater is not affecting water quality in the adjacent CDID Ditches 10, 5, or 14 (Anchor QEA 2014).

Carcinogenic Polycyclic Aromatic Hydrocarbons

Carcinogenic polycyclic aromatic hydrocarbon (CPAH) concentrations from the western portion of the Applicant's leased area do not exceed groundwater screening levels. In the eastern portion of the Applicant's leased area, and outside the project area boundaries, CPAH concentrations were below groundwater screening levels in all locations except for wells located immediately within or adjacent to fill deposits. Three localized areas (purple circles on Figure 4.4-6) include wells located immediately adjacent to Landfill 1 and Fill Deposit B-2. CPAH concentrations in wells located farther downgradient were lower than the groundwater screening level and the surface water screening level.

Polychlorinated Biphenyls

No polychlorinated biphenyls (PCBs) were detected in any of the groundwater samples analyzed.

Heavy Metals

Test findings indicate that groundwater heavy metals concentrations are below applicable screening levels.

Volatile Organic Compounds

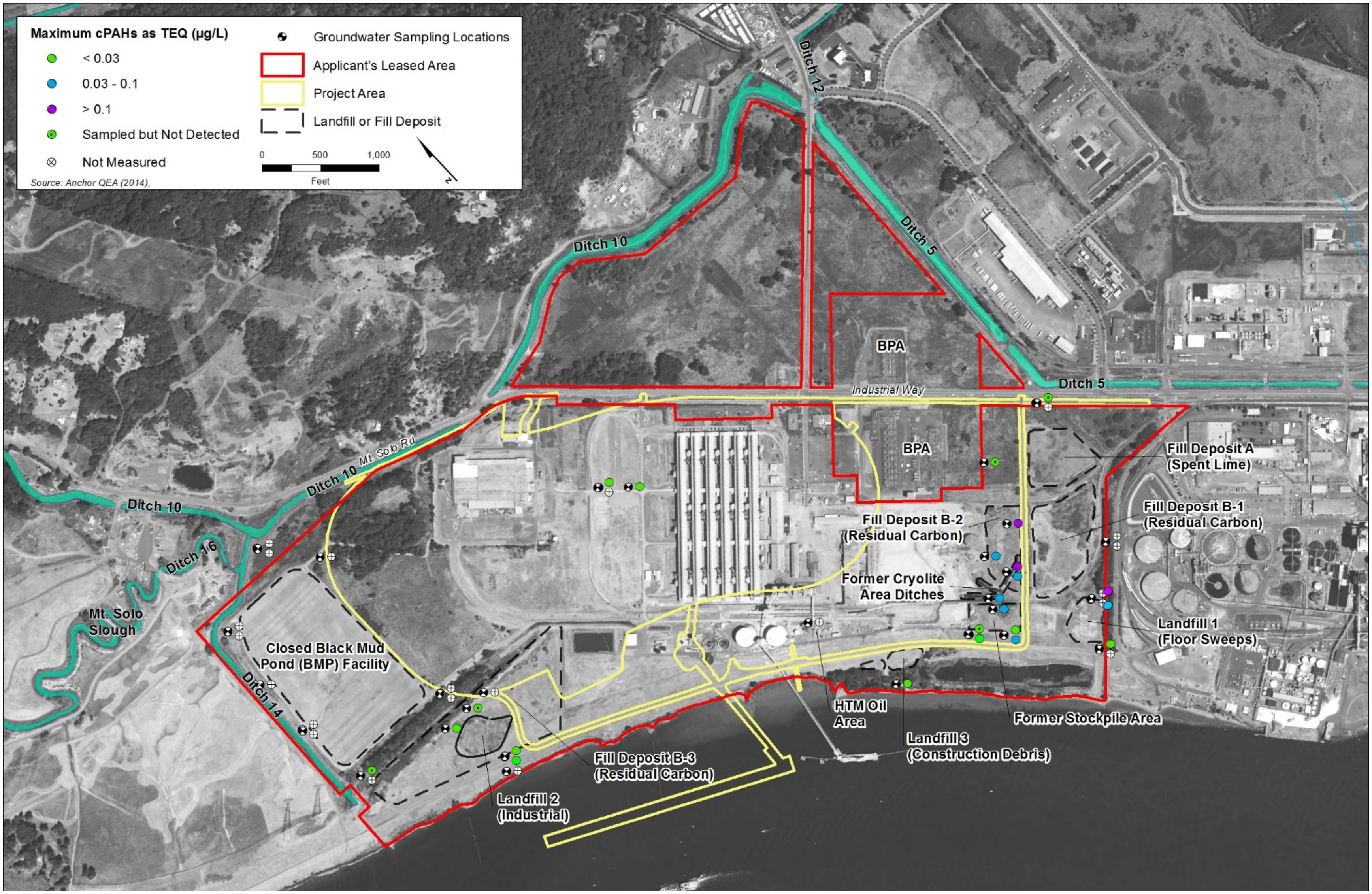
No volatile organic compounds were detected in any of the groundwater samples analyzed.

Total Petroleum Hydrocarbons

The RI/FS testing program included analysis for total petroleum hydrocarbons (TPHs) in the HTM Oil Area (Figure 4.4.-5). All samples collected were below groundwater screening levels.

[3] Free cyanide refers to the sum of hydrogen cyanide (HCN) and cyanide ion (CN-) in a sample. Free cyanide is bioavailable and toxic to organisms in aquatic environments.

Figure 4.4-6. 2007–2012 Groundwater Testing Results (Total CPAHs as Toxic Equivalents)



Distribution of Chemicals of Concern

Fluoride and cyanide levels found in the shallow groundwater within or immediately adjacent to Landfills 1, 2, and 3 have limited mobility and are not affecting downgradient groundwater (Anchor QEA 2014). Groundwater contaminated with fluoride and cyanide could occur during leaching when soils or solid media come into contact with the groundwater. However, the upward hydraulic gradients in the shallow aquifer cause dispersion of fluoride and cyanide and prevent migration into the north-south groundwater flows. This subsequently protects groundwater, surface water, and the Columbia River and limits fluoride and cyanide from traveling to the CDID #1 ditches. Fluoride and cyanide concentrations have been decreasing over time, since the closure of the former Reynolds Metal Company facility (Reynolds facility). It is unlikely that fluoride and cyanide in the study area affect the surrounding groundwater (Anchor QEA 2014).

Final Cleanup Actions

A draft Cleanup Action Plan for the study area was released in January 2016, and describes the cleanup actions that would protect human health and the environment, meet state cleanup standards, and comply with other applicable state and federal laws. Cleanup standards would be consistent with the current and anticipated future land use. Although a final Cleanup Action Plan has not been determined, this section discusses the site-specific cleanup action requirements applicable to all the cleanup alternatives.

Table 4.4-2 shows the proposed cleanup levels, remediation levels, and conditional points of compliance for groundwater to be implemented as part of the Cleanup Action Plan (Anchor QEA 2014). Cleanup levels were based on MTCA equations or Applicable or Relevant and Appropriate Requirements (ARARs) to protect groundwater resources for the highest beneficial use (i.e., drinking water) (Anchor QEA 2014).

Table 4.4-2. Groundwater Cleanup Standards

Chemical of Potential Concern	Groundwater Cleanup Level	Protection Basis	Point of Compliance
Fluoride (dissolved)	4 mg/L	State Drinking Water MCL	Conditional point of compliance at property line and groundwater-ditch boundary
Free cyanide (dissolved)	200 µg/L	State Drinking Water MCL	Wells adjacent to where remedial action will occur
CPAHs	0.1 µg/L	MTCA Method A Standard Value	
TPH-D	500 µg/L	MTCA Method A Standard Value	
TPH-O	500 µg/L	MTCA Method A Standard Value	

Notes:
Source: Anchor QEA 2014
mg/L = milligrams per liter; MCL = Maximum Contaminant Level; µg/L = micrograms per liter;
CPAHs = carcinogenic polycyclic aromatic hydrocarbons; MTCA = Model Toxics Control Act; TPH-D = total petroleum hydrocarbon – diesel; TPH-O = total petroleum hydrocarbon – oil

4.4.4.4 Applicant's Water Rights

The Applicant currently holds several water rights to extract groundwater from the deep aquifer (Kennedy/Jenks 2012). As shown in Table 4.4-3, the existing demand is well within the water rights[4] limits for groundwater pumping. However, if the Applicant does not fully beneficially use each water right within 5-year periods, the Applicant will relinquish the unused portion (RCW 90.14.160).

Table 4.4-3. Water Rights Claims and Certificates

		Withdrawal		
Record Number	**Certificate Number**	**Instantaneous (gpm)**	**Annual (AFY)**	**Priority Date**
G2-006572CL	-	2,500	2,340	-
G2-006573CL	-	2,500	2,340	-
G2-006574CL	-	2,500	1,614	-
G2-*02244CWRIS	01571	2,500	4,033	1951
G2-*08309CWRIS	06184	2,500	4,000	1966
G2-*08310CWRIS	06185	2,500	4,000	1966
G2-*08367CWRIS	06186	3,000	4,800	1966
G2-*08368CWRIS	06187	3,000	4,800	1966
G2-*09127CWRIS	06427	2,150	3,440	1967
Total		**23,150**	**31,367**	

Notes:
Source: URS Corporation 2014b.
gpm = gallons per minute; AFY = acre-feet per year

4.4.5 Impacts

This section describes the potential direct and indirect impacts related to groundwater that would result from construction and operation of the Proposed Action and the No-Action Alternative.[5]

4.4.5.1 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.

Construction site preparation activities would involve preloading and installation of vertical wick drains to aid in the consolidation of low consistency silt and low-density sand (i.e., unconsolidated materials). Wick drains would direct groundwater from the shallow aquifer upward toward the surface during preloading, where it would discharge. Water discharged from the wick drains would be captured, tested for contaminants, and treated prior to discharge to any surface waters.

[4] The Applicant is responsible for maintaining water rights. The Draft EIS did not verify water rights are current.

[5] Acreages presented in the impacts analysis were calculated using Geographic Information System (GIS), thus, specific acreage of impacts are an estimate of area based on the best available information.

Process water supply for construction and operation of the Proposed Action would come from two sources: the on-site water management system during the wet season and onsite groundwater wells during the dry season. Process water uses on the project area would include dust control, equipment washdown, and cleanup. Water for dust suppression would be applied on the main stockpiles, within unloading and conveying systems, and at the docks.

Construction activities that could impact groundwater include the following.

- Disturbance of surface soils during construction
- Release of hazardous and non-hazardous materials during construction
- Disturbance of previously contaminated sites
- Use of groundwater for dust control

Operational activities that could impact geology and soils include the following.

- Alteration of surface runoff patterns
- Use of groundwater for dust control, equipment washdown, and cleanup

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).

Affect Groundwater Recharge during Construction

Construction of the Proposed Action would involve preloading and installing vertical wick drains that would direct groundwater from the shallow aquifer upward toward the surface during preloading, where it would discharge. Ground-disturbing activities (excavations, grading, filling, trenching, backfilling, and compaction) could temporarily disrupt the existing drainage and groundwater recharge patterns in the study area. The study area is not considered a major source of groundwater recharge of the deep aquifer. During construction, drainage and groundwater recharge patterns are expected to be similar to those of the existing conditions, with wick drain effluent and runoff directed to collection and treatment facilities and minimal infiltration to groundwater of the deep aquifer. Therefore, construction of the Proposed Action would not be expected to have a measurable impact on groundwater recharge patterns of the deep aquifer.

Construction activities could have an impact on to the shallow water aquifer. Poured concrete, cement, mortars, and other Portland cement or lime containing construction material can alter the pH of stormwater, which could affect the shallow aquifer water quality. The shallow water aquifer in the project area would be recharged by stormwater and discharges groundwater to the CDID #1 ditches. Water from the CDID #1 ditches is discharged to the Columbia River. During construction, the grades of impervious surfaces would be sloped to convey stormwater to collection sumps on the project area. The collected stormwater would then be conveyed to water-collection facilities and discharged through a monitored internal outfall to existing facilities within the project area for treatment prior to discharge to the Columbia River.

Therefore, construction of the Proposed Action would be expected to have a slight impact on groundwater recharge patterns for the shallow aquifer.

For more information on the NPDES Construction Stormwater General Permit for the Proposed Action, see the *SEPA Water Quality Technical Report* (ICF International 2016b).

Degrade Groundwater Quality during Construction

Construction of the Proposed Action could release contaminants to the ground through leaks and spills, which could be introduced to groundwater and result in degradation of groundwater quality. Shallow aquifer groundwater is recharged mostly from the Columbia River. Stormwater generated during construction would be collected and treated in compliance with the NPDES Construction Stormwater General Permit prior to discharge to surface water, including the Columbia River, thus, water discharged to the Columbia River would not degrade water quality. Construction of the Proposed Action would adhere to project-specific best management practices, required in the NPDES Construction Stormwater General Permit to minimize potential impacts on surface and groundwater resources. Best management practices would include, but would not be limited to the following.

- **BMP C153.** Material delivery, storage and containment would be used to prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage.
- **BMP C154**. A concrete washout area would be constructed near the entrance to the project area to prevent or reduce the discharge of pollutants to groundwater or stormwater from concrete waste.

Site preparation activities would involve preloading and installation of vertical wick drains to aid in the consolidation of low consistency silt and low-density sand (i.e., unconsolidated materials). Wick drains would direct groundwater from the shallow aquifer upward toward the surface during preloading, where it would discharge. These activities could take place adjacent to areas where known groundwater contamination exists, and the contaminated groundwater could penetrate these areas. However, the permeability of the soil materials affected by preloading would be relatively low, and thus, would not be particularly susceptible to the infiltration of contaminated groundwater. Water discharged from the wick drains would be captured, tested for contaminants, and treated prior to discharge to any surface waters.

Construction of the Proposed Action could encounter previously contaminated areas that could result in degradation of groundwater quality. However, with the exception of two small areas—the eastern corner of the Flat Storage Area and the northeastern portion of Fill Deposit B-3 (Figure 4.4-5)—cleanup actions are not recommended in the draft Cleanup Action Plan for the project area. For the two areas where overlapping construction and remediation activities could occur, the activities would be coordinated to reduce conflicts and minimize exposure to the environment. Fluoride and cyanide levels found in shallow groundwater have limited mobility and do not affect downgradient groundwater or surface water quality. Therefore, construction of the Proposed Action would be possible but unlikely to result in groundwater degradation as a result of disturbing previously contaminated areas in the study area.

Construction of the Proposed Action would be unlikely to affect the wellfield at the Mint Farm Industrial Park, which is located upgradient and approximately 1.14 miles (6,000 feet) away. Although construction-related spills of hazardous materials could occur, the potential consequences of such spills depend on the size of the spill but are generally expected to be small. Any spill would be reported, contained on site to the extent feasible and cleaned up, and therefore, would be unlikely to reach the Mint Farm wellhead protection area. Existing on-site contamination from past actions associated with operation of the former Reynolds facility has limited mobility in shallow groundwater and is not affecting downgradient groundwater or surface water quality. Therefore, it is not anticipated that the existing contamination originating in the study area would adversely affect the wellhead protection area as a result of construction.

Affect Groundwater Supply during Construction

Construction of the Proposed Action would require groundwater use for dust suppression. The maximum amount of water that would be used for dust suppression is estimated to be less than 40,000 gallons per day (44.8 acre-feet per year [AFY]). Combined with demand from existing activities in the project area of 1,994 AFY, the total demand for groundwater during construction would be approximately 2,039 AFY. As described above, the Applicant holds water rights for instantaneous extraction from on-site wells of about 23,000 gpm or 31,367 AFY. Construction-related and water demand for existing operations would together represent approximately 6.5% of the Applicant's current groundwater extraction rights. Therefore, construction of the Proposed Action would have a negligible impact on groundwater supply.

Trenching activities may intersect groundwater in low-lying areas. Dewatering of trenches may result in temporary fluctuations in local groundwater levels in the shallow aquifer. Dewatering effluent would be pumped to temporary containment tanks for settling, where it will be tested for pollutants before being discharged to receiving waters. If pollutants are encountered during testing, dewatering would be suspended and Ecology would be notified. Contaminated water would be treated before being discharged to receiving waters.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on groundwater.

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*.

Affect Groundwater Recharge during Operations

A nominal amount of groundwater recharge for the deeper aquifer occurs under existing conditions and would likely be similar during operations. Operations would not be expected to measurably affect groundwater recharge for the deeper aquifer. Ground compaction, in the form of preloading would occur during construction. Groundwater flow is expected to be similar to existing conditions, but may increase at greater depths and/or slow near the surface. The direction and volume of groundwater recharge is expected to remain relatively constant. Under the Proposed Action, the Applicant would be required to obtain a separate NPDES Industrial Stormwater Permit and would develop a separate system of stormwater collection and discharge regulated by this permit. The project area would absorb some of the existing drainage basins in the project area, effectively eliminating a portion of the runoff volume that is presently handled under the Applicant's existing NPDES Industrial Stormwater Permit. Excess water from the project area would be collected and treated on the project area, then routed to a new internal outfall that would be monitored under the new NPDES Industrial Stormwater Permit. The outfall would tie into the existing Facility 77 sump, and all waters from the project area would go through Facility 73 for water quality treatment. The existing discharge line from Facility 73 would continue to discharge to the Columbia River through the existing Outfall 002A. Therefore, operation of the Proposed Action is not expected to substantially change groundwater recharge patterns associated with surface waters in the project area.

Degrade Groundwater Quality during Operations

Runoff from the study area would be directed to on-site drainage systems and would be treated and reused on site, or discharged in accordance with the new NPDES Industrial Stormwater Permit. Water being reused on site would be brought to Washington State Class A Reclaimed Water standards (URS Corporation 2014c). Excess water not reused on site would be further treated and tested prior to being routed to the NPDES Industrial Stormwater Permit permitted outfalls and discharged to the Columbia River. Discharge of water to the Columbia River during operation of the Proposed Action would mostly occur during the rainy season when excess surface water would be more likely to be generated on site.

Furthermore, as discussed in Section 4.5, *Water Quality*, the following project design and best management practices would be part of the Proposed Action design to maximize the protection of surface-water quality (and thus, groundwater via infiltration).

- Enclosed conveyor galleries.
- Enclosed rotary unloader building and transfer towers.
- Washdown collection sumps for settlement of sediment.
- Regular cleanout and maintenance of washdown collection sumps.
- Containment around refueling, fuel storage, chemicals, and hazardous materials.
- Oil/water separators on drainage systems and vehicle washdown pad.
- Requirement that all employees and contractors receive training, appropriate to their work activities, in the best management practices.
- Design of docks to contain spillage, with rainfall runoff and washdown water contained and pumped to the upland water treatment facilities.
- Design of systems to collect and treat all runoff and washdown water for on-site reuse (dust suppression, washdown water or fire system needs) or discharge off site.

Since water collected during operations would be treated before reuse or discharge to the Columbia River and would be unlikely to infiltrate, groundwater quality would not likely be affected by operation of the Proposed Action.

The potential for infiltration of surface water containing coal dust would be relatively low based on the low recharge rates of the soil characteristics that exist in the study area (URS Corporation 2014c). Thus, the potential for coal dust to infiltrate and affect groundwater quality is relatively low. Additionally, the potential for constituents of coal to become soluble and infiltrate is also relatively low. Most coal dust would be washed away prior to the constituents becoming soluble in surface water and infiltrating to groundwater. Toxic constituents of coal include PAHs and trace metals, which are present in coal in variable amounts and combinations dependent on the type of coal. The coal type, along with mineral impurities in the coal and environmental conditions determine whether these compounds can be leached from the coal. Some PAHs are known to be toxic to aquatic animals and humans.

Metals and PAHs could also potentially leach from coal to the pore water of sediments. However, the low aqueous extractability and bioavailability of the contaminants minimizes the potentially toxic effects. Furthermore, the type of coal anticipated to be exported from the coal export terminal is alkaline, low in sulfur and trace metals and the conditions to produce concentrations in pore waters are not present in a dynamic riverine environment. Thus, there would be a low likelihood for such toxins would affect groundwater quality.

The potential risk for exposure to toxic chemicals contained in coal (e.g., PAHs and trace metals) would be relatively low as these chemicals tend to be bound in the matrix structure and not quickly or easily leached. See Section 4.5, *Water Quality*, and Chapter 5, Section 5.7, *Coal Dust*, for more information.

Operation of the Proposed Action would not encounter or disturb existing groundwater contamination areas in the study area. The remedial and monitoring activities would be carried out in accordance with all relevant and appropriate regulations, and would be coordinated to avoid further exposure to the environment.

Affect Groundwater Supply during Operations

Process water, i.e., water that would be used during operations of the Proposed Action to control dust, and equipment washdown would be supplied from two sources: the on-site water management system during the wet season and on-site groundwater wells during the dry season.

The on-site water management system would provide process water in the following ways.

- Stormwater and surface water (washdown water) would be collected from the stockpile areas, rail loop, office areas, docks, and other paved surfaces in the project area and directed to a series of vegetated ditches and ponds, then to a collection basin or sump.
- The collected water would be pumped to an onsite treatment facility consisting of retention pond(s) with flocculent addition to promote settling as required.
- The water would then be pumped to a surface storage pond. The surface storage pond would have an approximate capacity of 3.6 million gallons (MG) and would be used to store the water for reuse. The capacity of the pond would include a reserve of 0.36 MG for fire suppression.

It is anticipated that approximately 1,200 gpm during the wet season and approximately 2,000 gpm during the dry season (approximately 2,034 AFY) would be required on average for dust suppression. Water from the on-site groundwater wells would provide approximately 635 gpm (1,025 AFY) to maintain minimum water levels in the storage pond to meet process water demands during the dry season. Water from the storage pond would also be used for the fire hydrant, sprinklers and deluge systems, watering of landscaping and other non-recyclable uses. As mentioned above, the Applicant holds water rights for instantaneous extraction of 23,150 gpm up to 31,367 AFY. Combined with the groundwater demand from existing activities in the study area (approximately 1,994 AFY), the total demand on groundwater supplies during operation of the Proposed Action would be approximately 3,019 AFY. This estimate does not account for any future projects that the Applicant may construct within the Applicant's leased area that could require groundwater pumping; however, since the Proposed Action, combined with the existing demand would account for less than 10% of the maximum pumping limits, operation of the Proposed Action would have a negligible impact on groundwater supply. The Applicant would ensure that water rights are current before withdrawing any water for construction or operations; water rights would be maintained for ongoing groundwater use during operation of the Proposed Action.

The on-site water management system would provide process water through stormwater collection, treatment and storage. Water from the on-site groundwater wells would augment stormwater collection to meet process water demands during the dry season. The total demand on groundwater supplies during operation of the Proposed Action would be approximately 3,019 AFY, accounting of for less than 10% of the maximum pumping limits allowed under existing water rights. Operation of the Proposed Action would have a negligible impact on groundwater supply.

Operations—Indirect Impacts

Operation of the Proposed Action would result in the following indirect impacts related to increased rail traffic (up to 240 unit trains[6] arriving and departing per month) on the Reynolds Lead. Operations-related activities are described in Chapter 2, *Project Objectives, Proposed Action*, *and Alternatives*.

Degrade Groundwater Quality during Operations

Operation of the Proposed Action likely would not affect the wellfield at the Mint Farm Industrial Park, because all surface water generated on the study area would be reused on site or treated before discharge to the Columbia River. As mentioned above, all process water reused on site would be brought to Washington State Class A Reclaimed Water standards. Excess water not reused on site would be further treated and tested prior to being discharged through the internal NPDES permitted outfalls and finally discharged to the Columbia River. Degradation of groundwater quality would be unlikely to occur as a result of operation of the Proposed Action. The majority of the study area is located within what is referred to as Zone 2 of the wellhead protection and sanitary control areas.[7] Should a release of a potential groundwater contaminant occur during operations, cleanup would occur rapidly to reduce potential risk to the wellfield at the Mint Farm Industrial Park.

Degrade Groundwater Quality as a Result of a Collision or Derailment

Spills of fuel or other potentially hazardous materials could occur if rail cars were to collide and/or derail within the study area. Materials released onto the ground as a result of a collision or derailment could enter groundwater and potentially degrade groundwater quality. As discussed in Chapter 3, Section 3.6, *Hazardous Materials*, if a release of hazardous materials was

[6] 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. Proposed Action-related unit trains would consist of approximately 125 rail cars and three locomotives.

[7] In Washington State, wellhead protection areas are based on horizontal time-of-travel rates for groundwater. Zone 2 areas are based on a 5-year time-of-travel for groundwater.

to occur, the rail operator would implement emergency response and cleanup actions as required by Occupational Safety and Health Administration rules (29 Code of Federal Regulations [CFR] 1910.120); the Washington State Oil and Hazardous Substance Spill Prevention and Response regulations (90.56 Revised Code of Washington [RCW]) and/or the Model Toxic Control Act Cleanup Regulations (Chapter 173-340 Washington Administrative Code [WAC]). In addition, Federal Railroad Administration accident reporting requirements (49 CFR 225) include measures to avoid or minimize the potential for a spill of fuel or other potentially hazardous materials from affecting groundwater quality, through quick response, containment and cleanup. Thus, a release of potentially hazardous materials would not be expected to affect groundwater.

4.4.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal and would continue with current 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 that would not require a permit from the U.S. Army Corps of Engineers (Corps) (i.e., would not affect waters of the United States). Because existing industrial import and export activities would be expanded, potential impacts on water quality of groundwater would be similar to those described for the Proposed Action regarding potential oils and grease spills from equipment or other raw materials shipped from the coal export terminal. The existing NPDES Industrial Stormwater Permit would remain in place, maintaining the water quality of existing stormwater discharges to the Columbia River, which would maintain water quality of groundwater.

Any new or expanded industrial uses would trigger a new NPDES or modified permit. Upland buildings could be demolished and replaced for new industrial uses. Ground disturbance would not result in any impacts on waters of the United States and would not require a permit from the Corps. Any new impervious surface area would generate stormwater, but all stormwater would be collected and treated to meet state and federal water quality requirements prior to discharge to the Columbia River. Groundwater recharge in the study area is primarily from the Columbia River, thus maintaining water quality in the Columbia River would be expected to maintain water quality of groundwater within the study area.

4.4.6 Required Permits

The following required permits would be required for groundwater.

- **Cowlitz County Critical Areas Permit—Cowlitz County**. The Cowlitz County Critical Areas permit would be needed to address compliance with the County's Critical Areas Ordinance related to the presence and protection of Critical Aquifer Recharge Areas located on-site.
- **Clean Water Act Section 401 Water Quality Certification—Washington State Department of Ecology.** This certification would be required to ensure no potential contamination of groundwater resources associated with project construction and operations stormwater discharge.
- **National Pollution Discharge Elimination System Construction Stormwater General Permit—Washington State Department of Ecology.** The NPDES Construction Stormwater General Permit would be required for stormwater discharges during construction of the Proposed Action.

- **National Pollution Discharge Elimination System Industrial Stormwater Permit—Washington State Department of Ecology**. The NPDES Industrial Stormwater Permit would be required for stormwater discharges related to operation of the Proposed Action.
- **Water Rights—Washington State Department of Ecology.** The Applicant would ensure that its existing water rights are current prior to using those rights. If the Applicant's water rights are current, the Applicant must maintain those water rights. If the Applicant's water rights are partially relinquished, the Applicant must apply for and obtain the necessary water rights.

4.4.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to groundwater 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.

4.4.7.1 Applicant Mitigation

The Applicant will implement the following measure to mitigate impacts on groundwater.

MM WQ-1. Locate Spill Kits Near Main Construction and Operation Areas

The Applicant will locate spill response kits throughout the project area during construction and operations. The spill response kits will contain response equipment and personal protective equipment appropriate for hazardous materials that will be stored and used during construction and operations. Site personnel will be trained in the storage, inventory, and deployment of items in the spill response kits. Spill response kits will be checked a minimum of four times per year to ensure proper-functioning condition, and will otherwise be maintained and replaced per manufacturer recommendations. Should a spill response kit be deployed, the Applicant will notify Cowlitz County and Ecology immediately. The Applicant will submit a map indicating the types and locations of spill response kits to Cowlitz County and Ecology for approval prior to beginning construction and operations.

4.4.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of mitigation measures and design features described above would reduce impacts on groundwater. There would be no unavoidable and significant adverse environmental impacts.

4.5 Water Quality

Surface water is used for a wide range of purposes, including wildlife habitat, industrial process water, drinking water, irrigation, flood control, and recreational activities The quality of these resources refers to the physical, chemical, biological, and aesthetic characteristics of the water body. Water quality can be eroded by contaminants introduced through domestic, industrial, and agricultural practices. Water quality impacts could include changes in turbidity, introduction of pollutants in coal dust, introduction of hazardous or toxic materials, and pollutants associated with shipping vessels and rail transport.

This section describes water quality in the study areas. It then describes impacts on water 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.

4.5.1 Regulatory Setting

Laws and regulations relevant to water quality are summarized in Table 4.5-1.

Table 4.5-1. Regulations, Statutes, and Guidelines for Water Quality

Regulation, Statute, Guideline	Description
Federal	
Clean Water Act (33 USC 1251 et seq.)	Authorizes EPA to establish the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.
Safe Drinking Water Act (42 USC 300f et seq.)	Requires the protection of groundwater and groundwater sources used for drinking water. Also, requires every state to develop a wellhead protection program. EPA is the responsible agency.
National Pollutant Discharge Elimination System Permit (40 CFR 122)	Controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Authorized by the Clean Water Act. EPA is the responsible agency.
National Pollutant Discharge Elimination System Vessels Program	Regulates incidental discharges from the normal operation of vessels. These incidental discharges include, but are not limited to, ballast water, bilge water, graywater (e.g., water from sinks, showers), and antifoulant paints (and their leachate). Such discharges, if not adequately controlled, may result in negative environmental impacts via the addition of traditional pollutants or, in some cases, by contributing to the spread of aquatic invasive species. Authorized by the Clean Water Act. EPA is the responsible agency.

Regulation, Statute, Guideline	Description
Washington State	
Clean Water Act Section 401 Water Quality Certification	Ecology issues Section 401 Water Quality Certification for in-water construction activities to ensure compliance with state water quality standards and other aquatic resources protection requirements under Ecology's authority as outlined in the federal Clean Water Act.
Drinking Water/Source Water Protection (RCW 43.20.050)	Ensures safe and reliable public drinking water supplies in cooperation with local health departments and water purveyors. Ecology is the responsible agency.
Model Toxics Control Act (RCW 70.105D)	Requires potentially liable persons to assume responsibility for cleaning up contaminated sites. Ecology is the responsible agency.
State Water Pollution Control Law (RCW 90.48)	Provides Ecology with the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland water, salt waters, watercourses, and other surface and groundwater in the state.
Water Resources Act of 1971 (RCW 90.54)	Sets forth fundamental policies for the state to ensure that waters of the state are protected and fully used for the greatest benefit. Ecology is the responsible agency.
Water Quality Standard for Surface Waters of the State of Washington (WAC 173-201A)	Establishes water quality standards for surface waters of the state of Washington. Ecology is the responsible agency.
Ballast Water Management (RCW 77-120)	Governs discharge of ballast water into waters of the state. Includes reporting and testing requirements. WDFW is the responsible agency.
Washington Administrative Code (WAC 173-340-300)	Requires reporting of hazardous substance releases if they may constitute a threat to human health or the environment.
Washington Administrative Code (WAC 173-204)	Establishes administrative procedural requirements and criteria to identify, screen, evaluate and prioritize, and cleanup contaminated surface sediment sites.
Washington State Oil and Hazardous Substance Spill Prevention and Response (90.56 RCW)	Requires notification of releases of hazardous substances and establishes procedures for response and cleanup
Oregon State	
Treatment Requirements and Performance Standards for Surface Water, Groundwater Under Direct Influence of Surface Water, and Groundwater (OAR 333-061-0032)	Establishes water quality standards for groundwater to meet current state and federal safe drinking water standards. Oregon DEQ is the responsible agency.
Oregon Drinking Water Quality Act (ORS 448.119 to 448.285; 454.235; and 454.255) (applicable to Columbia River)	Ensures safe and reliable public drinking water supplies in cooperation with local health departments and water purveyors. Oregon DEQ is the responsible agency.
Water Quality Standards: Beneficial Uses, Policies, And Criteria for Oregon Oregon State Legislature: Turbidity Rule (OAR 340-041-0036)	Establishes the following turbidity standard: No more than a 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity. However, limited-duration activities to address an emergency, essential dredging, construction, or other legitimate activities that cause the standard to be exceeded may be authorized, provided all practicable turbidity control techniques have been applied. Oregon DEQ is the responsible agency.

Regulation, Statute, Guideline	Description
Local	
Cowlitz County Stormwater Ordinance (CCC 16.22)	Establishes minimum standards to guide and advise all who make use of, contribute to, or alter the surface waters and stormwater drainage systems in the County.
Cowlitz County (CCC 19.15)	Requires the County to designate critical areas such as wetlands; aquifer recharge areas; geologically hazardous areas; fish and wildlife habitat; and frequently flooded areas; and adopt development regulations to assure the protection of such areas.
Cowlitz County Phase II Municipal Stormwater Management Plan	Requires Cowlitz County to develop a SWMP and update it at least annually. The SWMP incorporates best management practices to reduce the discharge of pollutants from the regulated area to the maximum extent practicable in order to protect water quality.

Notes:
USC = United States Code; EPA = U.S. Environmental Protection Agency; CFR = Code of Federal Regulations; RCW = Revised Code of Washington; Ecology = Washington State Department of Ecology; WAC = Washington Administrative Code; WDFW = Washington Department of Fish and Wildlife; OAR = Oregon Administrative Rules; Oregon DEQ = Oregon Department of Environmental Quality; ORS = Oregon Revised Statutes; CCC = Cowlitz County Code; SWMP = stormwater management plan

4.5.2 Study Area

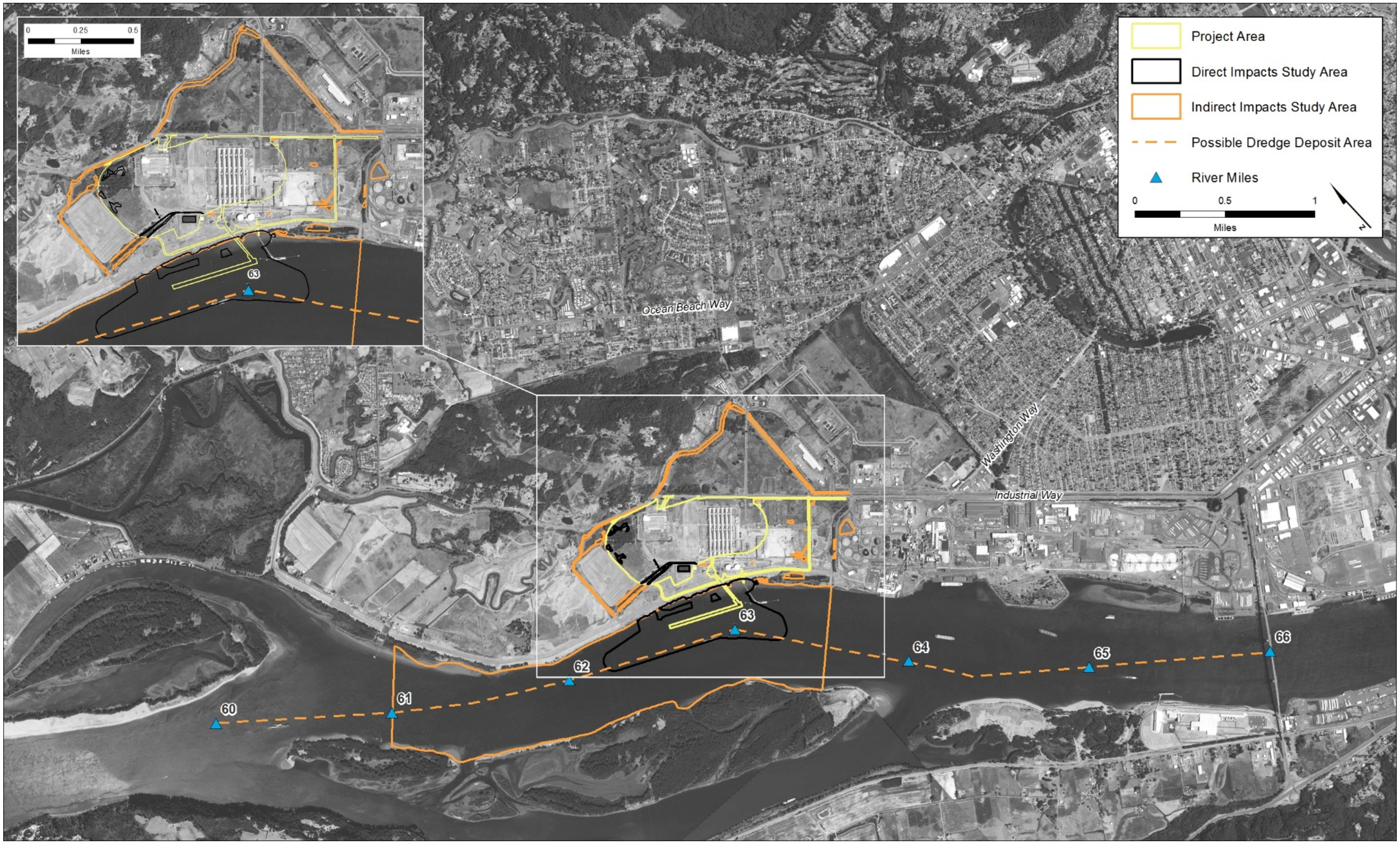
The study area for direct impacts on water quality is the project area and an area extending 300 feet from the project area into the Columbia River. This portion of the study area accommodates the analysis of in-water construction and dredging impacts on water quality associated with suspended sediment and elevated turbidity. The study area also incorporates potential in-river dredged material disposal sites and an area extending 300 feet downstream of the project area (Figure 4.5-1).

The study area for indirect impacts on water quality incorporates the project area, the Consolidated Diking and Improvement District (CDID) #1 stormwater system drainage ditches adjacent to the project area, the Columbia River downstream 1 mile from the project area, and the potential dredged material disposal sites.

4.5.3 Methods

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

Figure 4.5-1. Water Quality Study Area



4.5.3.1 Information Sources

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

- Reports on baseline water conditions at the project area and Columbia River (Anchor QEA 2011; Oregon Department of Environmental Quality 2012; Washington State Department of Ecology 2014; Grette 2014a, 2014b, 2014c; URS Corporation 2014)
- Reports on the salmon populations in the Columbia River (Ewing 1999; National Marine Fisheries Service 2011)
- Report on toxics in the Columbia River (U.S. Environmental Protection Agency 2009)
- Beneficial and recreational uses of the Columbia River (Oregon Department of Environmental Quality 2003; Oregon State Marine Board 2012)

4.5.3.2 Impact Analysis

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

The analysis of direct construction impacts was based on peak construction period, while operations impacts were based on maximum throughput capacity (up to 44 million metric tons per year). Potential water quality impacts were evaluated with respect to existing water quality conditions and Proposed Action-related water usage and discharge. The assessment of impacts also assumes the Proposed Action would comply with all regulations and include required National Pollution Discharge Elimination System (NPDES) permits, soil and groundwater remediation, water management on site, and long-term monitoring. Potential impacts on water quality of groundwater resources are covered in Section 4.4, *Groundwater*.

4.5.4 Existing Conditions

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

The project area is located along the north shore of the Columbia River and lies within CDID #1. The project area is drained by a system of NPDES ditches, which provide treatment of stormwater before it is discharged to the Columbia River and CDID #1 (Ditches #10 and #14).

4.5.4.1 Project Area Characteristics

The water quality characteristics of the project area are described in this section.

Drainage

Stormwater and shallow groundwater drainage for the project area are controlled by a system of ditches, pump stations, treatment facilities, and outfalls, shown in Figure 4.5-2. All of these facilities operate under a single NPDES permit. Project area drainage is either held on site until it evaporates, discharged to surrounding CDID #1 ditches (Ditches 10 and 14), or treated and discharged through Outfall 002A to the Columbia River.

The following is a brief description of drainage components in the Applicant's leased area.

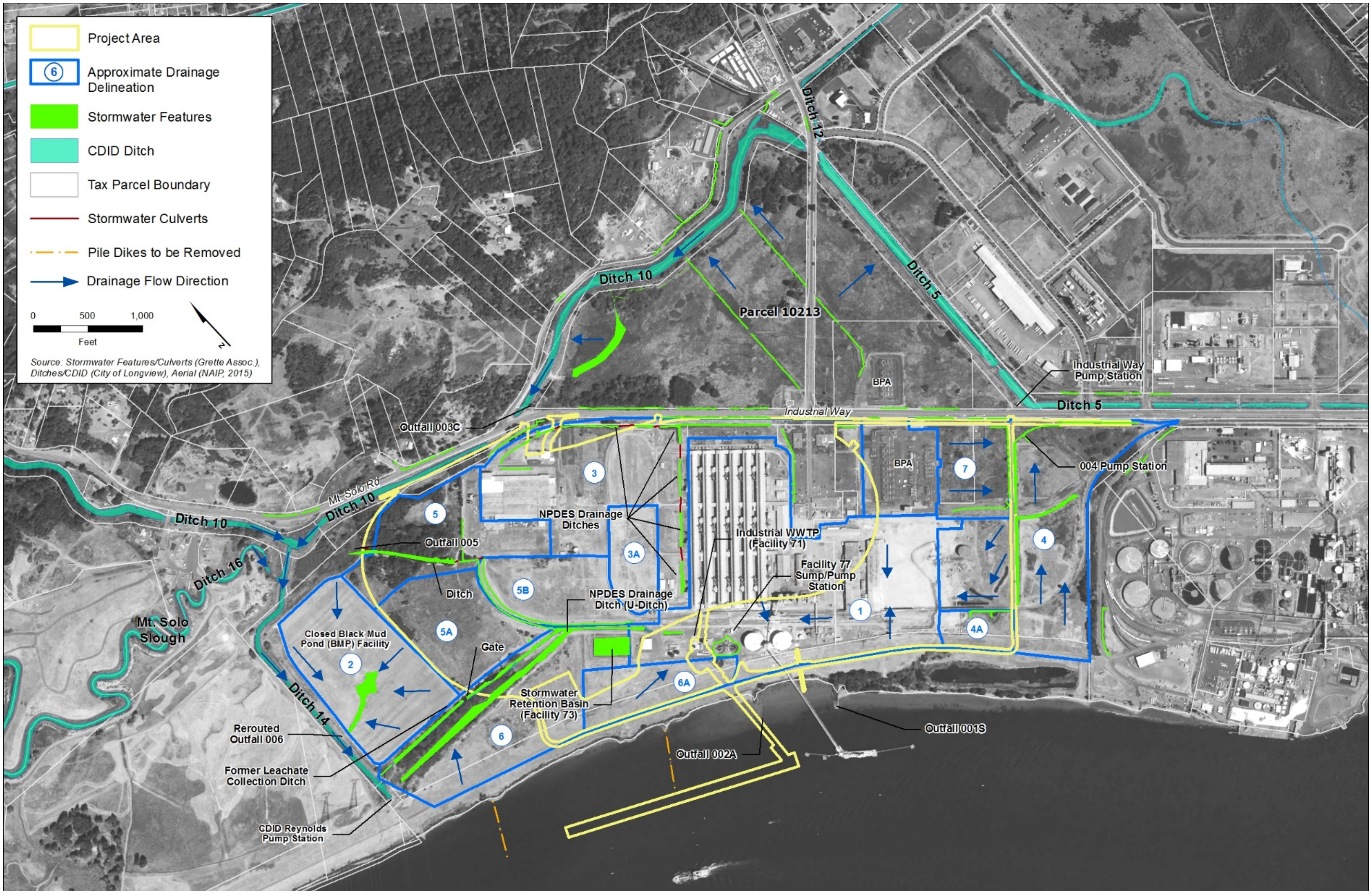
- **Sheet flow and infiltration.** Subbasins 4A, 5, 5A, 5B, 6A, and 7 receive sheet flow from storm events where it subsequently infiltrates or evaporates.
- **Columbia River discharge.** Subbasins 1, 2, 3A, 4, and 6 are conveyed via pumped systems or gravity to Facility 73, where they are treated and then discharged to the Columbia River via Outfall 002A.
- **CDID #1 discharge.** Subbasin 3 flows through a vegetated ditch that discharges to Ditch 10 through Outfall 003C. During larger storm events, a portion of the flows from Subbasin 2 and Subbasin 5 can discharge to the CDID #1 ditch system. Subbasin 2 overflows the rerouted 006 pump station and is discharged to Ditch14 through Outfall 006. This is a designed overflow system and it is equipped with a high flow alarm to alert staff when it is activated. Subbasin 5 flows can enter a vegetated ditch that discharges to Ditch 10 through Outfall 005. Ultimately, all CDID #1 ditch flows discharge to the Columbia River.
- **Drainage features on Parcel 10213**. These features include three vegetated ditches, two unvegetated ditches, and a shallow stormwater pond. Two of the vegetated ditches run north-south across the two larger portions of Parcel 10213. They are narrow and linear and convey stormwater to a culvert approximately 16 inches in diameter located at the north end of these ditches which then empties into Ditch 10. The third vegetated ditch consists of three segments of linear vegetated ditches adjacent to Industrial Way. These three ditches are connect by two culverts that are beneath the site's access roads. This feature likely collects stormwater from Industrial Way and adjacent areas and conveys it to Ditch 10.

  One unvegetated ditch runs parallel to Ditch 10 and consists of two sections of a narrow ditch that was likely constructed to intercept shallow groundwater that was affecting agricultural use of the site. This unvegetated ditch is several feet deep, near vertical along its sides, and is bisected by one of the vegetated ditches that runs parallel across the site; however, there is no surface hydrology connection between these two ditches. The other unvegetated ditch serves as the outlet channel for the stormwater pond. This ditch is located at the northeast end of the stormwater pond and conveys excess stormwater from the pond to Ditch 10 through a 16-inch culvert. All six features are privately owned and are not managed by CDID #1.

Consolidated Diking Improvement District # 1

The project area is served by the CDID #1 series of levees and ditches, which protect the project area from flooding. Water in the CDID #1 ditches does not exceed established water quality standards. Water from Ditches 5, 10 and 14 adjacent to the Applicant's leased area was tested in 2006, 2011, and 2012 to determine levels of cyanide and fluoride (contaminants associated with the site cleanup). Total Suspended Solids were also tested. No water quality exceedances were detected (Anchor QEA 2011). Drainage from CDID #1 ditches discharges to the Columbia River.

Figure 4.5-2. Drainage Features of the Proposed Action



Columbia River

The Columbia River flows along the southwest project area boundary. Near the project area, the river is composed of fresh water and is tidally influenced. The project area is located approximately at river mile 63 where instream flow requirements have not been established. The river's discharge rate fluctuates with precipitation, snowmelt, and reservoir releases. Flows in the river range from a low of about 63,600 cubic feet per second (cfs) to a maximum flow of about 864,000 cfs depending on conditions in the watershed (U.S. Geological Survey 2014). The Columbia River's annual cycle is driven by snowmelt and general climate of the Pacific Northwest leading generally highest flows during the spring snowmelt period and lowest flows during the late summer and early fall. This cycle is, however, highly managed through the operations of the many hydroelectric and irrigation dams that exist throughout the basin. The average annual discharge ranges from about 120,000 cfs during a low water year to about 260,000 cfs during a high water year (Washington State Department of Ecology 2016)

Surface water quality in the Columbia River is influenced by geology, point-source and nonpoint-source pollution, groundwater, and the natural flow regime. In 2009, the U.S. Environmental Protection Agency (EPA) listed the Columbia River in Washington's Water Resources Inventory Area (WRIA) 25 (which includes the project area) on the federal Clean Water Act Section 303(d) List as exceeding water quality criteria for certain parameters. WRIA 25 is listed as a Category 4a for total dissolved gas and dioxin. If a water body is listed as Category 4a, it indicates that the waters have identified pollution problems and that an approved total maximum daily load (TMDL) limit is actively being implemented for the listed water quality parameters.

4.5.4.2 Water Quality Characteristics and Criteria

Water quality characteristics and criteria are described below.

Designated Beneficial Uses

Designated beneficial uses for a water body, as established in the Clean Water Act, are used to design protective water quality criteria, to assess the general health of surface waters, and to establish thresholds for future permit limits. Table 4.5-2 provides a list of the beneficial uses for the Columbia River as defined by the Washington State Department of Ecology (Ecology) and the Oregon Department of Environmental Quality (Oregon DEQ).

Table 4.5-2. Beneficial Uses for the Columbia River

Washington State Department of Ecology[a]	Oregon Department of Environmental Quality[b]
Domestic water supply	Public domestic water supply; private domestic water supply
Industrial water supply	Industrial water supply
Agricultural water supply	Irrigation
Stock water supply	Livestock watering
Spawning/rearing uses for aquatic life	Fish and aquatic life
Harvesting	Fishing; wildlife and hunting
Boating	Boating
Primary contact for recreation uses	Water contact recreation

Washington State Department of Ecology[a]	Oregon Department of Environmental Quality[b]
Commerce/navigation	Commercial navigation and transportation
Aesthetics	Aesthetic quality

Notes:
[a] Washington State Department of Ecology (2012) approved uses for the Columbia River from its mouth to river mile 309.3.
[b] Oregon Department of Environmental Quality (2003) approved uses for the Columbia River from its mouth to river mile 86 (2003).

Water Quality Impairments

The Columbia River faces water quality issues that endanger the health of important habitats found throughout the basin. Portions of the Columbia River are considered impaired for a number of water quality factors according to the EPA-approved 303(d) lists for Washington and Oregon. The State of Washington recently conducted a draft water quality assessment and prepared an updated proposed 303(d) list. According to this proposed 303(d) list, in the vicinity of the project area the Washington state portion of the Columbia River is candidate for Category 5 waters for water temperature and bacteria (Washington State Department of Ecology 2015). Table 4.5-3 shows the 303(d) listed impairments for water quality factors in the Columbia River in WRIA 25 in Washington, and the Columbia River in the Lower Columbia-Clatskanie subbasin in Oregon.

Table 4.5-3. Proposed 303(d) Listed Impairments for the Columbia River near River Mile 64

Parameter	Washington	Oregon
Arsenic	-	5
Bacteria	5[a]	-
DDE 4,4	-	5
Dieldrin	5[a]	-
Dioxin (2,3,7,8-TCDD)	-	4A[b]
Dioxin	4A[b]	-
Fecal coliform	-	5
PCB	-	5
Temperature	-	5
Total dissolved gas	-	4A[b]

Notes:
[a] Category 5 impaired water list means water quality standards have been violated for one or more pollutants and a TMDL or other water quality improvement is required.
[b] Category 4A listing indicates that a TMDL has been developed and is actively being implemented.
Sources: Washington State Department of Ecology 2012a; Oregon Department of Water Quality 2012
DDE = Dichlorodiphenyldichloroethylene; TCDD = Tetrachlorodibenzo-p-dioxin; PCB = polychlorinated biphenyl

Baseline Water Quality Conditions

General baseline conditions for the broader Columbia River basin as well as the lower Columbia River and Estuary in the vicinity of the project area are described below.

Columbia River Basin

The four primary contaminants found in the broader Columbia River basin are mercury, dichlorodiphenyltrichloroethane (DDT) and its breakdown products, polychlorinated biphenyls (PCBs), and polybrominated diphenyl ether (PBDE) flame retardants. Other contaminants found in the basin include radionuclides, lead, pesticides, industrial chemicals, and newly emerging contaminants such as pharmaceuticals and personal care products (U.S. Environmental Protection Agency 2009).

Lower Columbia River and Estuary in Vicinity of the Project Area

The lower Columbia River and estuary is the 146-mile reach from the Bonneville Dam downstream to the Pacific Ocean. Monitoring results have shown high levels of contaminants such as PCBs, polyaromatic hydrocarbons (PAHs), DDT, and PBDEs in juvenile salmon tissue, water, and sediment. Studies have shown that flame retardants and endocrine-disrupting compounds in water, sediment, fish, and osprey eggs increase downstream from Skamania to Longview (Lower Columbia Estuary Partnership 2015).

Trace metals such as aluminum, iron, and manganese are predominantly transported in the suspended/solid phase, whereas arsenic, barium, chromium, and copper are transported in the dissolved phase. Water temperatures in the lower Columbia are generally warmest in August, when daily mean water temperatures often exceed 20 degrees Celsius (^{0}C). In general, dissolved oxygen saturation is relatively high and turbidity is relatively low. Data collected on September 11, 2015, at river mile 53 located near the Beaver Army Terminal indicated an oxygen saturation of 85.5% (9.17 mg/l), temperature of 20.03^{0}C, and turbidity of 1.61 nephelometric turbidity units (NTU). For contrast, data collected just below the Bonneville Dam at river mile 145 indicated an oxygen saturation of 97.9% (10.5 milligrams per liter), temperature of 20.07^{0}C, and turbidity of 2.27 NTUs (Center for Coastal Margin Observation & Prediction 2015).

On a more localized basis near the project area, the following average values were recorded in the lower Columbia: oxygen saturation of 73.62% (7.9 milligrams per liter), temperature of 20.96^{0}C, and turbidity of 9.9 NTUs (Weyerhaeuser, NPDES Permit 0000124).

Water Quality Attributes

Water Clarity

Water clarity refers to the amount of light that can penetrate water. Water clarity is an important parameter for assessing water quality because lower clarity increases water temperatures and adversely affects photosynthesis. Suspended sediment can clog the gills of fish and reduce their resistance to disease, cause lower growth rates, and affect egg and larval development. While both suspended sediment concentration and turbidity are common metrics of water clarity, turbidity data are used to characterize baseline conditions.

Water clarity can vary greatly in the Columbia River. U.S. Geological Survey (USGS) provisional data from the 2014 water year, collected near Quincy, Oregon, reported elevated turbidity (U.S. Geological Survey 2015) that was generally higher than during the 2007 water year, when water clarity was rated as poor (U.S. Environmental Protection Agency 2007). However, elevated turbidity levels, or poor water clarity, in rivers such as the Columbia River, are a natural condition that occurs during storm events and periods of high seasonal runoff and does not necessarily mean the water quality conditions are poor.

Biological Indicators

EPA and the Lower Columbia Estuary Partnership reported the following additional parameters in 2007 (U.S. Environmental Protection Agency 2007).

- **Dissolved nitrogen and phosphorus.** 100% of the estuarine area was rated good for dissolved nitrogen, while 70% of the estuarine area was rated fair for dissolved phosphorus.
- **Chlorophyll a.** 29% of the estuarine area was rated fair for this indicator, with the remaining 71% of the area rated good.
- **Dissolved oxygen.** 99% of the estuarine area rated good for this indicator.
- **Sediment quality.** 89% of the estuary as a whole rated good, while 11% was rated poor. The sediment quality index is rated based on three component indicators: sediment toxicity, sediment contaminants, and sediment total organic carbon. The estuarine area rated poor exceeded thresholds for one or more of these indicators.

Temperature

Water temperature is an important parameter for assessing baseline water quality. The Columbia River is impounded at many locations. These impoundments contribute to elevated water temperature by ponding water and increasing exposure to solar radiation. Although EPA and the Lower Columbia Estuary Partnership did not rate the Columbia River Estuary regarding water temperature, because water temperature affects the water's capacity for dissolved oxygen, if dissolved oxygen levels are considered good, water temperatures are also fairly good.

Chemical Indicators

USGS conducted a survey of water quality in the Columbia River estuary with data from 2004 and 2005. Major findings of this study are as follows (U.S. Geological Survey 2005).

- The median copper concentration was 1.0 microgram per liter, a level shown to have inhibitory effects on juvenile coho salmon.
- Of the 173 pesticides and degradation products analyzed, 29 were detected at least once, oftentimes with two or more products occurring in a sample together. Fourteen samples with multiple products were detected (no concentrations were provided).
- Of the 54 wastewater products analyzed, eight were detected at least once, usually at trace levels. The known endocrine disruptor bisphenol A was detected.
- Of the 24 pharmaceuticals analyzed, acetaminophen, a common analgesic, and diphenhydramine, a widely used antihistamine, were detected. This is an indicator of human sources of water contamination, likely from wastewater treatment plant effluent.
- During the seasonal samplings of suspended sediment at four sites, no organochlorine compounds or PAHs were detected.

Wetlands

Wetlands can provide multiple ecological functions, including water purification, water storage/flood protection, shoreline stabilization, groundwater recharge, and regulation of streamflow. They can also provide fish and wildlife habitat, recreational opportunities, and aesthetics benefits. More detailed information on wetlands is provided in Section 4.3, *Wetlands*.

Practices that Degrade Water Quality

Human activity has degraded water quality in the Columbia River estuary. Elevated water temperatures, increased nutrient loading, reduced dissolved oxygen, and increases in toxic contaminants pose risks to fish and wildlife, as well as to people. Sources of these contaminants include agricultural practices, urban and industrial practices, and riparian practices (National Marine Fisheries Service 2011).

Agricultural Practices

Agricultural practices contribute nutrients (nitrogen and phosphorus), sediment, and organic compounds (e.g., pesticides) and trace metals to runoff (U.S. Environmental Protection Agency 2014). Increased nutrient loads have been found to result in increased phytoplankton concentrations, increased turbidity, and depressed dissolved oxygen levels, especially in areas with lower flows and warmer water temperatures (Fenn et al. 2003). Increased sediment loads into surface waters can cause potential adverse impacts on aquatic resources. Common sediment impacts include deposition and scouring that can smother or dislodge benthic organisms; effects of turbidity (suspended sediment) which can affect aquatic organisms (e.g., clogging fish gills), alter water temperatures (by absorbing and scattering sunlight), and reduce light penetration which alters primary productivity and affects plants' ability to photosynthesize; and sediment binding to chemicals that can have toxic effects on organisms.

Banned pesticides, including DDT, persist in the environment, and pesticides currently in use continue to run off into the estuary (Ewing 1999). The pesticides atrazine, simazine, metolachlor, S-ethyl dipropylcarbamothioate, dimethyl tetrachloroterephthalate, and diuron are present at sites throughout the Columbia River estuary, often in combination (U.S. Environmental Protection Agency 2009). Pesticides have the potential to harm benthic invertebrates, fish, amphibians, and various stream microbes.

Trace metals can affect aquatic organisms depending on the metal, the species, and the environment in which it is deposited. Excessive concentrations of some metals can lead to dysfunction of the endocrine system, of reproduction, and growth. Moreover, those metals that can be accumulated in tissues and organs may adversely affect cellular functions by interacting with enzymes, which can lead to disturbances of growth, reproduction, the immune system, and metabolism (Jakimska et al. 2011).

Urban and Industrial Practices

Sources that affect water quality are separated into two groups: *point sources* and *non-point sources*. Point sources are easily identified by a concentrated outlet to a receiving water, where the origin of flow is single known source (e.g., municipal wastewater treatment plant). Non-point sources contribute from a variety of locations within a given area. Eventually, non-point sources can be concentrated to a single outlet to a receiving water, but each source is not known or difficult to determine (e.g., lawn fertilizer from one or many unknown homes within a watershed). Over 100 point sources discharge directly into this stretch of the Columbia River, including chemical plants, hydroelectric facilities, pulp and paper mills, municipal wastewater treatment plants, and seafood processors (Ewing 1999).

The largest point source discharger in the Columbia Basin is Portland's wastewater treatment plant (approximately 40 miles upstream of the project area). Nutrient loads from the plant account for 2% to 3% of the annual in-stream nutrient loads at the Beaver Army Terminal water quality sampling site in Quincy, Oregon. Effluent from existing pulp and paper mills also discharges dioxins and chlorinated phenols to the river (Ewing 1999). Pulp mill effluent is generally high in organic content and contains pollutants such as adsorbable organic halides, toxic dyes, bleaching agents, salts, acids, and alkalis. Heavy metals such as cadmium, copper, zinc, and chromium are often also present (Oberrecht 2014). Effluents from these point sources are regulated under NPDES permits, and violations can incur significant fines.

Riparian Practices

Shoreline modifications, timber harvest, and agricultural activities in riparian zones, and residential, commercial, and industrial development along the Columbia River have resulted in a significant loss of riparian habitat function in the area (Ewing 1999). Healthy riparian habitat conditions (i.e., connected, forested riparian zones) could help to regulate water temperatures, depending on the size of the stream and the extent of shading, and contribute to aquatic habitat conditions and complexity (i.e., woody debris, bank stability, allochthonous inputs). In the study area, riparian habitat conditions and the functions provided by riparian habitat are generally degraded (Ewing 1999).

4.5.5 Impacts

This section describes the potential direct and indirect impacts related to water quality that would result from construction and operation of the Proposed Action and the No-Action Alternative.[1] The Applicant has identified the following design features and best management practices to be implemented as part of the Proposed Action, and were considered when evaluating potential impacts of the Proposed Action.

- **BMP C200: Interceptor Dike and Swale**. A ridge of compacted soil, or a ridge with an upslope swale, would be provided at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. The dike and/or swale would be used to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This would be used to prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.
- The pads and berms would be made of low permeability engineered material. The use of low permeability engineered materials for formation of the pads and berms would control water from entering subsurface soil or groundwater.
- The stockyard and berms would be graded to allow the water to drain and be collected for treatment and reuse.

[1] Acreages presented in the impacts analysis were calculated using geographic information system (GIS), thus, specific acreage of impacts are an estimate of area based on the best available information.

- Drainage systems would be designed such that runoff within the project area would be collected for treatment before reuse or discharge. Best management practices that would be part of the coal export terminal's design to maximize the availability of water for reuse include the following.
  - Enclosed conveyor galleries
  - Enclosed rotary unloader building and transfer towers
  - Washdown collection sumps for settlement of sediment
  - Regular cleanout and maintenance of washdown collection sumps
  - Containment around refueling, fuel storage, chemicals and hazardous materials
  - Oil/water separators on drainage systems and vehicle washdown pad
  - Requirement that all employees and contractors receive training, appropriate to their work activities, in the site best management practices
  - Design of docks to contain spillage, with rainfall runoff and washdown water contained and pumped to the upland water treatment facilities
  - Design of system to collect and treat all runoff and washdown water for either reuse for onsite (dust suppression, washdown water or fire system's needs) or discharged off site
- The wharf area would be sealed to capture the washdown water and stormwater runoff, preventing it from flowing to the River without treatment.
- Pile will be removed slowly so as to minimize sediment disturbance and turbidity in the water column.
- Prior to pile extraction, the operator will "wake up" pile to break the friction between the pile and substrate to minimize sediment disturbance.
- Stormwater, sediment and erosion control best management practices would be installed in accordance with the Stormwater Management Manual for Western Washington and Cowlitz County. Water quality management would be performed in accordance with the requirements of the NPDES Industrial Stormwater General Permit. The site's SWPPP will provide details of the site best management practices.
  - Drainage systems would be designed such that runoff within the construction site would be collected and treated as necessary before reuse or discharge.
  - The treatment facility could treat surface runoff and process/construction waters with capacity to store the water for reuse.
- **BMP C153: Material Delivery, Storage and Containment.** Material delivery, storage and containment best management practices would be used to prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage:
  - Storage of hazardous materials on site would be minimized to the extent feasible.
  - Materials would be stored in a designated area, and secondary containment would be installed where needed.
- Refueling would occur in designated areas with appropriate spill control measures.

- Typical construction best management practices for working over, in, and near water would be applied, including checking equipment for leaks and other problems that could result in discharge of petroleum-based products, hydraulic fluid, or other material to the Columbia River.
- **BMP C154: Concrete Washout Area.** Concrete waste and washout waters would be either carried out off site or disposed of in a designated facility on site designed to contain the waste and washout water.
- Based on site grading and drainage areas, five water quality ponds (Wetponds) would treat runoff based on Ecology's requirements. In general, the ponds would be sized for treatment of the volume and flow from the water quality design storm event (72% of the 2-year storm). Additional storage would be provided within the coal storage area so that the runoff is always treated within the stockyard area, even for larger storm events. The ponds would be designed to provide settlement as the water passes through. Subsequently, water released from these ponds would be conveyed downstream to the existing pump station outfall 002A that discharges into the Columbia River via an existing 30-inch steel pressure line. The ponds that would treat runoff from the coal stockyard would harvest water for circulation around the site for multiple uses, including dust control measures. Ecology's criteria would be used as the basis of design, which uses the Western Washington Hydrology Model (WWHM) computer simulation for facility sizing. Because of the flat nature of the site, some surface ponding would occur in both the yard areas and open conveyance systems. The piped conveyance systems would be sloped at 0.50% minimum.
- The surface drainage system and features shall be designed and constructed in accordance with the *Stormwater Management Manual for Western Washington.*
- Based on site grading and drainage areas, water quality ponds (Wetponds) would treat runoff based on Ecology's requirements.
- Ecology's criteria would be used as the basis of design, which uses the WWHM computer simulation for facility sizing.
- The water treatment facility would be designed to treat all surface runoff and process water with capacity to store the water for reuse. Treatment would be as required to meet reuse quality or Ecology's requirements for offsite discharge.
- Additional water storage would be provided within the coal storage area in the event of a larger storm event. Water volumes exceeding the demands for reuse would be discharged off site via the existing outfall 002A into the Columbia River. Water released off site would be treated and would meet the requirements of Ecology and required discharge permits.
- The water system shall be designed and constructed in accordance with or consideration of the latest edition of the following standards, where applicable:
  - International Building Code (IBC)
  - National Fire Protection Association (NFPA)
  - Washington State Department of Ecology Stormwater Design Manual
  - United States Department of Health – Occupational Safety and Health Standards
  - Washington State Department of Health

    - In the event of conflict between codes and technical specification, the requirements will be reviewed and a decision made on the action to be implemented with agency of jurisdiction

- Where possible, extraction equipment would be kept out of the water to avoid "pinching" pile below the water line to minimize creosote release during extraction.
- During pile removal and pile driving, a containment boom shall be placed around the perimeter of the work area to capture wood debris and other materials released into the waters as a result of construction activities. All accumulated debris shall be collected and disposed of upland at an approved disposal site. Absorbent pads shall be deployed should any sheen be observed.
- The work surface on barge deck or pier shall include a containment basin for pile and any sediment removed during pulling. Any sediment collected in the containment basin would be disposed of at an appropriate upland facility, as would all components of the basin (e.g., straw bales, geotextile fabric) and all pile removed.
- Upon removal from substrate the pile shall be moved expeditiously from the water into the containment basin. The pile shall not be shaken, hosed-off, stripped or scraped off, left hanging to drip or any other action intended to clean or remove adhering material from the pile.
- Project construction would limit the impact of turbidity to a defined mixing zone and would otherwise comply with WAC 173-201A.
- All dredged material would be contained within a barge prior to flow lane disposal; dredged material would not be stockpiled on the riverbed.
- The contractor shall remove any floating oil, sheen, or debris within the work area as necessary to prevent loss of materials from the site. The Contractor shall be responsible for retrieval of any floating oil, sheen, or debris from the work area and any damages resulting from the loss.
- Project construction would limit the impact of turbidity to a defined mixing zone and would otherwise comply with WAC 173-201A.
- Flow lane disposal would occur using a bottom-dump barge or hopper dredge. These systems release material below the surface, minimizing surface turbidity.
- For work adjacent to water, proper erosion control measures shall be installed prior to any clearing, grading, demolition, or construction activities to prevent the uncontrolled discharge of turbid water or sediments into waters of the state. Erosion-control structures or devices shall be regularly maintained and inspected to ensure their proper functioning throughout this project.
- Project construction would be completed in compliance with Washington State Water Quality Standards WAC 173-201A, including but not limited to prohibitions on discharge of oil, fuel, or chemicals into state waters, property maintenance of equipment to prevent spills, and appropriate spill response including corrective actions and reporting as outlined in permits and authorizations (Corps, HPA, 401 Water Quality Certification)
- The contractor would have a spill containment kit, including oil-absorbent materials, on site to be used in the event of a spill or if any oil product is observed in the water.
- All fuel and chemicals shall be kept, stored, handled, and used in a fashion, which assure no opportunity for entry of such fuel and chemicals into the water.

- The contractor shall use tarps or other containment methods when cutting, drilling, or performing over-water construction that might generate a discharge to prevent debris, sawdust, concrete and asphalt rubble, and other materials from entering the water.
- The water treatment facility would be designed to treat all surface runoff and process water with capacity to store the water for reuse. Treatment would be as required to meet reuse quality or Ecology requirements for offsite discharge.
- Up to five ponds would treat the runoff. In general, the ponds would be sized for the treatment of the volume and flow from the water quality design storm event (72% of the 2-year storm). The ponds would be designed to be long and narrow to provide sufficient settlement time to clarify the water as it passes through the pond. The ponds that treat runoff from the coal stockyard would harvest water via pump systems to supplement the water supply for dust control measures.
- Additional water storage would be provided within the materials storage area in the event of a larger storm event. Water volumes exceeding the demands for reuse would be discharged offsite treatment via the existing outfall 002A into the Columbia River. Water released offsite would be treated and would meet the requirements of Ecology and required discharge permits. Additional water storage would be provided within the materials storage area in the event of a larger storm event.
- No land-based construction equipment would enter any shoreline body of water except as authorized.
- Equipment would have properly functioning mufflers, engine-intake silencers, and engine closures according to federal standards; the contractor would inspect fuel hoses, oil or fuel transfer valves, and fittings on a regular basis for drips or leaks to prevent spills into the surface water.

4.5.5.1 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 activities that could affect water quality include the following.

- Ground disturbance associated with construction
- Delivering, handling, and storing construction materials and waste
- Using heavy construction equipment
- In- and above-water work and dredging activities and disposal
- Demolishing existing structures
- Preloading ground for coal stockpiles

Operational activities that could affect water quality include the following.

- Coal spills from rail and vessel loading and unloading
- Transport of airborne fugitive coal dust from stockpiles or rail cars
- Operating and maintaining heavy equipment and machinery

- Maintenance dredging and disposal
- Operations of 16 trains a day
- Operations of 70 ships a month

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).

Construction projects in Washington State that include clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state are required to obtain an NPDES Construction Stormwater General Permit from Ecology. Prior to the issuance of permits, sites with known contaminated soils or groundwater are required to provide a list of contaminants with concentrations, depths found and boring locations shown on a map with an overlay of where excavation or construction may occur. Additional alternative best management practices may be necessary based on the contaminants and how contaminated construction stormwater would be treated. The permit requires preparing a Temporary Erosion and Sediment Control (TESC) plan, a construction stormwater pollution prevention plan (SWPPP) and best management practices to avoid and minimize the risk of erosion. Guidance for the design and implementation of these best management practices would be sourced from the Ecology *2012 Stormwater Management Manual for Western Washington* (Washington State Department of Ecology 2014) including but not limited to those developed by the Applicant (Section 4.5.7, *Potential Mitigation Measures*). The selected best management practices would represent the best available technology that is economically achievable and the best conventional pollutant-control technology to reduce pollutants. Best management practices would include a wide variety of measures to reduce pollutants in stormwater and other nonpoint source runoff. Construction practices would include measures to avoid and minimize erosion of soils associated with land disturbance and subsequent discharge of sediment-laden stormwater to adjacent surface waters. An initial list of best management practices to be implemented during construction is included in the *SEPA Water Quality Technical Report* (ICF International 2016a). These requirements were considered when evaluating the potential direct impacts associated with construction.

Temporary Discharges to Increase Surface Water Turbidity Because of Upland Soil Disturbance

Construction of the Proposed Action would include ground-disturbing activities on 201.95 acres that would expose soils and generate soil stockpiles. Rain falling and accumulating on areas of disturbed or exposed soils could erode soils and transfer sediments via runoff into adjacent waterways, such as the Columbia River and CDID #1 ditches. The potential for erosion during most ground-disturbing activities is considered low because the project area is relatively level, and appropriate erosion and sediment control measures would be required through the NPDES Construction Stormwater General Permit to reduce the potential for the Proposed Action to degrade water quality.

The CDID #1 ditches collect water from roads, parking lots, yards, and other land uses that contribute to elevated turbidity levels and pollutants that are discharged to the Columbia River. Both Ecology and Oregon DEQ have standards for turbidity increases as a result of construction. These include the Water Quality Standards for Surface Waters of the State of Washington; Water Quality Standards: Beneficial Uses, Policies, and Criteria for Oregon; and Oregon State Legislature: Turbidity Rule. Runoff from the project area would be required to meet the terms and conditions of all permits issued for the Proposed Action; thus, during construction, the Proposed Action would be expected to maintain water quality conditions in the receiving waters, but could even provide some improvement to the quality of water discharged from the site to the CDID #1 ditches.

Overall, the construction activities associated with the Proposed Action would not be expected to cause a measurable effect on water clarity, water quality, or biological indicators or affect designated beneficial uses.

Temporarily Release Contaminants Associated with Equipment and Material Use

Construction activities have the potential to introduce pollutants through handling of construction materials and operation of construction equipment. Potential chemicals such as fuel, oil, hydraulic fluid, grease, paints, solvents, and cleaning agents could degrade water quality if improperly handled. Construction waste such as metal, welding waste, and uncured concrete could be a potential source of pollution to water resources. Waste metals, welding wastes, and uncured concrete can degrade water quality and be harmful to aquatic organisms (Washington State Department of Ecology 2014).

Development and implementation of site-specific construction SWPPP that includes best management practices for material handling and construction waste management would reduce the potential for water quality impacts from these sources. The following are examples of best management practices in the SWPPP that would prevent or minimize releases to surface waters.

- All fuel and chemicals would be stored and handled properly to ensure no opportunity for entry into the water.
- No land-based construction equipment would enter any shoreline body of water except as authorized.
- Equipment would have properly functioning mufflers, engine-intake silencers, and engine closures according to federal standards; the contractor would inspect fuel hoses, oil or fuel transfer valves, and fittings on a regular basis for drips or leaks to prevent spills into the surface water.
- The contractor would have a spill containment kit on site, including oil-absorbent materials, to be used in the event of a spill or if any oil product is observed in the water.

If a spill were to occur, the amount would be relatively small (typically less than 50 gallons), and response time would be relatively quick on site. A fuel truck would visit the site as required. The frequency would vary based on usage and could range from once or twice per day to once or twice per week. The trucks would have a 3,000 to 4,000 gallon capacity. A spill could have potential impacts on water quality.

Construction site preparation activities would involve preloading and installing of vertical wick drains to aid in the consolidation of low consistency silt and low-density sand (i.e., unconsolidated materials). Wick drains would direct groundwater from the shallow aquifer upward toward the surface during preloading, where it would discharge. Water discharged from the wick drains would be captured, tested for contaminants, and treated prior to discharge to any surface waters. Water discharged from the wick drains is not anticipated to be contaminated, thus no impact on water quality is anticipated.

Temporarily Mobilize Pollutants or Increase Turbidity from In-Water Work and Dredging

The Proposed Action would require dredging an estimated 500,000 cubic yards of material to provide site access from the Columbia River navigation channel and berthing at Docks 2 and 3. The work necessary to construct the approach trestle and entire dock structures for Docks 2 and 3 would require in-water work that could resuspend pollutants and increase turbidity. Dredging would permanently deepen a 48-acre area, all of which is in deep water (at least -20 feet Columbia River datum [CRD]), to a target depth of -43 feet CRD with a 2-foot overdredge allowance. The deepening would require dredging from as little as a few feet to approximately 16 feet. The dredging permit would require testing of the sediment and suitability determination.

Dredging and in-water work would result in temporary increases in turbidity. Sediment sampling from within, adjacent to, and upstream of the project area has demonstrated that in deepwater areas of the Columbia River, sediments are typically composed of silty sands with a low proportion of fines (e.g., silt or mud) and very low total organic carbon. Further, sediments sampled from deepwater areas in the project vicinity have consistently met suitability requirements for flow lane disposal or beneficial use in the Columbia River (Grette 2014c). Thus, it is anticipated that sediment within the dredge prism for Docks 2 and 3 would be deemed suitable for flow lane disposal or beneficial use in the Columbia River. However, prior to obtaining permits for the Proposed Action, including dredging, the Applicant would conduct site-specific sediment sampling to characterize the proposed dredge prism and ensure compliance with the dredged materials management plan (Grette 2014c). The disposal area for dredged materials is anticipated to be approximately 80 to 110 acres. The actual acreage and specific location of the disposal site would be determined by the permitting agencies and would be based on sediment characteristics (i.e., consistency and density of sediments). Recent authorizations for flow lane disposal of dredged materials in the Columbia River in the vicinity of the project area were generally in or adjacent to the navigation channel between approximately river miles 60 and 66 (Grette 2014b).

Standard best management practices for working in aquatic areas would be followed to maintain acceptable construction water-quality conditions, including but not limited to maintaining appropriate standards for construction-related turbidity (including during active dredging and flow lane disposal), minimizing the risks of unintended discharges of materials such as fuel or hydraulic fluid, and managing construction debris. In addition, typical construction best management practices for working over, in, and near water would be applied, including checking equipment for leaks and other problems that could result in discharge of petroleum-based products, hydraulic fluid, or other material to the Columbia River.

The following best management practices relate to in-water work during the construction period.

- The contractor will use tarps or other containment methods when cutting, drilling, or performing over-water construction that might generate a discharge to prevent debris, sawdust, concrete and asphalt rubble, and other materials from entering the water.
- The contractor will retrieve any floating debris generated during construction using a skiff and a net. Debris would be disposed of at an appropriate upland facility. If necessary, a floating boom would be installed to collect any floated debris generated during in-water operations.

Construction of the approach trestle and entire dock structure for Docks 2 and 3 would require both in-water and over-water work. Work windows would be scheduled to avoid and minimize impacts on various natural resources, most notably federally protected fish species (Section 4.7, *Fish*). In-water construction would primarily involve dredging, pile driving, and removal of pile dikes and would use barge-based equipment and purpose-built vessels, although some work would likely be supported from land. A total of 610 of the 630 36-inch diameter steel piles required for the trestle and docks would be placed below the ordinary high water mark, permanently removing an area equivalent to 0.10 acre (4,312 square feet) of river bottom. The construction would also remove 225 feet of the deepest portion of timber pile dikes (Grette Associates 2014a).

Some materials disturbed during dredging activities would be expected to move down current and monitoring requirements would be identified in the dredge permit. The period of increased turbidity at the project area is anticipated to be relatively brief, as the bed material is primarily silty sands with low proportions of fines and organic material, thus reducing the potential to increase turbidity as compared to silty mud or sediments with high concentrations of organic material.

The following best management practices would avoid and minimize potential impacts from pile removal and installation activities.

- The contractor will remove piles slowly to minimize sediment disturbance and turbidity in the water column.
- Prior to pile extraction the contractor would "wake up[2]" the pile to break the friction between the pile and substrate to minimize sediment disturbance.

Release of creosote could occur from the removal of existing creosote-treated timber piles associated with two pile dikes. Creosote is composed of more than 300 chemicals, including PAHs, which have been shown to be fatal to marine life (Washington State Department of Natural Resources 2008). Creosote contamination could be exacerbated by removal of piles that have been buried in a zone generally depleted of oxygen and water, which leaves the creosote highly volatile when re-exposed to water. Droplets of previously unexposed creosote would be released from the piling into the surrounding sediments.

The removal of creosote-treated piling would result in temporary suspension of sediments and a potential long-term increase in the exposure of creosote in the project area. To minimize this impact, the contractor will follow the following standard best management practices for removal of creosote-treated wooden piles.

[2] "Waking up" the pile consists of vibration of the pile to break the skin friction bond between the pile and soil. This allows the pile to be extracted without pulling out a large block of soil.

- **Pile removal.** If possible, the contractor will use vibratory extraction, the preferred method of pile removal. A major creosote release to the environment could occur if equipment (bucket, steel cable, vibratory hammer) pinches the creosoted piling below the water line. Therefore, the contractor would keep the extraction equipment out of the water to the extent practicable to remove the piling. Cutting would be necessary if the pile were to break off at or near the riverbed, which means it could not be removed without excavation. Pile cutoff would be an acceptable alternative if vibratory extraction or pulling were not feasible. The piling would be cut 2 feet below the riverbed, and the subsequent hole would be capped/filled with clean sand.
- **Disposal of creosote treated piling, sediment, and construction residue.** The contractor would place the pulled pile in a containment basin to capture any adhering sediment immediately after the pile is removed. Cut-up piling, sediments, construction residue, and plastic sheeting from the containment basin would be packed into a container and disposed of at a facility in compliance with federal and state regulations.

Above-water work would include finishing the dock structures and installing the materials, and handling infrastructure and equipment. Some concrete components (such as the dock decking, crane rail supports, and pile caps) would need to be cast in place. Appropriate techniques and best management practices, such as the use of a bib, would avoid and minimize the potential for wet or uncured concrete to come in contact with the Columbia River.

Materials handling infrastructure and equipment, such as shiploaders and conveyors, would be delivered by barge and offloaded by crane directly to the docks and trestle. Barges would not offload materials or equipment on the beach. As much as practicable, infrastructure would be prefabricated so that above-water work would consist largely of installation and assembly.

Impacts on water quality from in-water and over-water work would be addressed in the Water Quality Monitoring and Protection Plan to be prepared by the Applicant. Impacts on water quality from dredging would be minimized with the preparation and implementation of a dredging plan in compliance with the dredged material management program (DMMP) as required by state agencies (Ecology and Washington State Department of Natural Resources) and federal agencies (the U.S. Army Corps of Engineers [Corps] and EPA). Adhering to a plan developed in compliance with DMMP would avoid and minimize water-quality impacts, ensuring that potential impacts are temporary and localized in nature. No long-term changes in the baseline conditions in the study area would be expected to persist.

Temporarily Introduce Hazardous or Toxic Materials from Demolition Activities

Demolition of the existing structures in the project area has the potential to affect water quality by disturbing soil or debris that could contain hazardous or toxic materials such as asbestos, lead, and concrete dust, which could cause harm to aquatic environments and organisms.

This impact would be minimized by the collection and removal of all concrete and other structural debris and the collection and treatment of all stormwater from the site prior to discharge to surface waters. The implementation of best management practices in compliance with the NPDES Construction Stormwater General Permit that would be obtained for the Proposed Action would reduce the potential for demolition-related pollutants to enter and contaminate surface waters. Overall, the demolition activities associated with the Proposed

Action would not be expected to cause a measurable effect on water quality or biological indicators, or affect designated beneficial uses.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on water quality because construction impacts are immediate, and no construction impacts would occur later in time or farther removed in distance than the direct impacts.

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*.

Introduce Contaminants from Coal Spills and Coal Dust

Proposed Action-related trains would hold approximately 122 tons of coal per car and there would be 125 cars per train; there would be 16 trains a day under the Proposed Action. An average of 70 ships a month would move coal for the Proposed Action. The Panamax class vessels, with an average capacity of 65,000 deadweight tonnage would be used to transfer the coal to its final destination (Maritime Connector 2015).

Coal and coal dust could enter the Columbia River directly or via the surrounding drainage channels from spills during loading or unloading or through airborne transport of fugitive dust from stockpiles. The extent of average annual coal dust deposition was modeled and mapped (Chapter 5, Section 5.7, *Coal Dust*, Figure 5.7-3). Coal dust is anticipated to deposit a maximum of 1.88 grams per square meter per year (g/m^2/year) adjacent to the project area. This area extends past the project area into the Columbia River. The spatial extent of the maximum annual coal dust deposition near the project area is shown in Figure 5.7-3 in Chapter 5, Section 5.7, *Coal Dust*.

At sufficient quantities, coal and coal dust in marine and estuarine environments have similar adverse effects as elevated levels of suspended sediments on water quality (Ahrens and Morrisey 2005). During periods of lower flow, a smaller amount of coal dust could have a greater impact on water quality. Impacts include increased turbidity, which can interfere with photosynthesis and increase water temperatures (Ahrens and Morrisey 2005). Coal and coal dust in the water column can also affect marine organisms through abrasion of tissue and smothering and clogging of respiratory and feeding organs (Ahrens and Morrisey 2005). However, at a maximum deposition rate of 1.88 g/m^2/year adjacent to the project area, and at the minimum flow[3] recorded over the 23-year period of record for 1 day, fugitive coal dust deposition directly into the river assumed to be an area of approximately 3 million square meters would result in a change in suspended sediment concentration of less than 1 part per 10 billion (0.000075 milligrams per liter [mg/L]). This change would not be measureable and is not anticipated to change turbidity, increase water temperature, or affect marine organism functions (respiration, feeding).

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[3] The minimum recorded flow at the Columbia at Beavery Army Terminal, Quincy, Oregon, is 65,600 cubic feet per second (1969 to 2014).

Coal and coal dust captured in stormwater (precipitation that falls on the stockpile areas and water used for dust suppression) would be collected within the stockpile pads (which are impervious), conveyed within an enclosed stormwater system, and treated at Facility 73 in settling ponds before being discharged from the site. If coal dust from the project area accumulated without being disturbed throughout the dry season (assumed to be 120 days), the anticipated change in suspended sediment concentration for the minimum recorded flow over 1 day would be 0.0000192 grams per liter (g/L). Again, this change would not be measureable and is not anticipated to change turbidity, increase water temperature, or affect marine organism functions (respiration, feeding). Approximately 4,900 linear feet of the 16,100 linear feet of conveyor belts would be enclosed as would the shiploaders to limit the potential for coal or coal dust to affect water quality. The coal export terminal would employ dust suppression systems throughout the terminal, including the tandem rotary dumpers, all conveyors, stockpile pads, surge binds, transfer towers, and trestle. The dust suppression system would employ sprayers, sprinklers and foggers that disperse water and capture coal dust. Dust suppression water would be collected and conveyed through the stormwater collection, conveyance and treatment system. Once treated, the water would either be reused or, if it is not needed (i.e., sufficient water is stored in the on-site water storage pond), would be discharged to the Columbia River. All water discharged to the Columbia River would be required to meet specific water quality standards prior to discharge. The specific standards would be defined in the NPDES permit for the Proposed Action.

Coal has a heterogeneous chemical composition; therefore, specific impacts related to the toxic contaminants of coal are highly dependent on coal composition and source (Ahrens and Morrisey 2005). The majority of coal transported to and from the project area would be from the Powder River Basin, with lesser amounts of coal being sourced from the Uinta Basin in Utah and Colorado. Trace elements of environmental concern (TEEC) in Powder River and Uinta Basin coal include antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, selenium, and uranium. Table 4.5-4 presents the average concentrations of each TEEC sampled in parts per million. However, at a maximum coal deposition rate of 1.88 g/m^2/year adjacent to the project area, a coal density of 0.83 grams per cubic meter (g/cm^3); and at the minimum flow recorded over the 23-year period of record for 1 day, TEEC deposition directly into the Columbia River assumed to be an area of approximately 3 million square meters would result in unmeasurable changes in concentration for each of the elements of concern on the order of 0.0000000000001 to is 0.000000000000001 g/L, or 0.0000001 to 0.000000001 ppb. If coal dust from the project area accumulated without being disturbed throughout the dry season (assumed to be 120 days long), the anticipated change in TEEC concentration for the minimum recorded flow over one day would be on the order of 0.0000000001 to 0.000000000001 g/L, or 0.0001 to 0.000001 ppb. Again, this change would not be measureable and is not anticipated to affect human health or affect marine organism functions (respiration, feeding).

Table 4.5-4. Average Concentration of Trace Elements in Wyodak and Big George Coalbeds, Powder River Basin, Wyoming and Miscellaneous Uinta Basin Coalbeds in Colorado Plateau

Trace Element of Environmental Concern	Average Concentration in Sampled Coal (ppm)	
	Powder River Basin[a,b]	Uinta Basin[b]
Antimony	0.10	0.7
Arsenic	1.43	2.2
Beryllium	0.18	1.5
Cadmium	0.06	0.1
Chromium	2.63	6.1
Cobalt	1.93	2.0
Lead	1.26	13.9
Manganese	10.05	28.2
Nickel	1.58	4.5
Selenium	0.57	1.4
Uranium	0.46	1.8

Notes:
[a] U.S. Geological Survey 2007
[b] Pierce and Dennen 2009

Toxic constituents of coal include PAHs and trace metals, which are present in coal in variable amounts and combinations dependent on the type of coal. The coal type, along with mineral impurities in the coal and environmental conditions determine whether these compounds can be leached from the coal. Some PAHs are known to be toxic to aquatic animals and humans. Metals and PAHs could also potentially leach from coal to the pore water of sediments. One review of coal dust's chemical composition (U.S. Geological Survey 2007) suggests that the risk of exposure to concentrations of toxic materials (e.g., polycyclic aromatic hydrocarbons and trace metals) from coal are low because the concentrations are low and the chemicals bound to coal are not easily leached. Furthermore, the type of coal anticipated to be exported from the coal export terminal is alkaline, low in sulfur and trace metals and the conditions to produce concentrations in pore waters are not present in a dynamic riverine environment. This would further support the view of Ahrens and Morrisey (2005) that the bioavailability of such toxins would likely be low.

In summary, fugitive coal dust from operations of the Proposed Action is not expected to increase suspended solids in the Columbia River to the point that there would be a demonstrable effect on water quality. Additionally, the potential risk for exposure to toxic chemicals contained in coal (e.g., PAHs and trace metals) would be relatively low as these chemicals tend to be bound in the matrix structure and not quickly or easily leached.

Coal spilling into the water could occur in Washington State. Cleanup efforts would be implemented quickly and it would be expected that the majority of the spilled coal would be recovered. Coal dust particles would likely be transported downstream by river flow and either carried out to sea or distributed over a sufficiently broad area that a measurable increase in concentrations of toxic chemicals in the Columbia River would be unlikely. The deposition of coal dust could be as high as 1.88 grams per square meter adjacent to the project area. However, toxic chemicals in coal dust tend to be bound to the matrix structure of the coal and not quickly or easily leached and would not, therefore, be expected to result in a significant increase in chemical indicators in the Columbia River. They would also not be expected to cause a measurable impact on water quality or biological indicators, or affect designated beneficial uses.

The concentration of PAHs in Powder River Basin coal was not investigated. An evaluation of a potential coal spill, as well as potential impacts associated with coal dust are described in the *SEPA Coal Technical Report* (ICF International 2016b). Because the rate of coal dust deposition is so low, it is likely unmeasurable and the concentration of TEEC is assumed to be low. Therefore, impacts of dispersed coal, coal dust, and coal dust constituents on water quality are anticipated to be low.

Rail cars carrying coal would have to be treated with topping agents or surfactants to the surface of loaded coal to control dust. These agents generally comprise glue (polyvinyl acetate), alkyl alcohol, guar gum, or vegetable oils mixed with water. These chemicals could enter the Columbia River directly from spills during loading or unloading; however, they have been found to be nontoxic and would not introduce pollutants of concern (Agency for Toxic Substances and Disease Registry 1992).

Introduce Contaminants from Maintenance and Operations

Potential contaminants, including diesel fuel, oils, grease, and other fluids are required for the operation and maintenance of heavy equipment and machinery used to transport, store, move, and load coal for operations of the Proposed Action. Normal operations and maintenance activities in the project area would not result in a direct discharge of pollutants or industrial process water into surface water bodies. Most operation-related impacts would result from spills of potentially hazardous materials, such as petroleum products or industrial solvents, either directly into surface waters or in locations where they could be transported and discharged to surface water or groundwater. These potential releases would be relatively small (less than 50 gallons) and limited in their extent and duration. Additionally, locomotives have a fuel capacity of 5,000 gallons and could also potentially release fuel during operations. A fuel truck would visit the site as required during operations. The frequency would vary based on usage and could range from once or twice per day to once or twice per week. The trucks would have a 3,000-to-4,000-gallon capacity. A spill could have potential impacts on water quality. A spill that occurred in the project area would be contained, conveyed and treated within the proposed stormwater system (i.e., material spilled within the project area would be contained and would not discharged to surface waters outside the project area). The Applicant would be required to manage contaminated stormwater in accordance with the requirements of the NPDES Industrial Stormwater Permit and avoid and minimize impacts on water quality.

Maintenance dredging for Docks 2 and 3 would be expected to occur on a multiyear basis, or as needed following extreme-flow and sediment-deposition events, with areas and volumes considerably smaller than the initial dredge action. Impacts would be similar to those discussed for construction, but to a lesser magnitude. Preparation and implementation of a dredging plan, discussed above for construction dredging, would also be employed for maintenance dredging.

Sediment accretion in the proposed dredge prism would most likely occur as a result of bedload transport due to river currents, and local scour and sediment redistribution resulting from propeller wash. Hydrodynamic modeling and sediment transport analysis was conducted for the proposed Docks 2 and 3 berthing/navigation basin. Specific data are unavailable for the proposed new dredging basin; therefore, the rate of accretion (i.e., gradual deposition and build-up of sediment) can only be estimated roughly. Based on current accretion estimates, rough estimates for annual accretion height is approximately 0.16 feet (0.07- to 0.26-foot range) and annual accretion volume is approximately 11,675 y^3 (4,670 to 23,350 y^3 range). Small scale maintenance dredging could be needed more frequently, especially in the early years following the initial dredging work when higher than normal accretion is more likely (WorleyParsons 2012). Similarly to construction-related dredging, long-term changes in study area baseline conditions likely would not persist as a result of maintenance dredging.

Introduce Contaminants from Stormwater Runoff

Stormwater would be managed in accordance with the requirements of a new NPDES Industrial Stormwater Permit that would be obtained exclusively for water management facilities of the coal export terminal. Contaminants such as oil and grease, coal dust, and other chemicals could accumulate on surfaces and would become constituents of site stormwater. All stormwater runoff would be collected for treatment before reuse or discharge to the Columbia River. Coal particulates would be removed from stormwater and placed back in the coal stockpile area. Other solids accumulated in the treatment systems not acceptable for reuse would be periodically collected and disposed of at an appropriate off-site disposal site.

As shown in Table 4.5-5, the Columbia River is listed as impaired for a number of pollutants. Some of these pollutants may be introduced from stormwater runoff from the project area. Arsenic, fecal coliform (indicator bacteria) and dioxin were detected during monitoring of existing outfalls that would drain the project area (Anchor QEA 2014). These pollutants would likely continue to be introduced as a result of the Proposed Action, although maximum reported outfall concentrations for these pollutants fall below established water-quality standards. Continued discharges at existing levels would not cause a measureable increase in chemical indicators in the Columbia River and would not cause a measurable impact on water quality or biological indicators or affect designated beneficial uses.

Table 4.5-5. Proposed 303(d) Listed Impairments for the Columbia River near River Mile 64

Parameter	Washington	Oregon
Arsenic	-	5
Bacteria	5[a]	-
DDE 4,4	-	5
Dieldrin	5 [a]	-
Dioxin (2,3,7,8-TCDD)	-	4A [b]
Dioxin	4A[b]	-
Fecal coliform	-	5
PCB	-	5
Temperature	-	5
Total dissolved gas	-	4A

Notes:
[a] Category 5 impaired water list means water quality standards have been violated for one or more pollutants and a TMDL or other water quality improvement is required.
[b] Category 4A listing indicates that a TMDL has been developed and is actively being implemented.
Sources: Washington State Department of Ecology 2012, Oregon Department of Water Quality 2012
DDE = Dichlorodiphenyldichloroethylene; TCDD = Tetrachlorodibenzo-p-dioxin; PCB = polychlorinated biphenyl; TMDL = total maximum daily load

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*.

Introduce Contaminants from Coal Spills and Coal Dust

Operations Indirect Impacts related to introduced contaminants from coal spills and coal dust would be the same as those described previously for Operations Direct Impacts.

Introduce Contaminants from Maintenance and Operations

Operations Indirect Impacts related to introduced contaminants from maintenance and operations would be the same as those described previously for Operations Direct Impacts.

Introduce Contaminants from Shipping Vessels or Rail Transport

Coal would be transported to the coal export terminal via rail, then loaded onto vessels and transported to its final destination in Asia. Water quality could be indirectly affected as a result of transportation to and from the project area. Details regarding vessel operations are available in Chapter 5, Section 5.4, *Vessel Transportation*. Details regarding a release of hazardous materials during rail operations and collision or derailment are discussed in Chapter 3, Section 3.6, *Hazardous Materials*.).

- **Propeller wash.** Propeller wash could increase the potential for scour and erosion of the dredged slopes and bottom of the navigation channel, and result in a temporary, localized increase in turbidity. The Proposed Action could result in increased propeller wash, and in impacts on erosion and turbidity, particularly from pilot vessels maneuvering near Docks 2 and 3. Tankers and cargo vessels would be more likely to create turbulence that could erode bottom sediments because the large propellers on these ships are closer to the river bottom as they travel through the Columbia River. The propeller wash from tugboats would be nearer the surface and would, thus, have less potential to result in scour or erosion of bottom sediments. The likelihood of temporary, localized increases in turbidity resulting from propeller wash is considered low based on the amount of dredging anticipated to be required to accommodate vessels at Docks 2 and 3. The dredge prism would tie into the navigation channel, thus reducing the potential for propeller wash during vessel movements at Docks 2 and 3. Vessels calling at Docks 2 and 3 would have sufficient depth to minimize the potential for prop-wash. However, any increase in turbidity would be temporary and localized and would not be expected to be measurable beyond the study area.
- **Ballast water.** Ballast water discharges could contain materials that could degrade surface waters. Primary among these contaminants are invasive marine plants and animals, bacteria, and pathogens that could result in harm or displace native aquatic species. However, the likelihood of such occurrences is considered low since state and federal regulations limit discharge of ballast and regulate water quality of ballast water, and it is required that vessels would comply with such regulations. Oversight of federal ballast water regulations is provided by the U.S. Coast Guard and EPA and Washington State regulations by WDFW. Discharge of ballast water into waters of the state is not allowed unless there has been an open sea exchange (replacing coastal water with open-ocean water to reduce the

density of coastal organisms), or if the vessel has treated its ballast water to meet state and federal standards set by the U.S. Coast Guard, the Clean Water Act (33 USC 1251–1387).

- **Spills from vessel.** Coal and fuel spills could occur if the cargo tanks on a vessel are ruptured during such events as a grounding or collision; however, the potential for a vessel rupture incident is low. Chapter 5, Section 5.4, *Vessel Transportation*, evaluates the risk of vessel-related incidents. Chapter 3, Section 3.6, *Hazardous Materials*, also discusses actions to be taken for emergency response and cleanup. A spill from a vessel could have significant potential impacts on water quality based on the location, quantity spilled, and response actions taken.
- **Day-to-day rail operations.** Day-to-day rail operations could release contaminants to stormwater, including coal dust, metals, hydraulic and brake fluid, oil, and grease from track lubrication. As discussed in Chapter 3, Section 3.6, *Hazardous Materials*, if a release of hazardous materials were to occur, the rail operator would implement emergency response and cleanup actions per the Federal Railroad Administration requirements and state law, including Washington State regulations under Revised Code of Washington (RCW) 90.56. Chapter 3, Section 3.6, *Hazardous Materials*, also discusses actions to be taken for emergency response and cleanup.
- **Spill from collision or derailment of train.** Fuel or hazardous material spills could occur if any of the trains or rail cars collide or derail. As discussed in Chapter 3, Section 3.6, *Hazardous Materials*, if a release of hazardous materials were to occur, the rail operator would implement emergency response and cleanup actions as required by the Federal Railroad Administration requirements and state law, including Washington State regulations under RCW 90.56. Chapter 3, Section 3.6, *Hazardous Materials*, also discusses actions to be taken for emergency response and cleanup. Spills of coal from a rail car could affect water quality based on the location, quantity spilled, and response actions taken.

4.5.5.2 No-Action Alternative

Under the No-Action Alternative, current operations would continue, and the existing bulk product terminal would be expanded. Because existing industrial import and export activities would be expanded, impacts on water quality would be similar to those described for the Proposed Action regarding potential oils and grease spills from equipment or other raw materials shipped from the terminal. The existing NPDES permit would remain in place, maintaining the water quality of existing stormwater discharges. Maintenance dredging at Dock 1 would continue in accordance with a future maintenance dredging permit, with dredging occurring every 2 to 3 years.

Any new or expanded industrial uses would trigger a new or modified NPDES permit. Upland buildings could be demolished and replaced for new industrial uses. Ground disturbance would not result in any impacts on waters of the United States and would not require a permit from the Corps. Any new impervious surface area would generate stormwater, but all stormwater would be collected and treated to meet state and federal water quality requirements prior to discharge to the Columbia River.

4.5.6 Required Permits

The Proposed Action would require the following permits for water quality.

- **NPDES Construction Stormwater General Permit—Washington State Department of Ecology**. The construction of the Proposed Action would result in more than 1 acre of ground disturbance and would require a construction stormwater general permit.
- **NPDES Industrial Stormwater Permit—Washington State Department of Ecology**. The Proposed Action would result in industrial activities such as the operation of a transportation facility or bulk station and terminal and would require an industrial stormwater permit.
- **Clean Water Act Section 404—U.S. Army Corps of Engineers**. Construction and implementation of the Proposed Action would affect waters of the United States, including wetlands. Because impacts would exceed 0.5 acre, Individual Authorization from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and appropriate compensatory mitigation for the acres and functions of the affected wetlands would be required.
- **Clean Water Act Section 401—Washington State Department of Ecology**. An Individual Water Quality Certification from Ecology under Section 401 of the Clean Water Act and a National Pollution Discharge Elimination System permit under Section 402 of the Clean Water Act would also be required for construction of the Proposed Action. Additional details regarding the permitting process related to the Clean Water Act can be found in the *SEPA Water Quality Technical Report* (ICF International 2016a).
- **Rivers and Harbors Act—U.S. Army Corps of Engineers**. Construction and implementation of the Proposed Action would affect navigable waters of the United States (i.e., the Columbia River). The Rivers and Harbors Act authorizes the Corps to protect commerce in navigable streams and waterways of the United States by regulating various activities in such waters. Section 10 of the RHA (33 USC 403) specifically regulates construction, excavation, or deposition of materials into, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.
- **Hydraulic Project Approval—Washington Department of Fish and Wildlife**. The Proposed Action would require a Hydraulic Project Approval from WDFW because project elements would affect and cross the shoreline of the Columbia River. The approval would consider impacts on riparian and shoreline/bank vegetation in issuance and conditions of the permit, including for the installation of the proposed docks and piles, as well as for interior culverts or other crossings of drainage features.

4.5.7 Potential Mitigation Measures

This section describes the potential mitigation measures that would reduce impacts related to water quality 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.

4.5.7.1 Applicant Mitigation

The Applicant will implement the following measures to mitigate impacts on water quality.

MM WQ-1. Locate Spill Response Kits Near Main Construction and Operations Areas.

The Applicant will locate spill response kits throughout the project area during construction and operations. The spill response kits will contain response equipment and personal protective equipment appropriate for hazardous materials that will be stored and used during construction and operations. Site personnel will be trained in the storage, inventory, and deployment of items in the spill response kits. Spill response kits will be checked a minimum of four times per year to ensure proper/functioning condition, and will otherwise be maintained and replaced per manufacturer recommendations. Should a spill response kit be deployed, the Applicant will notify Cowlitz County and Ecology immediately. The Applicant will submit a map indicating the types and locations of spill response kits to Cowlitz County and Ecology for approval prior to beginning construction and operations.

MM WQ-2. Develop and Implement a Coal Spill Containment and Cleanup Plan.

To limit the exposure of spilled coal to the terrestrial, aquatic, and built environments during coal handling, the Applicant will develop a containment and cleanup plan. The plan will be reviewed by Cowlitz County and Ecology and implemented prior to beginning operations.

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-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 application of surfactants along the rail routes for Proposed Action-related trains.

4.5.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the measures and design features described above would reduce impacts on water quality. There would be no unavoidable and significant adverse environmental impacts.

4.6 Vegetation

Vegetation is the foundation of most aquatic and terrestrial ecosystems. Among other functions, plants release oxygen and sequester carbon, provide wildlife habitat and food, affect soil development, and can increase slope stability. Plants are involved in the regulation of biogeochemical cycles such as the movement and filtration of water, carbon, and nitrogen. Plants can also have cultural, spiritual, and psychological benefits for humans.

This section describes vegetation in the study area. It then describes impacts on vegetation 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.

4.6.1 Regulatory Setting

Laws and regulations relevant to vegetation are summarized in Table 4.6-1.

Table 4.6-1. Regulations, Statutes, and Guidelines for Vegetation

Regulation, Statute, Guideline	Description
Federal	
Clean Water Act (33 USC 1251 *et seq*.)	Authorizes EPA to establish the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Regulates impacts on wetlands and other vegetated areas such as shoreline vegetation at and below ordinary high water, and vegetated shallows waterward of the shoreline along the Columbia River.
Endangered Species Act	Requires that applicants seeking a federal action, such as issuing a permit under a federal regulation (e.g., NEPA, Clean Water Act, Clean Air Act) undergo consultation with USFWS and/or NMFS. This will ensure the federal action is not likely to jeopardize the continued existence of any listed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. Section 6 requires USFWS and WDNR work cooperatively to conduct research and conservation activities to protect and recover rare or endangered plant species.
State	
Washington State Growth Management Act (RCW 36.70A)	Defines a variety of critical areas, which are designated and regulated at the local level under city and county critical areas ordinances.
Water Quality Standard for Surface Waters of the State of Washington (WAC 173-201A)	Establishes water quality standards for surface waters. Ecology is the responsible agency.

Regulation, Statute, Guideline	Description
Washington State Shoreline Management Act (RCW 90.58)	Requires cities and counties (through their Shoreline Master Programs) to protect shoreline natural resources against adverse impacts.
State Water Pollution Control Act (RCW90.48)	Provides Ecology with the jurisdiction to control and prevent the pollution of streams, lakes, rivers, ponds, inland water, salt waters, watercourses, and other surface and groundwater in the state.
Washington Natural Resource Damage Assessment (RCW 90.56.370)	Holds parties responsible for spilling oil into state waters liable for damages resulting from injuries to public resources.
Oil Spill Natural Resource Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee and screening of resource damages resulting from oil spills to determine which damage assessment to use. Provides for determining damages in cases where the compensation schedule is selected as the damage assessment method to apply.
Washington Natural Area Preserves Act	Establishes the Washington Natural Heritage Program to identify candidates for natural areas designated to preserve special-status plant species and regionally important or unique plant communities. Authorizes the program to track plant species and high-quality natural ecosystems in the state and to designate plants with a state status as threatened, sensitive, or endangered. WDNR is the implementing agency.
Washington State Noxious Weed Control Act (RCW 17.10, WAC 16-750)	Establishes noxious weed control boards, which designate certain plant species as Class A, B, or C noxious weeds. Authorizes the management, control, and/or elimination of noxious weed populations in the state.
Washington State Hydraulic Code (WAC 220-110)	WDFW issues a hydraulic project approval for certain construction projects or activities in or near state waters. Considers effects on riparian and shoreline or bank vegetation in issuance and conditions of the permit.
Clean Water Act Section 401 Water Quality Certification	Ecology issues Section 401 Water Quality Certification for in-water construction activities to ensure compliance with state water quality standards and other aquatic resources protection requirements under Ecology's authority as outlined in the federal Clean Water Act.

Regulation, Statute, Guideline	Description
Local	
Cowlitz County Critical Areas Protection Ordinance (19.15)	Requires the County to designate critical areas, including vegetation in wetlands and their buffers.
Cowlitz County Shoreline Master Program (CCC 19.20)	Regulates development in the shoreline, including the shoreline of the Columbia River, a Shoreline of Statewide Significance.

Notes:
USC = United States Code; EPA = U.S. Environmental Protection Agency; NEPA = National Environmental Policy Act; USFWS = NMFS = National Marine Fisheries Service; U.S. Fish and Wildlife Service; WDNR = Washington Department of Natural Resources; Ecology = Washington State Department of Ecology; RCW = Revised Code of Washington; WAC = Washington Administrative Code

4.6.2 Study Area

The study area for direct impacts on vegetation is defined as the Applicant's leased area, which also includes the project area. The study area for indirect impacts on vegetation is defined as the area immediately adjacent to the direct impact study area, contiguous forestland and other intact vegetation communities, and vegetation within 1 mile of the project area. This broader study area considers potential coal dust deposition (Chapter 5, Section 5.7, *Coal Dust*) that could occur as a result of the Proposed Action (Figure 4.6-1). An indirect study area was also established to evaluate the potential impacts that could occur as a result of a coal spill, which includes the rail routes for Proposed Action-related trains in Cowlitz County and Washington State to transport coal to the proposed coal export terminal. Wetland vegetation is further discussed in Section 4.3, *Wetlands*.

4.6.3 Methods

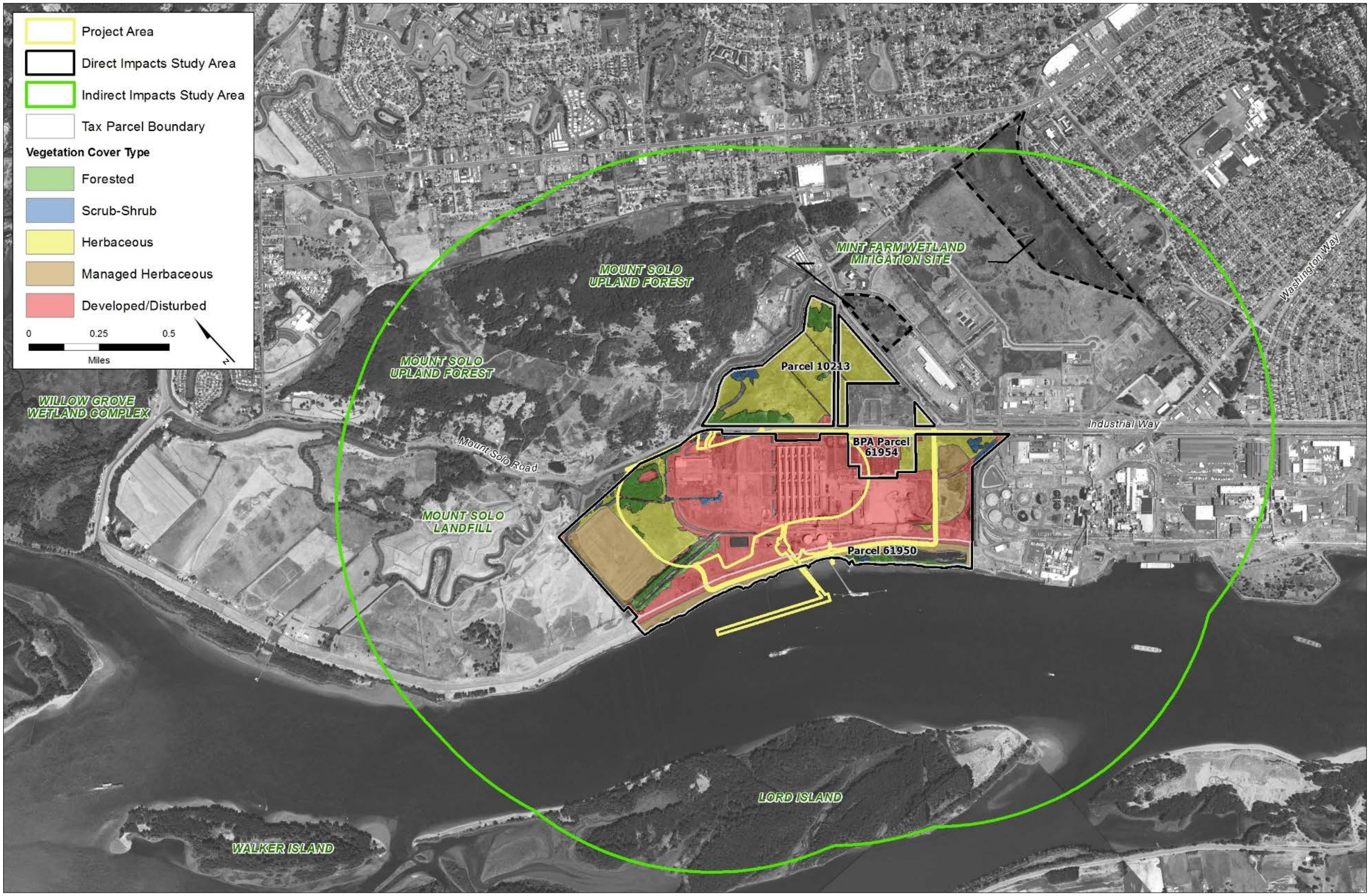
This section describes the sources of information and methods used to evaluate the potential impacts on vegetation associated with the construction and operation of the Proposed Action and No-Action Alternative.

4.6.3.1 Information Sources

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

- Two site visits conducted by ICF International biologists on April 8, 2014, and December 11, 2014.
- Historical aerial photos from 1994 and 2014 accessed through Google Earth Professional, a 2010 aerial photo provided by ESRI, and a 2012 aerial photo from the North Agriculture Imagery Program.
- Reports prepared by Grette Associates for the Applicant as part of the permit application materials (Grette 2014a through 2014i).
- U.S. Fish and Wildlife Service (USFWS) (2015) Information for Planning and Conservation, online database.

Figure 4.6-1. Vegetation Study Area



- Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) spatial data provided by WDFW on May 5, 2014, for the 5-mile radius surrounding the project area (Washington Department of Fish and Wildlife 2014).
- The Washington Department of Natural Resources (WDNR) Natural Heritage Program Information System (Washington Department of Natural Resources 2015) list of known occurrences of rare plants in Cowlitz County, Washington, and details regarding their occurrence, habitat, and range.

4.6.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on vegetation. A full description of analysis methods is provided in the *SEPA Vegetation Technical Report* (ICF International 2016a).

- Vegetation cover maps were developed for five cover types (developed lands, uplands, wetlands, riparian lands, and open water) based on site visits, aerial photographs, federal data bases, and information provided by the applicant. Vegetation cover was then characterized (forested, scrub-shrub, herbaceous, and managed herbaceous). Cover type mapping was adjusted based on field observations.
- Direct impacts on vegetation from construction of the Proposed Action would result when portions of the study area are cleared to construct the coal export terminal and associated infrastructure. These impacts were quantified by overlaying the study area on the vegetation cover map. The approximate acreage of each affected cover type was calculated and expressed as a percentage of all cover types in the study area.
- Indirect impacts on vegetation from construction could occur outside of the Applicant's leased area. These impacts are qualitatively described by identifying the impact mechanism (i.e., how the impact would occur), describing the potential impacts, and assessing the likelihood of impacts after implementation of mitigation measures.
- Direct and indirect impacts from operations are qualitatively described, including the impact mechanism, potential impacts, duration (i.e., temporary or permanent), and likelihood of occurrence.

For the purposes of this analysis, construction impacts are based on peak construction period and operations impacts are based on maximum throughput capacity (up to 44 million metric tons per year).

4.6.4 Existing Conditions

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

4.6.4.1 Direct Impact Study Area

The following land cover types are found in the Applicant's leased area, which includes the project area. Of the cover types discussed below, open water is not considered in Applicant's leased area.

Developed Lands

Developed lands accounts for 267 acres (48%) and includes those areas where the majority of the vegetation has been removed and replaced with pavement, buildings, or other types of infrastructure. Widely scattered patches of invasive shrubs such as Himalayan blackberry and Scotch broom occur on higher mounds, and around derelict structures and pieces of equipment. The disturbed cover type occurs on all of the areas previously developed by the former Reynolds Metals Company facility (Reynolds facility), with the exception of the closed Black Mud Pond (BMP) facility, which is classified as a managed herbaceous upland area. Also classified as disturbed areas are the Bonneville Power Administration (BPA) and Cowlitz County Public Utility District substations and the former commercial area on Parcel 10213, i.e., the portion of the study area north of the project area and Industrial Way (Figure 4.6-1). Named features and facilities described below are shown in Figure 4.2-3 in Section 4.2, *Surface Water*. Wetlands discussed below are shown in Figures 4.3-1 through 4.3-4 in Section 4.3, *Wetlands*.

Uplands

Uplands account for 160 acres (29%) and include the following vegetation types.

- **Forested upland.** Forested upland includes areas where trees more than 16 feet in height provide more than 20% canopy cover (Multi-Resolution Land Characteristic Consortium 2011). Approximately 26.71 acres of the Applicant's leased area (4.8%) were identified as forested upland. On Parcel 10213, forested upland occurs along both Industrial Way and 38th Avenue in the northwestern and central portions, and between Ditch 10 and 38th Avenue on the northeastern portion. The dominant tree species in these forested areas includes black cottonwood and Sitka willow, with Hooker's willow and Himalayan blackberry common in the shrub layer. On the former Reynolds facility, forested upland occurs around Wetlands A, C, and Y between the closed BMP facility and the former Cable Plant and along the U-Ditch and Interceptor Ditch. Dominant trees in the uplands adjacent to Wetlands A, C, and Y include black cottonwood, some Pacific willow, and Oregon ash. Common shrubs include Himalayan blackberry, red elderberry, and sweetbriar rose, with black cottonwood and Oregon ash sapling also present. Dominant trees in the forested corridor along the U-Ditch and Interceptor Ditch include black cottonwood, red alder, and some Oregon ash along the ditch banks. Himalayan blackberry is the most common plant in the shrub layer, but has been recently cleared from some areas on the western end of the U-Ditch. Red osier-dogwood is also common. Several types and sizes of down wood are present in this forested corridor, as are various snags. Reed canarygrass is common in the herbaceous layer in all of these forested upland areas.
- **Scrub-shrub upland.** Scrub-shrub upland includes areas with more than 20% canopy cover of shrubs or small trees that are less than 16 feet high (Multi-Resolution Land Characteristic Consortium 2011). Approximately 4.74 acres of the Applicant's leased area (0.9%) were identified as scrub-shrub upland. On Parcel 10213, scrub-shrub uplands occur between Wetland LW1 and Ditch 10. Dominant shrubs in these areas include Pacific and Hooker's willow and Himalayan blackberry. Young black cottonwood is also present. Reed canarygrass dominates the

herbaceous layer in these areas. Scrub-shrub uplands on the former Reynolds facility occur around the former Cable Plant and north of the closed BMP facility around Wetland Y. Common species in these areas include young black cottonwood, willows, and Himalayan blackberry. Reed canarygrass is also common in the herbaceous layer.

- **Unmanaged herbaceous upland.** Approximately 49.91 acres of the Applicant's leased area (9.0%) were identified as herbaceous uplands. These areas occur on Parcel 10213, the former Reynolds facility, and BPA Parcel 61954. Herbaceous uplands occur in between the herbaceous wetlands throughout Parcel 10213. These areas are dominated by a near monoculture of reed canarygrass, with some widely scattered Scotch broom and bentgrass also present. Herbaceous uplands on the Applicant's leased area occur along the Consolidated Diking Improvement District (CDID) #1 Ditch 10 to the northwest of the former Cable Plant; in the former borrow area to the east of the closed BMP facility; and in the southeastern portion of the Applicant leased area along the Reynolds Lead spur. These areas are primarily dominated by reed canarygrass. Herbaceous uplands on BPA parcel 61954 are located in a transmission line easement to the northwest of the Longview Substation. This area is dominated by species similar to those listed above for the Applicant's leased area, as well as Himalayan blackberry.
- **Managed herbaceous upland.** Approximately 78.61 acres of this cover type occurs on the former Reynolds facility, on the CDID #1 levee, the lawns around the administrative and maintenance buildings, and on the caps of the closed BMP facility, and fill deposits A (White Mud Pond), and B-2 (Eastern Black Mud Ponds). All of these areas are dominated by grasses and forbs that are regularly mown. Species present include reed canarygrass, haired bentgrass, colonial bentgrass, American plantain, orchard grass, short-awn foxtail, western bittercress, blue wildrye, common horsetail, Queen Anne's lace, scouring rush, bedstraw, velvetgrass, perennial ryegrass, Kentucky bluegrass, and American vetch may also be present.

Wetlands

Wetlands account for 97 acres (17%). The most prevalent wetland type is herbaceous wetlands followed by forested wetlands, scrub-shrub wetlands, disturbed wetlands, and managed wetlands. Approximately 5.25 acres of the Applicant's leased area were identified as disturbed wetland. Section 4.3, *Wetlands*, discusses wetlands and wetland vegetation in detail, including potential impacts and mitigation.

Riparian Lands

Riparian lands account for 10 acres (2%). They are predominantly along the shoreline of the Columbia River between the ordinary high water mark (OHWM) and the top of the CDID #1 levee. Riparian lands include vegetation growing in the active channel margin and riparian zones identified in the previous upland and shoreline habitat inventories (Grette Associates 2014e, 2014g, 2014h). For the purposes of this analysis, riparian vegetation communities are limited to uplands located in the riparian zone. Wetlands located in the riparian zone are included in the wetland vegetation community (Section 4.3, *Wetlands*). Riparian lands include the following vegetation types.

- **Riparian forest.** Riparian forest includes upland areas with more than 30% canopy cover of trees at least 20 feet high along the shoreline of the Columbia River between the OHWM and the levee. This cover type is found growing within both sandy substrates and among riprap and other types of shoreline armoring. Approximately 8.63 acres of the Applicant's leased area

(1.5%) were identified as forested riparian. All forested riparian areas are found on Parcel 61950, between the Columbia River and the CDID #1 levee (Figure 4.6-1). They extend in a band of varying width along most of the site's shoreline, with the widest areas found on the southern portion of the shoreline near the Dredged Material Storage Area. Dominant vegetation in this cover type includes 12- to 16-inch-diameter black cottonwood and various willow trees, underlain by a mixture of native shrubs such as red osier dogwood and invasive shrubs such as Himalayan blackberry and Scotch broom. Scattered accumulations of large woody debris and downed trees are present in these areas

- **Riparian scrub-shrub.** Riparian scrub-shrub includes upland areas with more than 30% canopy cover of shrubs or small trees (less than 20 feet in height) along the shoreline of the Columbia River between the OHWM and the levee. It is found in similar substrates as the forest vegetation community and contains similar species. Approximately 1.25 acres of the Applicant's leased area (0.2%) were identified as scrub-shrub riparian areas. Two scrub-shrub riparian areas are found on Parcel 61950, between the Columbia River and the levee. These areas are dominated by black cottonwood saplings, various willow, and nonnative vegetation including Himalayan blackberry and Scotch broom. Native and nonnative herbaceous species are also present.
- **Riparian herbaceous cover.** Approximately 0.01 acre of the Applicant's leased area (<0.01%) was identified as herbaceous riparian area. These sparse patches of emergent vegetation occur under the existing Dock 1 conveyor and trestle, and on the sandy flats that lie between OHWM and the approximate elevation of mean high water.

Open Water

Open water accounts for 24 acres (4%). Open waters include the various surface and stormwater ditches and ponds. This land cover is described in more detail Section 4.2, *Surface Water and Floodplains*. These areas support vegetation along their outer perimeters, typically including native plants as well as noxious weeds. Curly pondweed was observed at approximately -1 foot Columbia River datum downstream of Dock 1 during a period of high visibility. It is possible that the gently sloping portion of the shallow water habitat area between the east and west pile dikes near the project area could support a narrow band of sparse aquatic vegetation in the upper most elevations where increased light penetration and reduced river velocity are present, relative to the deeper portions of the river in this area.

4.6.4.2 Indirect Impact Study Area

Much of the surrounding study area is occupied by the Columbia River and lands that have been heavily disturbed by residential, industrial, and agricultural development. However, the following areas contain higher-quality vegetation communities adjacent to the Applicant's leased area that generally represent contiguous forestland and other intact vegetation communities (Figure 4.6-1).

- **Mount Solo upland forest**. Mount Solo is a forested ridge north of the project area. It supports a large area of contiguous native forest intermixed with rural residential areas and some light industrial uses. This area is the largest inland contiguous forested area in the indirect impact study area. Vegetation includes Douglas fir, big leaf maple, red alder, and western hemlock. It supports a diversity of native plant communities and provides habitat for a variety of wildlife species.

- **Mint Farm wetland mitigation sites**. Two compensatory wetland mitigation sites for the Mint Farm Industrial Park are located east of the project area. The Phase I mitigation site is more than 4 acres and is a complex of forested, scrub-shrub and emergent wetlands; the Phase II mitigation site is more than 66 acres and is a mixture of forested, scrub-shrub and emergent wetlands intermixed with forested uplands.
- **Lord Island**. Lord Island is located in the Columbia River off the shoreline of the project area. The 234-acre island was previously used for dredge material disposal. It is densely forested and bisected by various high-flow channels that support tidal marshes and shallow habitat areas. Vegetation on the island is largely native.

4.6.4.3 Special-Status Plant Species

As shown in Table 4.6-2, there are 15 plant species with some type of federal or state status in Cowlitz County (Washington Department of Natural Resources 2015). None of these species has been recorded in the direct or indirect study areas. The nearest record of occurrence of a special-status plant species is a documented siting of the obligate wetland species Columbia water-meal approximately 1.5 miles northwest of the project area and outside of the direct and indirect study area (Washington Department of Natural Resources 2015).

The special-status plant species, and the preferred elevation, habitat and geographic range for each are provided in Table 4.6-3. As indicated in Table 4.6-3, of the 15 special-status plant species known to occur in Cowlitz County, six were identified as potentially occurring in the study area for direct impacts, based on the presence of potentially suitable habitat. These species are Nelson's checker-mallow, western wahoo, western false dragonhead, loose-flowered bluegrass, soft-leaved willow, and Columbia water-meal.

Table 4.6-2. Known Occurrences of Threatened, Endangered, Sensitive, and Rare Plants in Cowlitz County

Scientific Name	Common Name	Federal Status[a]	State Status[b]	Historical Record[c]
Agoseris elata	Tall agoseris	--	S	C
Buxbaumia viridis	Buxbaumia moss	--	R1	C
Cimicifuga elata	Tall bugbane	SC	S	H
Corydalis aquae-gelidae	Clackamas corydalis	SC	S	C
Erythronium revolutum	Pink fawn-lily	--	S	C
Euonymus occidentalis var. *occidentalis*	Western wahoo	--	S	C
Isoetes nuttallii	Nuttall's quillwort	--	S	C
Physostegia parviflora	Western false dragonhead	--	R1	H
Poa laxiflora	Loose-flowered bluegrass	--	S	C
Poa nervosa	Wheeler's bluegrass	--	S	C
Salix sessilifolia	Soft-leaved willow	--	S	C
Sidalcea nelsoniana	Nelson's checker-mallow	LT	E	C
Tetraphis geniculata	Tetraphis moss	--	R1	C
Utricularia gibba	Humped bladderwort	--	R1	C
Wolffia columbiana	Columbia water-meal	--	R1	C

Notes:

[a] Federal Status under the Endangered Species Act:
LE = Listed Endangered (in danger of extinction)
LT = Listed Threatened (likely to become endangered)
PE = Proposed Endangered
PT = Proposed Threatened
C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.
SC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but insufficient information to support listing.

[b] State Status of plant species is determined by the Washington Natural Heritage Program. Factors considered include abundance, occurrence patterns, vulnerability, threats, existing protection, and taxonomic distinctness. Values include:
E = Endangered. In danger of becoming extinct or extirpated from Washington.
T = Threatened. Likely to become Endangered in Washington.
S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state.
R1 = Review group 1. Of potential concern but needs more fieldwork to assign another rank.

[c] Historical Record refers to when the occurrence was documented:
C = Most recent sightings after 1977.
H = Most recent sighting before 1977.

Source: Washington Department of Natural Resources 2014.

Table 4.6-3. Elevation, Habitat, and Geographic Range of Listed Threatened, Endangered, Sensitive, and Rare Plants in Cowlitz County

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Project Area
Tall agoseris	*Agoseris elata*	500 to 7,800 feet	Found in meadows, prairies, open woods, and exposed rocky ridges. Occurs in areas with little to no canopy cover and assumed to be shade intolerant.	Throughout California, Oregon, and Washington.	Documented in northeastern Cowlitz County. Not likely to occur on the project area due to elevation.
Buxbaumia moss	*Buxbaumia viridis*	Low to subalpine elevations	Found in coniferous forests on well-rotted logs and peaty soil and humus.	Western North America including the western portion of Washington.	Documented in east-central Cowlitz County. Not likely to occur on the project area due to lack of suitable coniferous habitat.
Tall bugbane	*Cimicifuga elata*	100 to 2,800 feet, with majority below 700 feet	Occurs in or along margins of mixed mature or old growth forests, including mesic coniferous or mixed coniferous-deciduous stands. Frequently found on north or east-facing slopes.	Southwestern British Columbia to southern Oregon, west of Cascade range.	Documented in western Cowlitz County in areas along the Columbia River. Not likely to occur on the project area due to lack of appropriate forest habitat.
Clackamas corydalis	*Corydalis aquae-gelidae*	1,250 to 4,200 feet	Occurs in or near cold flowing water, including seeps and small streams; often occurring in stream channels. Moist shady woods in western hemlock (*Tsuga heterophylla*) and silver fir (*Abies amabilis)* zones. Prefers intermediate levels of overstory canopy closure.	Regionally endemic of Washington; Clackamas and Multnomah Counties in Oregon.	Documented in eastern Cowlitz County. Not likely to occur on the project area due to elevation and lack of suitable habitat.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Project Area
Pink fawn-lily	*Erythronium revolutum*	100 to 600 feet	Occurs in high-precipitation areas within 100 km of the coast, in moist soil in open or moderately shaded forests that provide full light at ground level. Habitats in Washington include swampy western redcedar (*Thuja plicata*)-lodgepole pine (*Pinus contorta*) forests, Sitka spruce (*Picea sitchensis*) woods on consolidated sand dunes, Sitka spruce-western hemlock forests, and shaded river bottoms.	Pacific coast region from southern British Columbia to northwestern California.	Documented in northwestern Cowlitz County. Not likely to occur on the project area due to lack of suitable coniferous forest habitat.
Western wahoo	*Euonymus occidentalis* var. *occidentalis*	20 to 600 feet	Occurs in moist woods and forested areas on west side of Cascades. Often found in shaded draws, riparian areas, and ravines. Sometimes found in grassy areas with scattered trees. In Washington, it typically occurs on fine sandy loam, silty loam, and silty clay loams.	British Columbia, western Washington and Oregon, south to central California	Documented in west-central Cowlitz County, potentially near the project area. Appropriate habitat may occur on and near the project area.
Nuttall's quillwort	*Isoetes nuttallii*	200 to 345 feet	Terrestrial species found in seasonally wet ground, seepages, temporary streams, and mud near vernal pools.	Southeast Vancouver Island, British Columbia to southern California	Documented in west-central Cowlitz County, potentially near the project area. Not likely to occur on the project area due to elevation.
Western false dragonhead	*Physostegia parviflora*	None provided.	Occurs along shores of streams and lakes, marshes, and other low, wet places in the valleys and foothills.[a]	East of the Cascade summits, British Columbia south through Washington to the Columbia Gorge, then west to Portland, Oregon; east to Idaho and North Dakota.[a]	Most recent documentation in Cowlitz County is prior to 1977. Appropriate habitat may occur on and near the project area.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Project Area
Loose-flowered bluegrass	*Poa laxiflora*	50 to 3,700 feet	Found on moss-covered rocks and logs, along streams and rivers, and on edges of wet meadows in moist shady woods.	Coastal Alaska, British Columbia, western Washington, and western Oregon	Documented in northwestern Cowlitz County. Appropriate habitat may occur on and near the project area.
Wheeler's bluegrass	*Poa nervosa*	10 to 800 feet	Found in low-elevation wet habitats west of the Cascade crest in forest openings with minimal canopy cover, mossy rock outcrops, cliff crevices, and occasionally talus. Sites are often sparsely vegetated with little soil development.	Endemic from Vancouver Island, British Columbia, to northwest Oregon	Documented in west-central Cowlitz County, potentially near project area. Unlikely to occur on the project area due to lack of preferred habitat elements.
Soft-leaved willow	*Salix sessilifolia*	None provided	Found in wet lowland habitats, including silty or sandy riverbanks, riparian forests, dredge spoils, sandy beaches, and at the upper edge of an intertidal zone.	Southern British Columbia to northern California	Documented in northern Cowlitz County. Appropriate habitat may occur on or near the project area.
Nelson's checker-mallow	*Sidalcea nelsoniana*	None provided	Found in low-elevation meadows, prairie or grassland, along fencerows, streams, and roadsides, drainage swales, and edges of plowed fields adjacent to wooded areas.	Regionally endemic of Benton County, Oregon, north to Lewis County, Washington, and from central Linn County, Oregon to just west of the crest of the Coast Range.	Documented in northwestern Cowlitz County. Appropriate habitat may occur on and near the project area.
Tetraphis moss	*Tetraphis geniculata*	Sea level to subalpine elevations.	Occurs on the cut or broken ends or lower half of large decay class rotten logs or stumps, and occasionally on peaty banks in moist coniferous forests.	From Alaska and British Columbia through western Washington and select sites in Oregon.	Not documented in Cowlitz County. Not likely to occur on project area due to lack of suitable coniferous habitat with logs and stumps.

Common Name	Scientific Name	Elevation Range	Habitat	Geographic Range	Occurrence Relative to Project Area
Humped bladderwort	*Utricularia gibba*	160 to 490 feet	Occurs in lakes, lake edges, and muddy disturbed sites in the lowland zone.	Southern British Columbia south to California.	Documented in northern Cowlitz County. Not likely to occur on project area due to elevation.
Columbia water-meal	*Wolffia columbiana*	10 to 250 feet	Found in freshwater lakes, ponds, and slow streams.	From California to British Columbia, east to Quebec, and south to Florida, excluding the interior southwestern states.	Occurs within 1.5 miles of the project area; could occur in ponded habitats on or near the project area.

Notes:
[a] Herbarium, Burke Museum of Natural History and Culture 2014.
Source: Unless noted otherwise, this information came from the Washington Department of Natural Resources, Washington Natural Heritage Program plant species fact sheets; available at: http://www1.dnr.wa.gov/nhp/refdesk/lists/plantsxco/cowlitz.html

4.6.4.4 Noxious Weeds

The project area supports plant species regulated as noxious weeds under the law. The management of developed areas can also affect the spread of noxious weeds to adjacent undeveloped areas of natural plant communities. Fourteen noxious weed species have been documented in the project area (Table 4.6-4) (Cowlitz County Noxious Weed Control Board 2015; Washington State Noxious Weed Control Board 2015). None of the species designated for Cowlitz County as Class A noxious weeds has been observed in the project area (Table 4.6-5 provides definitions for the noxious weed classifications). Six of these species (indigobush, scotch broom, policeman's helmet, Eurasian water milfoil, Canada thistle, and common tansy) are considered Class B weeds, and identified as priorities for control, either by Washington State or Cowlitz County. Eight species in the study area are listed Class C noxious weeds, a classification assigned to weeds that are not typically considered a priority for weed control because they are already widespread throughout the state. These species are Canada thistle, bull thistle, English ivy, yellow-flag iris, reed canarygrass, Himalayan blackberry, common tansy, and nonnative cattail.

Table 4.6-4. Noxious Weeds Identified in the Project Area

Noxious Weed Species			Classification		
Common Name	**Scientific Name**	**Location Observed[a,b,c]**	**State[d]**	**Cowlitz County[e]**	**State/County Priority Weed for Control[e]**
Indigobush	*Amorpha fruticosa*	Riparian[b]	B	B	Yes/No
Scotch broom	*Cytisus scoparius*	W/U[a, b]	B	B	No/Yes
Policeman's helmet	*Impatiens glandulifera*	W/U[a]	B	B	Yes/Yes
Eurasian water milfoil	*Myriophyllum spicatum*	W/OW[a]	B	B	Yes/No
Parrotfeather	*Myriophyllum aquaticum*	W/OW[a]	B	B	No/No
Water primrose	*Ludwigia hexapetala*	D[c]	B	B	No/No
Canada thistle	*Cirsium arvense*	W/U[a, b]	C	C	No/Yes
Bull thistle	*Cirsium vulgare*	W/U[a, b]	C	C	No/No
English ivy	*Hedera helix*	W/U[a, b]	C	C	No/No
Yellowflag iris	*Iris pseudacorus*	W/D[b]	C	C	No/No
Reed canarygrass	*Phalaris arundinacea*	W/U[a, b]	C	Not listed	No/No
Himalayan blackberry	*Rubus armeniacus*	U[a, b]	C	C	No/No
Common tansy	*Tanacetum vulgare*	U[a]	C	C	No/Yes
Nonnative cattail	*Typha* spp.	W[a, b]	C	C	No/No

Notes:

[a] *Appendix F: Noxious Weeds and Sensitive Plants* in Grette Associates 2014a. Location values: W = wetland; U = upland; D = Ditches; OW = open water

[b] Observations made by ICF International during site investigations in April and December 2014.

[c] Observations by Washington State Noxious Weed Control Board (1999).

[d] State classification based on Washington State Noxious Weed Control Board 2015 Noxious Weed List.

[e] County classification and priority for weed control (state and county level) based on Proposed 2015 Cowlitz County Noxious Weed List (Cowlitz County Noxious Weed Control Board 2015).

Table 4.6-5. Washington State Noxious Weed Classification

Class	Definition
A	Nonnative species whose distribution in Washington is still limited. Preventing new infestations and eradicating existing infestations are the highest priority. Eradication of Class A plants is required by law.
B	Nonnative species presently limited to portions of the State. Species are designated for control in regions where they are not yet widespread. Preventing new infestations in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal.
C	Noxious weeds that are typically widespread in Washington or are of special interest to the state's agricultural industry. The Class C status allows counties to require control if locally desired. Other counties may choose to provide education or technical consultation.

Notes:
Source: Washington State Noxious Weed Control Board 2015.

4.6.5 Impacts

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

4.6.5.1 Proposed Action

This section describes the potential direct and indirect impacts related to vegetation that would result from construction and operation of the Proposed Action and the No-Action Alternative. Direct impacts could result from activities that directly disturb or damage vegetation including such actions as removing vegetation during clearing and grading activities and the physical and chemical management of vegetation and noxious weeds as part of routine facility maintenance. Indirect impacts include the future spread of noxious weeds into adjacent areas from the construction site and the associated changes in plant communities over time that could result from this activity.

Potential impacts on vegetation were also considered regarding duration. Permanent impacts are those that would modify vegetation cover types to such a degree that they would not return to their preconstruction state for the life of the project. Temporary vegetation impacts are those that would result in the disturbance of vegetation cover types but that due to implementation of best management practices, project design components, regulatory requirements, or an on-site vegetation management plan would facilitate reestablishment of vegetation cover types similar to preproject conditions after construction is completed.

The following measures have been identified by the Applicant as measures that would be implemented during operations to suppress coal dust. These measures were considered part of the project when evaluating the potential impacts of the project on vegetation.

- The Applicant will implement best management practices and the following project components (and related activities) to avoid and minimize potential impacts associated with coal dust.
    - Conveyors will be:
        - Monitored for general status and washed down regularly.
        - Cleaned using high-pressure water in the collection and containment areas, including belts.

- Transfer points will be:
  - Cleaned using high-pressure water as part of regular washdowns of underbelt plating, and water collection and containment system.
- Rail car unloaders will be:
  - Cleaned with dry fog and water spray systems.
- Stockpiles will be:
  - Sprayed via a spray system controlled by local and remote weather stations.
  - Managed via a controlled dropper from the stackers to manage height of piles.
  - Cleaned along conveyor berms and sealed roadways.
- Shiploading equipment will be:
  - Discharged below deck of vessel.
  - Cleaned and washed by high-pressure water.

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).

Permanently Remove Vegetation

Clearing and grading would permanently remove 189 acres of nonwetland vegetation, including noxious weeds, from the project area (Table 4.6-6). Most of the clearing would affect disturbed vegetation and weedy areas that generally do not support native plant species or provide suitable wildlife habitat (Figure 4.6-2).

The majority (71%) of the total impact would occur in areas occupied by the disturbed cover type (i.e., scattered grasses and weeds in and around the developed portions of the project area). Approximately 26.19 acres of upland vegetation or 16.4% of the total upland vegetation within the project area would be removed. Herbaceous upland vegetation surrounding Wetlands A, C, and Z make up the majority (41.5%) of this acreage. These herbaceous upland areas are generally dominated by reed canarygrass. Approximately one-third of the upland forest in the project area would be removed. The majority of the 8.84 acres of upland forest impacts would occur to the upland forested areas surrounding Wetland A and the upland forested areas surrounding the interception ditch and stormwater conveyance. These areas are dominated by native trees, primarily black cottonwood, red alder, Oregon ash, and Pacific willow trees, with an understory of mixed native and invasive shrubs dominated by red elderberry, sweetbriar rose, and Himalayan blackberry. The impacts would occur as a result of construction of the rail loop, stockpile pads, and the series of stacking and reclaim conveyors.

Table 4.6-6. Permanent Direct Impacts by Land Cover and Vegetation Cover Type in the Study Area

Land Cover Category	Vegetation Cover Type[a]	Total Applicant's Leased Area (Acres)[a]	Impacts in Project Area (Acres)[b]	Percentage of Cover Type[c]
Developed land	*Disturbed*	*266.76*	*151.61*	*56.8*
	Developed land total	**266.76**	**151.61**	**56.8**
Upland	*Forested*	*26.71*	*8.84*	*33.1*
	Scrub-shrub	*4.74*	*2.10*	*44.3*
	Herbaceous	*49.91*	*10.88*	*21.8*
	Managed herbaceous	*78.61*	*4.37*	*5.6*
	Upland total	**159.97**	**26.19**	**16.4**
Riparian land	*Forested*	*8.63*	*0.05*	*0.6*
	Scrub-shrub	*1.25*	*0.00*	*0*
	Herbaceous	*0.01*	*0.00*	*0*
	Riparian land total	**9.89**	**0.05**	**0.5**
Open water	**Open water total**	**23.54**	**10.78**	**45.8**
Total		**460.16**	**188.64**[b]	**40.99**[c]

Notes:

[a] Wetland area is not included in this total. Refer to the Section 4.3, *Wetlands*, for information on impacts on Wetlands.

[b] These are direct impacts on vegetation in the 190-acre project area.

[c] This column represents the percent of cover type in the Applicant's leased area that would be affected by construction.

Impacts on riparian vegetation would be limited to approximately 0.05 acre, or 0.5% of the total riparian vegetation in the project area, including black cottonwood and willow trees, and understory shrubs such as red-osier dogwood and Himalayan blackberry. These impacts would occur as a result of construction of the trestle conveyor that connects the surge bin to Docks 2 and 3.

Although no special-status plant species have been recorded in the project area, potentially suitable habitat is present. Should any special-status plant species occur in the project area, they would be permanently removed as a result of project construction.

As mentioned previously, six special-status plant species were identified as potentially occurring in the study area for direct impacts, based on the presence of potentially suitable habitat. These plant species include Nelson's checker-mallow, western wahoo, western false dragonhead, loose-flowered bluegrass, soft-leaved willow, and Columbia water-meal. The spatial extent of any impact on special-status plants cannot be quantified until a special-status plant survey is conducted. Such surveys would be required mitigation, as identified in Section 4.6.7.1, *Applicant Mitigation*. These surveys would occur during the appropriate time of year, prior to any project related construction activities beginning.

Figure 4.6-2. Impacts on Existing Land Cover Classes and Vegetation Cover Types

Temporarily Disturb Adjacent Vegetation

Construction and staging activities along the edges of the project area could crush and bury adjacent vegetation and compact soil through vehicle use, material storage and stockpiling, and ground disturbance. Ground disturbance related to these activities could also increase the opportunity for stormwater runoff to carry sediments, spilled vehicle fluids, or other construction materials into areas outside of the project area, potentially affecting the health and vigor of adjacent vegetation. Depending on the extent, duration, and content of this runoff, vegetation could be affected through interference with photosynthesis, respiration, growth, and/or reproduction.

Fugitive dust from construction activities could also affect vegetation by collecting on leaves and other plant surfaces, potentially inhibiting photosynthesis and other plant functions.

The 35-foot-high preload material piles could provide an area for invasive plant species, including noxious weeds, to colonize. Such conditions would provide a seed source that could be readily dispersed into adjacent areas by wind and runoff, increasing the potential for invasive species and noxious weeds to spread and displace native vegetation.

Any special-status plants adjacent to the project area would be temporarily affected by construction as described previously. The spatial extent of any such impact cannot be quantified until a special-status plant survey is conducted.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on vegetation because construction of the coal export terminal would be limited to the project area.

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*. Direct impacts on vegetation from operation of the Proposed Action would likely be limited to the continued existence or possible colonization by noxious weeds around the periphery of the project area, impacts from vessel loading and transport along rail tracks, and maintenance of vegetation under the conveyor and along the rail tracks and rail loop.

Promote Colonization by Noxious Weeds

The disturbed nature of the project area during operations would favor colonization by noxious weeds rather than native plants. Invasive plant species, including noxious weeds, are generally adapted to colonize highly disturbed areas and could thus colonize the periphery and portions of the project area. Areas along the rail tracks, along the stacking conveyors, and between the tracks of the rail loop would be most likely to support noxious weed species in scattered patches. Reed canarygrass, Himalayan blackberry, Canadian and/or bull thistle, and Scotch broom are already present on the project area, and are common in adjacent areas. These species would likely continue to persist during operations.

Disturb Vegetation during Rail and Vessel Loading

Operation of the Proposed Action could affect vegetation along the rail tracks entering the project area, along the shoreline of the Columbia River, and in the shallow waters of the Columbia River near the project area. Such impacts could occur as the result of spills of coal or other materials associated with operation of the rail cars, the conveyor and stockpiling systems, the mobile maintenance equipment, and the shiploaders.

Direct impacts on aquatic vegetation along the shoreline of the Columbia River cannot be quantified until an aquatic vegetation survey is conducted. A mitigation measure to conduct an aquatic vegetation survey is described in Section 4.6.7, *Potential Mitigation Measures*. Impacts on water quality associated with the routine movement of coal across the shoreline zone and along the shiploaders into vessels at the docks could also affect vegetation along or in receiving waters. However, stormwater runoff would be collected at the project area and treated to remove potential contaminants associated with the operations and maintenance activities (e.g., coal, diesel fuel, oil, hydraulic fuel, antifreeze, tire, and brake dust, exhaust particulates) prior to discharge to the Columbia River. Best management practices and mitigation to reduce potential water quality impacts are detailed in Section 4.5, *Water Quality*.

Although hazardous material spills or leaks could occur, the potential for these to occur and affect the environment would be minimized by appropriate training and the implementation of prevention and control measures. Best management practices and mitigation to reduce potential impacts from spills and leaks are detailed in Chapter 3, Section 3.6, *Hazardous Materials*, Chapter 5, Sections 5.1, *Rail Transportation* and 5.4, *Vessel Transportation*.

Alter Vegetation during Maintenance Activities

Trees and tall shrubs around the conveyor to the shiploaders on Docks 2 and 3 would likely be regularly trimmed or removed, slightly reducing organic material delivered to the river, shade the upper beach and shoreline, and native foraging, resting, and perching opportunities to for passerine birds. The 45- to 50-foot-wide area that would be affected is small relative to the approximately 5,000 linear feet of vegetated shoreline in the project area.

Routine vegetation maintenance along the perimeter road, rail tracks, and rail loop would involve trimming trees and tall shrubs within approximately 25 feet of either side of the perimeter road. This maintenance would artificially stunt individual trees and shrubs in these areas but would not reduce the functions of native plant communities because it would be confined to the outermost edges of such communities. Any vegetation that colonizes the disturbed interior of the project area along the rail loop would likely also be removed, controlled, or trimmed to eliminate any interference with the movement of the rail cars, equipment, or personnel.

Any special-status plants that occur along the periphery of the project, along the rail tracks and rail loop, or under the conveyor would be affected by operations as described above. The spatial extent of any such impact cannot be quantified until a special status plant survey is conducted.

Deposit Coal Dust on Vegetation

The movement of coal into and around the project area, the creation of large stockpiles of coal, and the use of 29,100 linear feet of open conveyors to move coal onto vessels could generate coal particles and fugitive coal dust, which could be deposited on vegetation, soils, and sediments.

Windborne coal dust can deposit on vegetation, soils, and sediments. The potential extent and deposition rate of coal dust particles less than 75 microns was modeled as part of the analysis conducted relative to air quality. Based on this modeling, the highest rate of coal dust deposition would be expected in the area adjacent to the project area, but smaller particles could also be expected to deposit in a zone extending around and downwind of the project area. Deposition rates could range from 1.88 grams per square meter per year ($g/m^2/year$) closest to the project area, gradually declining to less than 0.0003 $g/m^2/year$ approximately 2.5 miles from the project area.

The potential zone of deposition includes the coniferous forest vegetation on the hills adjacent to the northern extent of the project area, as well as the riparian vegetation along the shoreline of the river. Deposition rates of less than 0.1 $g/m^2/year$ are projected to occur over the forested communities on Lord Island within the Columbia River just east of the project area, with declining concentrations across the island and to the south and west toward Walker Island.

The impacts of dust on vegetation would vary depending on dust load, climatic conditions, and the physical characteristics of the vegetation. Impacts could be physical, such as blocked stomata that alters gas diffusion into and out of the leaves, causing reduced respiration or increased transpiration; altered leaf surface reflectance and light absorption potential; and increased leaf temperature due to optical properties of the dust (Chaston and Doley 2006; Doley 2006:38; Farmer 1993). Such impacts can be complex and neither the impact mechanism nor a threshold for any potential physical or biological effects of coal dust deposition have been studied relative to the climate and native vegetation of the Pacific Northwest. The *SEPA Vegetation Technical Report* summarizes studies of the impacts of dust deposition on vegetation in other regions. Coal dust deposition is also discussed in Chapter 5, Sections 5.6, *Air Quality*, and 5.7, *Coal Dust.*

Although coal transport may increase the concentration of contaminants such as arsenic, polycyclic hydrocarbons in the soil, concentrations could vary greatly and impacts on vegetation communities have not been studied in the Columbia River Gorge or the study area. Given the number and variety of environmental, climatic and plant factors affecting the deposition of dust (Doley 2006), information regarding foliage density, leaf dimensions and characteristics, as well as particle size distribution, dust color and climatic conditions would likely be needed to determine the level of dust deposition that could affect sensitive plant species or functions.

Coal dust deposition could also affect special-status plant species in the same areas. The spatial extent of any such impact cannot be quantified until a special-status plant survey is conducted. A mitigation measure to conduct a special-status plant survey is described in Section 4.6.7, *Potential Mitigation Measures*.

The potential impacts for fugitive emissions of coal dust could be reduced through use of the following equipment and system operations that are part of the Proposed Action. The Applicant would use enclosed conveyors and transfer points (except for stockyard and shiploader conveyors). Transfer chutes would be enclosed in transfer towers with soft flow transfer chutes and inlet and outlet curtains and side skirts. The conveyor system would include a washdown water collection and containment system that is discussed further in Section 4.5, *Water Quality*. Rail car unloaders are located in an enclosed building and would use a dry fog system and water spray systems. The coal stockpile would have a spray system controlled by local and remote weather stations. The system would control drop height from stackers. During shiploading, the shiploader boom would be enclosed and coal would be discharged below deck of vessel.

Spill Coal during Operations of the Proposed Action

Direct impacts on the natural environment from a coal spill during operations of the Proposed Action could occur. Direct impacts resulting from a spill during coal handling at the coal export terminal would likely be minor because the amount of coal that could be spilled would be relatively small. Also, impacts would be minor because of the absence of terrestrial environments in the project area and the contained nature and features of the terminal (e.g., fully enclosed belt conveyors, transfer towers, and shiploaders).

Coal released as the result of a spill into terrestrial environments could result in impacts. Herbaceous vegetation would be more susceptible to damage and smothering from a coal spill compared to more rigid, woody vegetation like shrubs and trees, which may be better able to withstand the weight and force of a coal spill, depending on the magnitude of the spill. The magnitude of potential impacts would depend on the size (volume) and extent (area) of the coal spill. The physical impact of coal spilled on vegetation would range from minor plant damage to complete loss of vegetation. Some plant species may be more sensitive to coal than other species. Coal dust associated with a coal spill could also cover vegetation, resulting in reduced light penetration and photosynthesis, which could lead to reduced vegetation density and plant diversity. The magnitude of potential coal dust impact would depend on duration of exposure, tolerance of vegetation, and aggressiveness of nonnative species. Cleanup of coal spilled during operations may further impact vegetation by either removing or further damaging vegetation as a result of ground disturbance related to cleanup activities. Any pieces of residual coal that might remain on the ground after a cleanup effort could leach chemicals from exposure to rain, which could damage or kill vegetation. However, if this were to occur, the impact area would generally be highly localized and limited to the extent of the spill, and unlikely to disrupt the overall plant ecosystem.

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*.

Deposit Coal Dust on Vegetation

The movement of coal by rail could generate coal particles and fugitive coal dust, which could be deposited on vegetation, soil, and sediments. Coal transported by vessel would be in enclosed cargo holds and is not likely to result in deposition on vegetation along the vessel route in the Columbia River. Coal dust deposition from rail cars is discussed in Chapter 5, Sections 5.6, *Air Quality*, and 5.7, *Coal Dust.* The potential impacts from coal dust deposition on vegetation is described the *Operations—Direct Impacts* section.

Erode Tidal Marsh Vegetation Due to Vessel Wakes

Increased vessel traffic and associated wakes could contribute to erosion of tidal marsh vegetation along the shoreline of the Columbia River. Operation of the coal export terminal at maximum throughput would deliver 70 vessels per month or 840 vessels per year to Docks 2 and 3 and would equate to 1,680 vessel transits a year (840 vessels each way) (Chapter 5, Section 5.4, *Vessel Transportation*). The location and extent of these impacts would depend on vessel design, hull shape, vessel weight and speed, angle of travel relative to the shoreline, proximity to the shoreline, currents and waves, and water depth (Jonason 1993:29–30; MARCOM 2003). The potential for shoreline erosion could also be influenced by the slope and physical character of the shoreline (i.e., soil susceptibility to erosion), as well as the amount and type of vegetation that occurs along the shoreline.

The potential for vessel wake impacts on vegetation along the shoreline would be limited by the slope of the shoreline and the general lack of aquatic vegetation near the docks. Additionally, vessels maneuvering near the docks would move slowly as they prepare to dock and likely not putting out a wake sufficient to cause shoreline erosion. However, there may be a potential for such impacts on the thin strip of shoreline vegetation along the northern end of Lord Island from large wakes, or wakes oriented perpendicular to the main navigation channel and docks, such as those that can occur when tugs are oriented perpendicular to the shoreline as they push vessels into position at docks. There is the potential for impacts related to vessel wakes on vegetation along the shoreline of the lower Columbia River as a result of the Proposed Action.

Vessel operations in the Lower Columbia River are federally regulated, including size, speed, and navigation. Additionally, large vessels must be operated by pilots within the Lower Columbia River, who are licensed by the Coast Guard to perform this function. The navigation channel and its ongoing maintenance are also managed and regulated at the federal level, including dredging and dredged material disposal.

Disturb Vegetation during Rail and Vessel Transport

Operation of the Proposed Action could indirectly affect vegetation outside of the project area along the rail tracks entering the project area, along the shoreline of the Columbia River, and in the shallow waters of the Columbia River. Such impacts could occur as the result of spills of coal or hazardous materials associated with operation of the trains and vessels transporting coal within the study area. These spills could also affect special-status plant species in the same areas. The spatial extent of any such impact cannot be quantified until a special-status plant survey(s) is conducted. Chapter 3, Section 3.6, *Hazardous Materials*, and Chapter 5, Sections 5.1, *Rail Transportation*, and 5.4, *Vessel Transportation,* provide further details. Washington State oil transfer rules include requirements for trained personnel, procedures and equipment to prevent a spill during a transfer of oil over water, such as diesel for emergency ship generators.

Spill Coal during Rail Transport

The magnitude of the potential indirect impact from a coal spill on terrestrial environments would be similar to those described previously and would depend on the location of the spill, the volume of the spill, and success of efforts to contain and cleanup the spill, none of which can be predicted.

The potential impact of a coal spill from a Proposed Action-related train is directly related to the probability of a Proposed Action-related train incident occurring. Section 5.2, *Rail Safety*, estimates the number of Proposed Action-related train incidents that could potentially occur during coal transport within Cowlitz County and Washington State. In Cowlitz County, the predicted number of loaded coal train incidents is approximately one every 2 years. The predicted number of loaded coal train incidents within Washington State is approximately five per year.

Not every incident of a loaded coal train would result in a rail car derailment or a coal spill. A train incident could involve one or multiple rail cars, and could include derailment in certain circumstances. The size and speed of the train and the terrain where an incident were to occur would influence if the incident resulted in a coal spill. A broad range of spill sizes from a partial rail car to multiple rail cars could potentially occur from a Proposed Action-related train accident.

Additionally, containment and cleanup efforts for coal spills from a rail incident factor into the potential impact on the environment. It is expected that coal spills in the terrestrial and built environments would be easier to contain and clean up than spills occurring in an aquatic environment. Spills occurring on land may have a quicker response time and cleanup in some locations due to their visibility and access for cleanup equipment, as compared to spills into aquatic environments.

Potential physical and chemical effects of a coal release in terrestrial environments would be the same or similar to those described above under direct impacts.

4.6.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the Proposed Action. Current operations would continue and the existing bulk product terminal site would be expanded. However, any expansion would be limited to activities that would not require a permit from the U.S. Army Corps of Engineers (Corps) or a shoreline permit from Cowlitz County. Therefore, no construction impacts on aquatic habitats or plant species would be expected to occur as a result of an expansion of the existing bulk production terminal under the No-Action Alternative.

Continued industrial use of the project area over the 20-year analysis period (2018 to 2038) would likely result in the redevelopment of the largely developed upland areas of the project area. New construction, demolition, and activities related to this development could affect the disturbed vegetation that is present throughout the developed portions of the site. Cleanup activities, relative to past industrial uses, would also continue, potentially affecting vegetation in disturbed areas.

4.6.6 Required Permits

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

4.6.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to vegetation 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.

4.6.7.1 Applicant Mitigation

The Applicant would implement the following measures to mitigate impacts on vegetation.

MM VEG-1. Conduct Rare Plant Surveys Prior to Construction.

To ensure that threatened, endangered, or rare plants are not affected, the Applicant will conduct rare plant surveys of the project area, including the ditches and stormwater conveyance features. Surveys for rare plants will be performed for those rare plants that may occur in Cowlitz County, according to the Washington Natural Heritage Program. Surveys will be performed prior to any project related ground disturbance and during the appropriate survey windows for each species. If such plant species are found, the Applicant will notify and consult with the Washington Department of Natural Resources, and the U.S. Fish and Wildlife Service (if federally protected species are found). The Applicant and the agencies will work together to determine the appropriate conservation and mitigation measures should potential impacts on any rare plants be possible as a result of ground-disturbing activities.

MM VEG-2. Conduct Aquatic Vegetation Surveys Prior to Construction.

To ensure that aquatic plants along the shoreline of the Columbia River are not affected, the Applicant will conduct an aquatic plant survey along the shoreline of the project area prior to commencing in-water work associated with construction of Docks 2 and 3 and construction related dredging, including all areas within the shallow water zone adjacent to the proposed docks. If areas of aquatic vegetation are found, the Applicant will notify the Washington Department of Natural Resources, Cowlitz County, and the U.S. Fish and Wildlife Service, and work with these agencies to develop appropriate conservation or mitigation measures before beginning any in-water work.

MM VEG-3. Replant Areas Temporarily Disturbed during Construction.

To ensure that disturbed native vegetation is restored, after construction the Applicant will replant vegetated areas temporarily disturbed during construction with native vegetation suitable for site conditions post-construction. The Applicant will monitor replanted vegetation annually for 5 years and will ensure the survival of 80% of all replanted vegetation. The Applicant will submit annual monitoring reports to Cowlitz County.

MM VEG-4. Develop and Implement a Revegetation Plan.

To mitigate permanent removal of vegetation from project construction, the Applicant will develop and implement a revegetation plan for the project area. This plan will be approved by Cowlitz County prior to implementation and will be consistent with the Cowlitz County Critical Areas Ordinance 19.15.170.

MM VEG-5. Control Noxious Weeds.

To limit the invasion and colonization of noxious weeds on disturbed land, the Applicant will monitor for noxious weeds during construction and operations. The Applicant will coordinate with the Cowlitz County Noxious Weed Control Board if noxious weeds are detected.

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 PM 10 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-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 application of surfactants along the rail routes for Proposed Action-related trains.MM WQ-2. Develop and Implement a Coal Spill Containment and Cleanup Plan.

MM WQ-2. Develop and Implement a Coal Spill Containment and Cleanup Plan.

To limit the exposure of spilled coal to the terrestrial, aquatic, and built environments during coal handling, the Applicant will develop a containment and cleanup plan. The plan will be reviewed by Cowlitz County and Ecology and implemented prior to beginning operations.

4.6.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the mitigation measures and design features described above would reduce impacts on vegetation. There would be no unavoidable and significant adverse environmental impacts.

4.7 Fish

Fish and fish habitat are important resources of the Columbia River. They include fish listed as endangered or species of concern under state or federal regulations. Resident or anadromous[1] fish species support important tribal, commercial and recreational fisheries and are integral to a healthy freshwater and marine ecosystems.

This section describes fish in the study area. It then describes impacts on fish 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.

4.7.1 Regulatory Setting

Laws and regulations relevant to fish are summarized in Table 4.7-1.

Table 4.7-1. Regulations, Statutes, and Guidelines for Fish

Regulation, Statute, Guideline	Description
Federal	
Endangered Species Act (16 USC 1531 *et seq*.)	Requires that applicants seeking a federal action such as issuing a permit under a federal regulation (e.g., NEPA, Clean Water Act, Clean Air Act) undergo consultation with USFWS and/or NMFS. This will ensure the federal action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. NMFS is responsible for managing, conserving, and protecting ESA-listed marine species. USFWS is responsible for terrestrial and freshwater species. Both NMFS and USFWS are responsible for designating critical habitat for ESA-listed species.
Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267)	Requires fishery management councils to include descriptions of essential fish habitat and potential threats to essential fish habitat in all federal fishery management plans. Also requires federal agencies to consult with NMFS on activities that may adversely affect essential fish habitat.
State	
Washington State Growth Management Act (36.70A RCW)	Defines a variety of critical areas, which are designated and regulated at the local level under city and county critical areas ordinances. These critical areas may include shorelines or portions of fish habitat.
Washington State Shoreline Management Act (90.58 RCW)	Requires cities and counties (through Shoreline Master Programs) to protect shoreline natural resources.

[1] *Anadromous* describes a life history of migration between fresh water and salt water. Reproduction and egg deposition occur in fresh water while rearing to the adult stage occurs in the ocean.

Regulation, Statute, Guideline	Description
Washington State Hydraulic Code (WAC 220-660)	WDFW issues a hydraulic project approval for certain construction projects or activities in or near state waters. The hydraulic code was specifically designed to protect fish life.
Clean Water Act Section 401 Water Quality Certification	Ecology issues Section 401 Water Quality Certification for in-water construction activities to ensure compliance with state water quality standards and other aquatic resources protection requirements under Ecology's authority as outlined in the federal Clean Water Act.
Local	
Cowlitz County Critical Areas Ordinance (CCC 19.15)	Regulates activities within and adjacent to critical areas.
Cowlitz County Shoreline Master Program (CCC 19.20)	Regulates development within shoreline jurisdiction, including the shorelines of the Columbia River, a Shoreline of Statewide Significance.

Notes:
USC = United States Code; NEPA = National Environmental Policy Act; USFWS = U.S. Fish and Wildlife Service; NMFS = National Marine Fisheries Service; ESA = Endangered Species Act; RCW = Revised Code of Washington; WAC = Washington Administrative Code; WDFW = Washington Department of Fish and Wildlife; CCC = Cowlitz County Code; Ecology = Washington State Department of Ecology

4.7.2 Study Area

The study area for direct impacts on fish is the main channel of the Columbia River 3.92 miles upstream and downstream of the project area, measured from the two proposed docks (Figure 4.7-1). This study area accounts for the area where noise from construction or operation of the Proposed Action could affect fish.

The study area for indirect impacts on fish extends downstream from the project area to the mouth of the Columbia River (Figure 4.7-2). This extended study area accounts for areas with shallow-sloping beaches on which fish could be stranded by wakes from the 70 large vessels that would be operated monthly for the Proposed Action. An indirect study area was also established to evaluate the potential impacts that could occur as a result of a coal spill, which includes the rail routes for Proposed Action-related trains in Cowlitz County and Washington State to transport coal to the coal export terminal (refer to Chapter 5, Section 5.1, *Rail Transportation,* for rail routes in Cowlitz County and Washington State).

4.7.3 Methods

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

Figure 4.7-1. Fish Direct Study Area

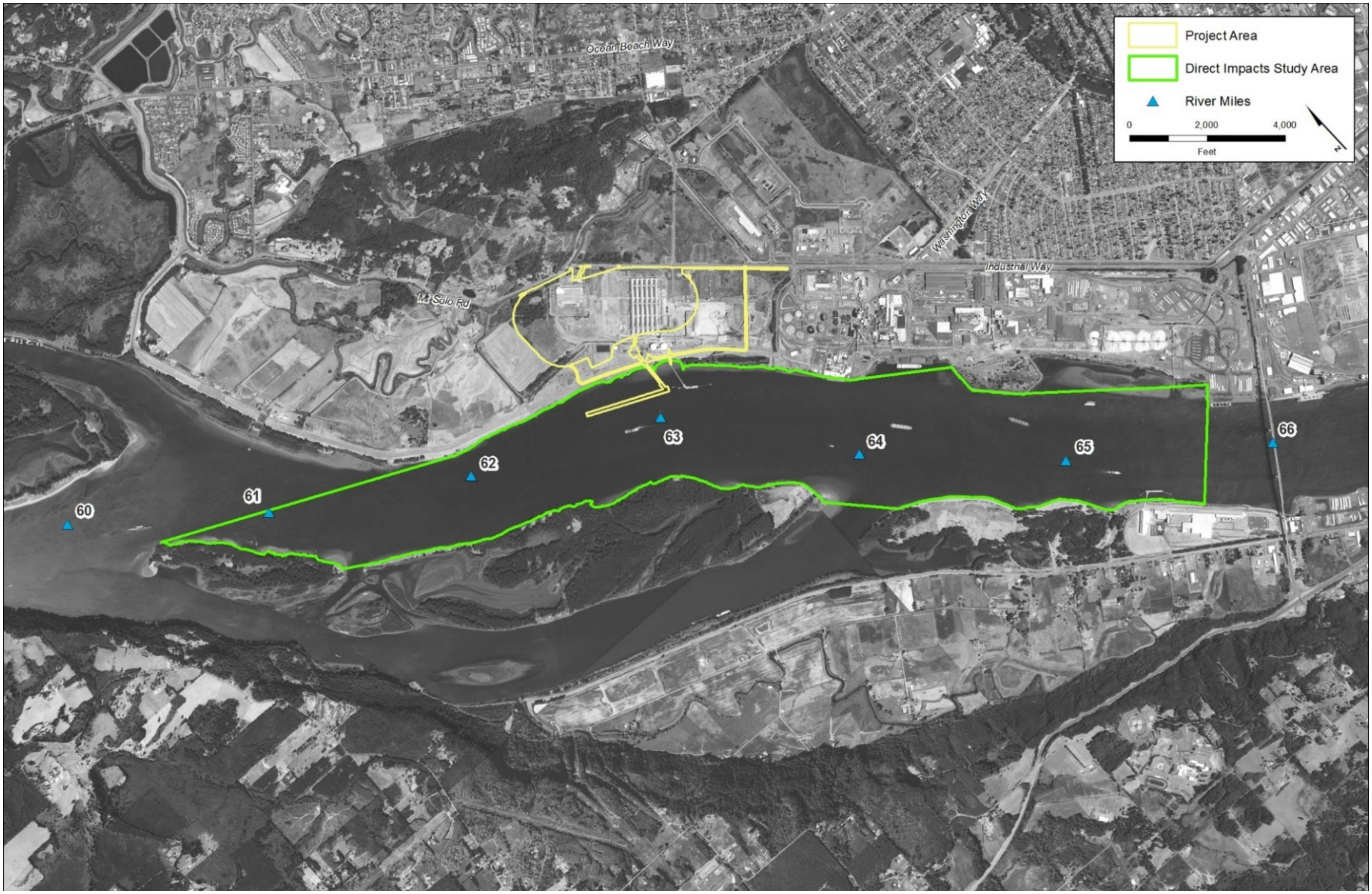


Figure 4.7-2. Fish Indirect Study Area

4.7.3.1 Information Sources

The following sources of information were used to define the existing conditions relevant to fish and identify the potential impacts of the Proposed Action and No-Action Alternative on fish in the study areas. These sources focus on fish, fish habitat, and aquatic resources in the study areas and, specifically, the aquatic and shoreline habitat adjacent to the project area.

- One site visit conducted by ICF International fish biologists on January 29, 2014.
- Reports prepared by Grette Associates for the Applicant as part of the permit application materials. (Grette Associates 2014a, 2014b, 2014c, 2014d, 2014e, 2014f).
- National Oceanic and Atmospheric Administration (NOAA) Fisheries West Coast Region species list and listing packages (2014a, 2014b
- U.S. Fish and Wildlife Service (USFWS) (2014) Information, Planning, and Conservation system online database.
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) geographic information system (GIS) data (2015a) and SalmonScape data (2015b).
- Washington Department of Natural Resources, Natural Heritage Program (2014).
- Washington State Department of Ecology (Ecology) 303(d)/305(b) Integrated Report Viewer (2014).
- Fish Passage and Timing Data Columbia River Data Access in Real Time, Columbia Basin Research, University of Washington (juvenile and adult fish passage) (Columbia River Research 2014).

A detailed list of references is provided in the *SEPA Fish Technical Report* (ICF International 2016a).

4.7.3.2 Impact Analysis

Potential fish and fish habitat that could be affected by construction and operation of the Proposed Action were determined as follows. For more information on these methods, see the *SEPA Fish Technical Report*.

Identifying Resources in the Study Area

The following species and habitat characteristics were identified and quantified, where possible.

- Documented species occurrences.
- Species likely to occur in the study area.
- Suitable habitat conditions.

Impacts on fish species are qualitatively described because fish are generally mobile and their presence and abundance in the study area cannot be quantitatively predicted at a specific location or time. Where appropriate, species sensitivity to construction or operation impacts is discussed.

Assessing Noise Impacts

Federal agencies have established interim criteria to protect fish from underwater noise generated by pile-driving (Fisheries Hydroacoustic Working Group 2008; Carlson et al. 2007). The criteria indicate that sound pressure levels ranging from 150 to 206 decibels (dB) peak could injure fish or change their behavior, depending on the size of the fish. Specific dB criteria for Endangered Species Act (ESA)-listed fish are provided in Table 4.7-2. NMFS assumes that a 12-hour recovery period with no exposure to sound is necessary to return to appropriate cumulative sound levels (Stadler and Woodbury 2009).

Table 4.7-2. Underwater Sound-Level Thresholds for Endangered Species Act-Listed Fish

Species	Effect Type	Threshold
All Listed Fish[a]	Injury, cumulative sound (fish ≥2 grams): onset of TTS (auditory response), with onset of auditory tissue damage and nonauditory tissue damage with increasing cumulative sound	187dBSELcum
	Injury, cumulative sound (fish <2 grams): similar to above, onset of nonauditory tissue damage occurs at lower sound levels with smaller fish	183dBSELcum
	Injury, single strike: onset of TTS and auditory tissue damage from single strike	206dBPEAK
	Behavioral Disruption	150dBRMS

Notes:

[a] Injury thresholds are based on interim criteria that were developed for salmonids based on data specific to hearing generalists with swim bladders (Carlson et al. 2007). NMFS also applied these thresholds to other listed fish with swim bladders (e.g., green sturgeon) and sometimes conservatively to fish without swim bladders (e.g., eulachon). Injury descriptions are based on information summarized in Carlson et al. (2007).

Source: Grette Associates 2014a.

TTS = temporary threshold shift; dB = decibel; SEL = sound exposure level; cum = cumulative; RMS = root mean square.

The criteria for sound pressure levels and underwater noise thresholds described above were applied to proposed pile-driving activities for the Proposed Action. Because the project area is similar to the Columbia River Crossing (the site of a proposed interstate crossing of the Columbia River, between Portland, Oregon and Vancouver, Washington), underwater noise characteristics from pile-driving at that site were used to calculate per-pile levels of underwater noise for the 36-inch diameter pile used for the Proposed Action (Grette Associates 2014b).

A complete description of noise impact models, calculations, and assessments is provided in the *SEPA Fish Technical Report*. Further, project-related vessels could generate underwater noise levels that could cause disturbance, as measured by the applicable noise thresholds for fish. Vessel noise levels were obtained from available literature, and are described in the *SEPA Fish Technical Report*.

4.7.4 Existing Conditions

This section describes the existing environmental conditions in the direct and indirect study areas related to fish that could be affected by the construction and operation of the Proposed Action and the No-Action Alternative. Key terms used in this section are defined in Table 4.7-3.

Table 4.7-3. Definitions of Key Terms

Term	Acronym	Definition
Active channel margin	ACM	The shoreline and nearshore edge habitat, extending from the OHW line to 0 feet (Columbia River Datum)
Columbia River Datum	CRD	The adopted fixed low water reference plane for the lower Columbia River.
Decibel	dB	A logarithmic unit used to express the ratio of two values of a physical quantity, often power or intensity.
Deepwater zone	DWZ	The area extending from the edge of the SWZ, approximately 450 feet from the shore at a depth of 31 feet, outward to a maximum depth of 56 feet deep approximately 1,200 feet from shore.
Distinct population segment	DPS	The smallest division of a taxonomic species permitted to be protected under the ESA.
Essential fish habitat	EFH	Per the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act, EFH includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.
Evolutionarily significant unit	ESU	A population of organisms that is considered distinct for purposes of conservation.
Peak	PEAK	The instantaneous maximum overpressure or underpressure observed during each pulse during pile-driving.
Primary constituent element	PCE	A physical or biological feature essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species' historic geographic and ecological distribution.
Priority habitat and species	PHS	Program fulfilled by WDFW to provide important fish, wildlife and habitat information to local governments, state and federal agencies, private landownders and consultants, and tribal biologists for land use planning purposes.
Root mean square	RMS	The square root sound of the energy divided by the impulse duration. Essentially, the average of the PEAK energy measured over time.
Shallow water zone	SWZ	The fully inundated near-shore zone extending from the edge of the ACM at 0 feet CRD out to -20 feet CRD.

Term	Acronym	Definition
Sound exposure level	SEL	A metric for acoustic events, often used as an indication of the energy dose.
Temporary threshold shift	TTS	Temporary hearing damage.

The lower Columbia River (Bonneville Dam to the mouth of the Columbia River), which encompasses the study areas, has been affected by extensive modifications for flood control, industrial development, and deep draft vessel traffic. The mainstem Columbia River is deeper than it was historically because of the deepening and periodic maintenance dredging of the navigation channel and the berths in and adjacent to the existing and proposed docks. The hydrologic regime and water temperature have been altered by the operation of dams throughout the Columbia River basin. River flows can reverse direction during periods when river flows are low and incoming tides are large. Although the flow may reverse in response to tidal fluctuation, saltwater does not intrude as far upstream as the study area and the water remains fresh through the tidal cycle. The study area can be considered a high energy environment, characterized by strong currents, active bedload transport, and variable patterns of sediment of deposition and erosion (Grette Associates 2014c).

Floodplain habitats have been disconnected from the riverine environment and in some cases eliminated. The shoreline and riparian environment has been substantially altered by extensive shoreline armoring and protection, construction of overwater structures, and development in adjacent upland and riparian zones. These modifications have eliminated and substantially altered habitat conditions and degraded habitat-forming processes, resulting in corresponding changes to the biological communities associated with these habitats.

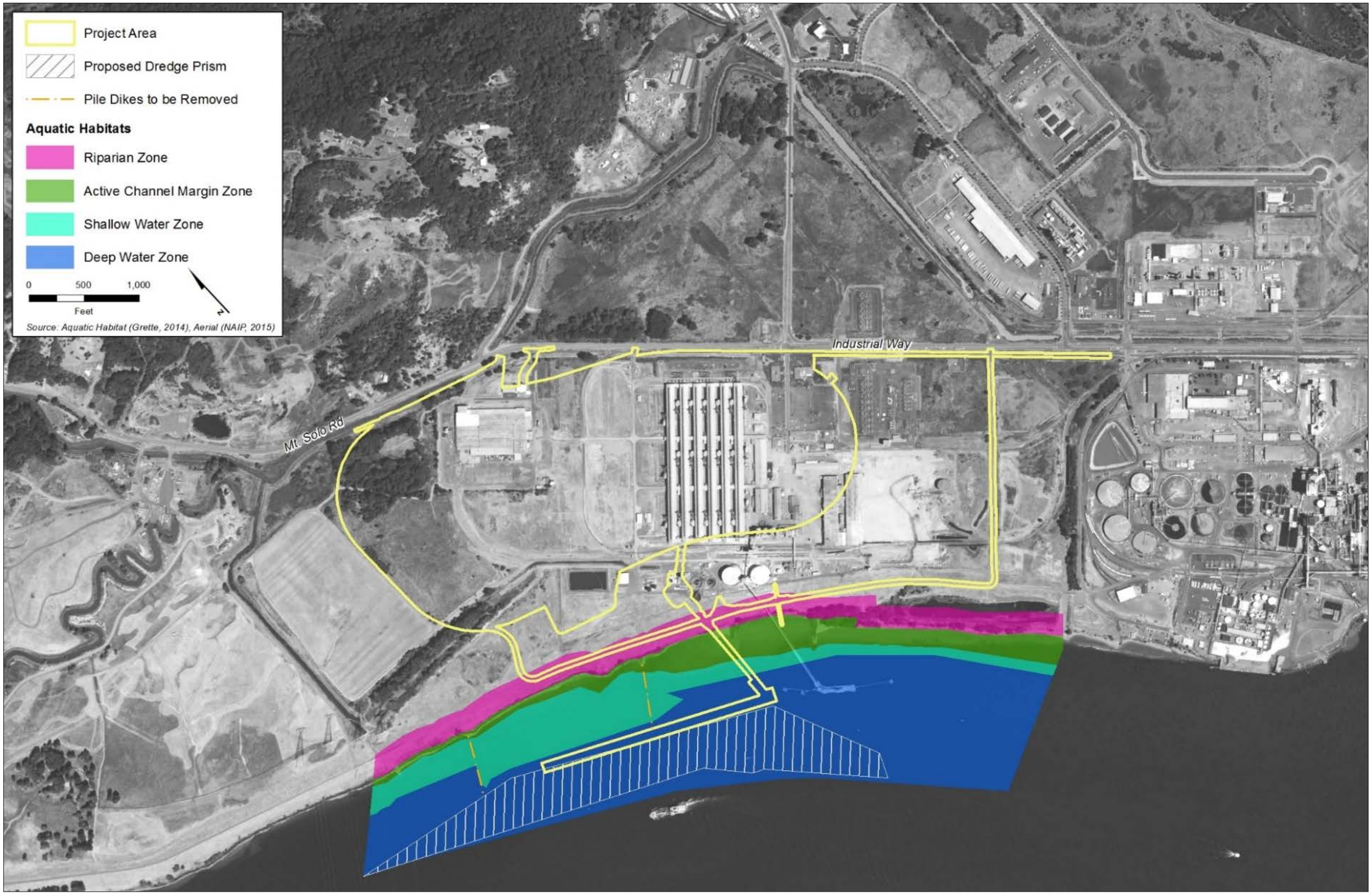
The Columbia River estuary is downstream of the project area. It has been considerably degraded from past use due to diking and filling and from water withdrawal for agricultural, municipal, and industrial purposes. The estuary is also influenced by a number of physical structures (e.g., jetties, pilings, pile dikes, bulkheads, revetments, and docks) that contribute to its overall degradation. Habitat-forming processes in the lower river and estuary have also been altered by loss of upstream sediment input (now constrained behind upriver dams), changes in flow patterns that move sediments and modify landforms, and channel deepening and dredging.

4.7.4.1 Aquatic Habitat Types

The aquatic habitat in the study area is discussed in terms consistent with habitat equivalency analysis,[2] which describes habitat quality in the context of habitat availability and suitability as a function of water depth and physical attributes. The aquatic portion of the study area adjacent to the project area is composed of three broad habitat types (Grette Associates 2014a): the active channel margin (ACM), the shallow water zone (SWZ), and the deepwater zone (DWZ). The riparian zone is also considered in terms of its interactions with aquatic habitats, as the riparian zone is the transition from aquatic to upland/terrestrial habitat. A plan view showing the extent of each habitat type is provided in Figure 4.7-3.

2 Habitat equivalency analysis is a tool that can be used to estimate habitat gains and losses across a range of habitat types

Figure 4.7-3. Aquatic Habitat Types Potentially Affected by the Proposed Action



Riparian Zone

The riparian zone includes lands extending approximately 200 feet landward from ordinary high water mark (OHWM). Shoreline armoring and Consolidated Diking Improvement District (CDID) #1 levees have contributed to a low-complexity and artificially steepened upper shoreline with no floodplain connectivity downstream of the proposed new docks. Landward of the shoreline, most of the riparian area has been heavily modified such that there is little remaining habitat function (Grette Associates 2014a). Relative to shoreline areas with intact riparian habitat, the habitat equivalency analysis would rank shoreline habitat at a lower value, especially when compared to similar areas with intact riparian habitat (e.g., Lord Island, immediately across the river) (Grette Associates 2014a).

Active Channel Margin

The ACM is defined as the shoreline and nearshore edge habitat. The ACM near the proposed docks covers approximately 25 acres and extends from 25 to 350 feet offshore with a maximum depth of about 11 feet (Figure 4.7-2). Water levels in the ACM fluctuate continuously. Portions of the ACM are periodically dewatered by tidal influence and river flow conditions, with the extent and duration of exposure dependent on site-specific topography. Habitat functions in the ACM are strongly influenced by the condition of the shoreline and adjacent riparian zone. The shoreline in this area is highly modified by levees and riprap armoring with scattered large woody debris.

Shallow Water Zone

The SWZ includes the fully inundated near-shore zone extending waterward from the edge of the ACM. The SWZ covers approximately 34 acres near the proposed docks and extends from approximately 25 to 500 feet offshore with maximum depths ranging from 11 to 31 feet. Bottom structure is primarily (90%) flat or shallow sloping substrate, with some moderate slopes out to depths of about 25 feet, where the slope becomes markedly steeper. The substrate consists primarily of silty river sand with little organic matter (Grette Associates 2014a).

Deepwater Zone

The DWZ encompasses approximately 115 acres near the proposed docks, extending waterward from the edge of the SWZ. At approximately 450 feet from the shore, it is 31 feet deep; at 1,200 feet from shore, it reaches 56 feet deep. The DWZ is a dynamic environment, characterized by relatively high flows (high water velocity) and sediment transport. Sediments are composed of fine grain sands with little to no gravel or cobble for structure (Grette Associates 2014a).

4.7.4.2 Focus Fish Species

Fish species of special interest include federally and state-listed threatened and endangered fish and their designated critical habitat, as well as species of commercial, recreational, or cultural importance. Table 4.7-4 outlines the focus fish species, the listing status of each species (i.e., state and federal), habitat types these species typically occupy, and their seasonal occurrence in the study area. Other common native and introduced fish species also occur in the study area.

Salmon and Trout

Eight threatened or endangered salmon evolutionarily significant units (ESUs), five threatened steelhead distinct population segments (DPSs), one threatened bull trout DPS, and their designated critical habitats occur in the study area (Table 4.7-4) (Bottom et al. 2008; National Marine Fisheries Service 2011). In addition, essential fish habitat (EFH) has been designated for Chinook and coho salmon in the lower Columbia River. The Columbia River estuary is used primarily as migratory and rearing habitat by salmon, steelhead, and bull trout (salmonid), and no salmonid spawning takes place in the study area. Adult anadromous salmonids travel through the estuary and lower river relatively quickly during their migration to upstream spawning grounds, remaining primarily in offshore deepwater habitats. In contrast, juvenile salmonids use a wider variety of habitats and exhibit more variable downstream migration speed, taking advantage of shallow water and ACM for foraging and seeking cover.

General salmon reproductive strategies can be divided into two groups: stream-rearing and ocean-rearing. Stream-rearing fish tend to spend extended periods of time, usually more than a year, rearing in fresh water before emigrating to the ocean. Examples of stream-type fish are steelhead, coho and spring-run Chinook salmon. In contrast, ocean-type juvenile salmonids tend to return to the ocean in the same year they were spawned. Examples of ocean-type fish are chum salmon, and fall-run Chinook salmon. These strategies affect how each population uses the estuary and how it may be affected by the Proposed Action.

Designated critical habitat for federally protected salmonids within the study area consists of two primary elements: migration corridors and estuarine areas. Additionally, the Columbia River is also EFH, as defined by the Magnuson-Stevens Fishery and Management Conservation Act for Chinook salmon and coho salmon. EFH for Pacific salmon is defined as those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem.

A fully functioning ACM provides natural cover (large woody debris, undercut banks, overhanging vegetation), shoreline complexity, shade, submerged and overhanging large woody debris, logjams, and aquatic vegetation. All of these elements are identified in the primary constituent elements (PCEs) of critical habitat for ESA-listed salmon and steelhead, as well as bull trout (Grette Associates 2014a). PCEs are defined as those physical and biological features that a species needs to survive and reproduce. The ACM provides important habitat for juvenile salmon, with different species using different habitat types at different life stages. Table 4.7-4 identifies the seasons when salmon and steelhead species could be present in the ACM portion of the study area.

The SWZ is used primarily as a migratory corridor by adult salmon and steelhead and as foraging habitat by larger juveniles that are capable swimmers in open water. Juvenile Chinook salmon, and sockeye salmon and steelhead smolts are typically found in deeper open water in the SWZ, where they forage on phytoplankton, invertebrates, and small fish (Bottom et al. 2008; Carter et al. 2009). Juvenile Chinook salmon are most commonly present from March through July but juveniles of certain runs may be found in the SWZ during any month of the year. Juvenile coho salmon and steelhead are less likely to be found in the shallower areas but are abundant in deepwater offshore habitats during their outmigration period (Roegner and Sobocinski 2008), indicating that they likely occur in the deeper areas of the SWZ.

Table 4.7-4. Status of Focus Species and Seasonal Presences in the Study Area[a]

Species	Evolutionarily Significant Units/ Distinct Population Segments	Status Federal/ State	Life History Type	Critical Habitat Present in Study Area	Habitat Type	Expected Seasonal Presence[c]			
						Winter	Spring	Summer	Fall
Chinook Salmon[b] (*Onchorhyncus tshawytscha*)	Lower Columbia River	T/SC	O	Yes	ACM	X	X	X	
					SWZ		X	X	X
					DWZ	X	X	X	X
	Upper Willamette River	T/NL	O	Yes	ACM	X	X		
					SWZ		X		X
					DWZ	X	X		X
	Deschutes River Summer/Fall Run	NL/NL	O	NA	ACM		X	X	
					SWZ		X	X	X
					DWZ		X	X	X
	Middle Columbia River Spring Run	NL, PHS	S	NA	ACM				
					SWZ				
					DWZ		X		
	Upper Columbia River Summer/Fall Run	NL, PHS	0	NA	ACM		X	X	
					SWZ		X	X	X
					DWZ		X	X	X
	Upper Columbia Spring Run	E/SC	S	Yes	ACM				
					SWZ		X		
					DWZ		X		
	Snake River Fall Run	T/SC	O	Yes	ACM		X	X	
					SWZ		X	X	X
					DWZ		X	X	X
	Snake River Spring/Summer Run	T/SC	S	Yes	ACM				
					SWZ		X	X	
					DWZ		X	X	
Coho Salmon (*O. kisutch*)	Lower Columbia River	T/NL	S	Proposed	ACM	X	X	X	
					SWZ	X	X	X	X
					DWZ		X		X

Species	Evolutionarily Significant Units/ Distinct Population Segments	Status Federal/ State	Life History Type	Critical Habitat Present in Study Area	Habitat Type	Expected Seasonal Presence[c]			
						Winter	Spring	Summer	Fall
Chum Salmon (*O. keta*)	Columbia River	T/SC	O	Yes	ACM	X	X		
					SWZ	X	X		X
					DWZ				X
Sockeye Salmon (*O. nerka*)	Snake River	E/SC	S	Yes	ACM				
					SWZ		X	X	
					DWZ		X	X	
	Okanogan River	NL, PHS	S	NA	ACM				
					SWZ		X	X	
					DWZ		X	X	
	Lake Wenatchee	NL, PHS	S	NA	ACM				
					SWZ		X	X	
					DWZ		X	X	
Steelhead Trout (*O. mykiss*)	Snake River	T/SC	S	Yes	ACM				
					SWZ		X	X	X
					DWZ		X	X	X
	Upper Columbia River	T/SC	S	Yes	ACM				
					SWZ		X	X	X
					DWZ		X	X	X
	Middle Columbia River	T/SC	S	Yes	ACM				
					SWZ		X	X	X
					DWZ		X	X	X
	Lower Columbia River	T/SC	S	Yes	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X
	Upper Willamette River	T/NL	S	Yes	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X
Pink Salmon (*O. gorbuscha*)		NL/NL	0	NA	ACM				
					SWZ		X	X	
					DWZ		X	X	

Species	Evolutionarily Significant Units/ Distinct Population Segments	Status Federal/ State	Life History Type	Critical Habitat Present in Study Area	Habitat Type	Expected Seasonal Presence[c]			
						Winter	Spring	Summer	Fall
Bull Trout (*Salvelinus confluentus*)	Columbia River	T/SC	NA	Yes	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X
Cutthroat Trout (*Oncorhynchus clarki clarki*)	Columbia River	NL/NL	NA	NA	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X
Green Sturgeon (*Acipenser medirostris*)	Southern and Northern	T/NL (Southern) SOC/NL (Northern)	NA	Yes	ACM				
					SWZ			x	x
					DWZ			x	X
White Sturgeon (*A. transmontanus*)	Lower Columbia River	NL, PHS	NA	NA	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X
Eulachon (*Thaleichthys pacificus*)	Southern	T/SC	NA	Yes	ACM		X		
					SWZ	X	X	X	
					DWZ	X	X	X	
Pacific (*Entosphenus tridentatus*) and River Lamprey (*Lampetra ayresii*)	Multiple populations	NL, PHS	NA	NA	ACM				
					SWZ	X	X	X	X
					DWZ	X	X	X	X

Notes:

[a] Based on Fresh et al. (2005).

[b] Information for Chinook salmon is referenced from Roegner et al. (2012, 2013), Columbia River Research (2014), and Bottom et al. (2008). Lowercase "x" denotes that species/life stage use of this habitat type is limited relative to other habitat types.

[c] Seasons are based on Roegner et al. (2012, 2013): December–February = Winter; March–June = Spring; July–August = Summer; and September–November = Fall.

T = Federal Threatened; E = Federal Endangered; SOC = Species of Concern; SC = State Candidate; NL = not listed; PHS = priority habitats and species; NA = not applicable; ACM = active channel margin, SWZ = shallow water zone, DWZ = deepwater zone; O = ocean-type characterized by upstream migration as mature spawners, fry and fingerlings dominate age class in estuary, migrate to sea in same year as spawned, most affected by flow and habitat; S = stream-type characterized by upstream migration in unripened condition, extended rearing in stream, yearling or older age class dominate in estuary, affected by flow and predation.

The DWZ provides a migratory corridor for adult salmon and steelhead and foraging and migratory habitat for larger juvenile Chinook salmon, coho salmon, and sockeye salmon and steelhead smolts pursuing phytoplankton, invertebrates, and small fish (Bottom et al. 2008; Carter et al. 2009; Roegner and Sobocinski 2008). Generally, juvenile salmonids do not reside in specific habitats in the lower Columbia River for extended periods, remaining in a given area for just a day or two before moving downstream to new suitable habitats (Bottom et al. 2008; Johnson et al. 2003). Juvenile and adult salmon and steelhead are likely to be found in the DWZ during their respective migration and rearing periods (Table 4.7-4) as outmigrating salmonids (particularly stream type) tend to use deepwater (Carter et al. 2009).

Bull Trout (Char)

Columbia River bull trout are listed as threatened, and there is one extant population in the Lewis River subbasin, which drains to the lower Columbia River below Bonneville Dam. Bull trout migrate to the mainstem Columbia River to rear, overwinter, or migrate to and from spawning areas. Subadults may occur in the study area throughout the year in shallow rearing habitats of the ACM and SWZ while adults are more likely to occur in the deeper areas of the SWZ and the DWZ (U.S. Army Corps of Engineers 2004).

Eulachon

Eulachon are small anadromous fish in the smelt family (*Osmeridae*), sometimes known as Columbia River smelt (among other names), that spawn in coastal rivers and migrate to the ocean to rear to adulthood. The lower Columbia River up to Bonneville Dam and the lower reaches of those tributary streams that provide potential spawning habitats (i.e., Grays, Elochoman, Cowlitz, Kalama, Lewis and Sandy Rivers) have been designated as critical habitat (76 *Federal Register* [FR] 65324). Currently, the lower mainstem Columbia River and the Cowlitz River support the majority of eulachon production in the system (Gustafson et al. 2010). However, in years of relative abundance, spawning occurs broadly in the tidally influenced portions of the Columbia River and its tributaries (Grette Associates 2014c).

Recent studies have documented egg and larval stage eulachon between the Port of Longview above Barlow Point and the channel below the Cowlitz River mouth including four sample sites offshore of the project area (Mallette 2014). Peak larval abundance occurred in mid-March during two of the three survey years and in late April/early May in the third (Mallette 2014). Eggs could be present From December through April; however, peak of spawning season is usually in February or March. Larval eulachon, particularly from spawning aggregations in the Cowlitz River, likely pass through the study area as they are transported downstream.

Adult eulachon could arrive in the study area as early as November, although most adults would migrate through the study area during peak spawning between February and March. Eggs from early spawners could be transported with currents from the tributaries downstream to portions of the study area where suitable incubation conditions exist (i.e., sand waves) shortly thereafter. Emergent larvae could be present in the study area as early as December. However, based on the timing of peak spawning, and because incubation occurs for 1 to 2 months (Grette Associates 2014b), peak larval transport has been shown to occur between mid-March and early May (Mallette 2014).

Dredging in the Columbia River is identified as an activity of concern for eulachon conservation because this activity takes place in proximity to known and potential eulachon habitats. Dredging activities during the migratory and spawning period could entrain and kill adult fish, eggs, and larvae; bury and smother incubating eggs; or cause stress and disturbance that could contribute to decreased spawning success (National Marine Fisheries Service 2010).

Sturgeon

Both green and white sturgeon may be present in the deepwater habitats of the study area as adults and subadults. Two green sturgeon DPSs occur in in the lower Columbia River. While this species does not spawn in the Columbia River or its tributaries, subadult and adult green sturgeon from all major spawning populations use the lower Columbia River and other coastal estuaries in Oregon and Washington for holding habitat in the summer and early fall (Adams et al. 2002; Lindley et al. 2011; Moser and Lindley 2007). Sturgeon are most commonly found in association with the bottom, where they feed on a mixture of aquatic insects and benthic (i.e., bottom dwelling) invertebrates (Adams et al. 2002; Independent Scientific Review Panel 2013). The water depth preferences of white sturgeon indicate this species is most likely to be found in the DWZ, but individuals may also be present in the SWZ and, infrequently, in the ACM. The DWZ near the proposed docks does not provide suitable substrates for white sturgeon spawning or larval rearing, so these life stages are unlikely to occur for extended periods in this area. In contrast, juvenile white sturgeon are found throughout the lower Columbia River and use a wide variety of habitats, including both main-channel and off-channel areas. They are most commonly found at depths greater than 33 feet (Independent Scientific Review Panel 2013).

The white sturgeon population in the Columbia River downstream from Bonneville Dam has been among the most productive sturgeon populations in North America. White sturgeon downstream from Bonneville Dam continue to range freely throughout the lower river mainstem, estuary, and marine habitats to take advantage of dynamic seasonal patterns of food availability. Individual growth, condition, and maturation values from the Lower Columbia River remain among the highest observed for white sturgeon range-wide. Habitat use of subadults and adults varies with habitat availability. Given the abundance and mobility of white sturgeon in the Lower Columbia River, there likely would be some present during construction and operation of the Proposed Action.

Lamprey

Lamprey are primitive anadromous fish that spend their adult lives in the ocean but return to freshwater habitats for spawning and larval rearing. Two species, Pacific and river lamprey, spawn in tributaries to the Columbia River and migrate through the study area as adults and juveniles. Adults migrate through the lower Columbia River from March through October on their return to spawning tributaries (Columbia River Research 2014). Adult lamprey ascend rivers by swimming upstream briefly, sucking to rocks, resting, and then proceeding. Larval lamprey (ammocoetes) hatch after 2 to 3 weeks and are dispersed downstream by currents to slack-water areas with soft substrates, where they settle in sediments. The larval lamprey burrow into soft substrate where they may reside for 3 to 8 years as filter feeders. Late in the larval lamprey's life stage, unknown factors trigger metamorphosis, when larval lamprey become juvenile lamprey. During late winter or early spring, juvenile lamprey migrate to the ocean where they mature. The study area lacks suitable spawning substrates for either species. Juvenile and adult lamprey may be present in the SWZ and DWZ during their respective migration periods (Table 4.7-4).

Nonfocus Fish

The nonfocus fish (Table 4.7-5) are important food fish (harvested commercially and recreationally), game fish (harvested recreationally), or on Washington's PHS list. Two of the species, mountain whitefish (*Prosopium williamsoni*) and leopard dace (*Rhinichthys falcutus*), are on Washington's PHS list as state candidate species. Both species are widely distributed in the Columbia and Frasier River basins. The remainder of the species in this group are important as commercial or recreational species. Most are abundant and widely distributed in the system, including several introduced species. Some are known predators of juvenile salmonid, such as largemouth bass, northern pikeminnow, smallmouth bass, striped bass, and walleye.

Table 4.7-5. Nonfocus Fish Species that Could Occur in the Study Area

Species	Reason for Interest	Native or Introduced
Channel catfish (*Ictalurus punctatus*)	WDFW game fish	I
Common carp (*Cyprinus carpio*)	WDFW food fish	I
Largemouth bass (*Micropterus salmoides*)	WDFW game fish	I
Leopard dace (*Rhinichthys falcutus*)	WDFW PHS	N
Mountain sucker (*Catostomus platyrhuchus*)	WDFW PHS, WDFW game fish	N
Mountain whitefish (*Prosopium williamsoni*)	WDFW game fish	N
Northern pikeminnow (*Ptychocheilus oregonensis*)	WDFW game fish	N
Peamouth (*Mylocheilus caurinus*)	WDFW game fish	N
Perch (family Percidae)	WDFW game fish	I
Shad (subfamily Alosinae)	WDFW food fish	I
Smallmouth bass (*Micropterus dolomieu*)	WDFW game fish	I
Suckers (family Catostomidae)	WDFW game fish	N
Sunfish (family Centrarchidae)	WDFW game fish	I
Striped bass (*Morone saxatilis*)	WDFW game fish	I
Walleye (*Sander vitreus*)	WDFW game fish	I

Notes:
Source: Grette Associates 2014a.
WDFW = Washington Department of Fish and Wildlife; PHS = Priority Habitats and Species; I = introduced; N = native

Commercial, Tribal and Recreational Fishing

Commercial, tribal and recreational fisheries in the lower Columbia River are managed by the States of Washington and Oregon, and tribes, subject to the terms of the 2008–2017 *United States v. Oregon* Management Agreement. The agreement establishes tribal harvest allocations and upholds the right of tribes to fish for salmon in their usual and accustomed fishing grounds. Commercial and recreational fishing primarily target hatchery-produced salmon and steelhead, as well as sturgeon and other game fish. Tribal fish resources are discussed in Chapter 3, Section 3.6, *Tribal Resources*.

Commercial fisheries in these waters are managed under the Columbia River Compact, a congressionally mandated process that adopts seasons and rules for Columbia River commercial fisheries (National Marine Fisheries Service 2015). The Columbia River Compact consists of the Washington and Oregon Departments of Fish and Wildlife Directors or their delegates, acting on behalf of the Oregon and Washington Fish and Wildlife Commission. The Columbia River Compact is charged by congressional and statutory authority to adopt seasons and rules for Columbia River commercial fishers. When addressing commercial seasons for salmon, steelhead, and sturgeon, the Columbia River Compact must consider the effect of the commercial fishery on escapement, treaty rights, and sport fisheries, as well as the impact on species listed under the federal ESA. Although the Columbia River Compact has no authority to adopt sport fishing seasons or rules, its inherent responsibility is to address the allocation of limited resources among users. This responsibility has become increasingly demanding in recent years. The Columbia River Compact can be expected to be more conservative than in the past when considering fisheries that will affect listed salmon and steelhead (National Marine Fisheries Service 2015).

In Washington, recreational fishing seasons and rules are updated annually and presented in the Washington Sport Fishing Rules pamphlet. Sport fishing seasons are generally established for July 1 through June 30 of the following year. The pamphlet covers all fresh waters and marine waters in Washington, including the lower Columbia River, and establishes the seasons and rules for recreational fishing for finfish and shellfish or seaweed.

Water Quality Conditions

Sediment conditions in the study area are generally uniform with slight variations between aquatic habitat types. ACM sediments are primarily sand mixed with silt, SWZ sediments are primarily sand, and DWZ sediments are primarily silt mixed with sand (Grette Associates 2014c). The Lower Columbia River is listed as a Washington State 303(d) impaired water and is classified by Ecology as a Category 5 polluted water for dissolved oxygen, Dieldrin (organochlorine insecticide), PCB (polychlorinated biphenyl), and 2,3,7,8 TCDD (tetrachlorodibenzo-p-dioxin), and 4,4,4 DDE (dichlorodiphenyldichloroethylene) (Grette Associates 2014c). The nearest measured water quality impairment (for dioxin and bacteria) occurs approximately 2.5 miles upstream of the project area (Washington State Department of Ecology 2014). Over the years, downstream salinity patterns have changed, but intrusion and salinity within the study area are generally similar to historic patterns. Turbidity in the study area consistently ranges from 29 to 67 nephelometric turbidity units (NTUs) at all depths (U.S. Army Corps of Engineers Dredged Material Management Office 2010 in Grette Associates 2014c). Water temperature within the study area ranges from low 40s to low 70s (°F), and while this is slightly warmer than historic values (Bottom et al. 2008), the area is not listed as a Washington State 303(d) impaired water for temperature. Salmonids typically move from habitat areas as temperatures approach 66°F, and the study area habitat within the ACM and upper SWZ likely reaches this threshold and may become unsuitable for juveniles salmonids in the summer months. Refer to the *SEPA Water Quality Technical Report* (ICF International 2016b) for further information regarding water quality conditions near the project area.

Fish Stranding

A growing body of evidence indicates that juvenile salmon and other fish are at risk of stranding on wide, gently sloping beaches because of wakes generated by deep draft vessel passage (Bauersfeld 1977; Hinton and Emmett 1994; Pearson et al. 2006; ENTRIX 2008). Depending on the slope and breadth of a beach, wakes from passing vessels can travel a considerable distance, carrying fish and depositing them on the beach where they are susceptible to stress, suffocation, and predation.

Pearson et al. (2006) published the most detailed study of Columbia River fish stranding completed to date. They evaluated stranding at three sites in the Lower Columbia River: Sauvie Island, Barlow

Point (adjacent to the project area), and County Line Park. The sites were chosen because prior work had established them as sites with a high risk of stranding (Bauersfield 1977). Pearson et al. (2006) observed 126 vessel passages, 46 of which caused stranding. They also measured numerous site variables such as fish density (measured via beach seining), site topography, river stage, current velocity, tidal stage, tidal height, and a variety of vessel variables including direction of movement, velocity, ship type, ship size, and draft. Although the study provides an understanding of the factors that contribute to stranding, it does not create a predictive model because it was limited to analysis of known or suspected high-risk sites. From the study, certain sites appear to be more susceptible to stranding than others. For example, the highest occurrence of stranding occurred at Barlow Point, where 53% of the observed passages resulted in stranding. Stranding occurred less frequently at Sauvie Island (37% of the observed passages resulted in stranding) and County Line Park (15% of observed passages resulted in stranding) (Person et al. 2006). The Proposed Action would add 840 vessel transits to the Columbia River at full build-out, which would introduce additional permanent risk of fish stranding in the Columbia River. However, Barlow Point is directly downstream from the Proposed Action and vessels would be slowing as they approach the docks and accelerating as they leave the docks, which could reduce the size of vessel wakes generated by vessels associated with the Proposed Action at Barlow Point. Other sites downstream of Barlow Point would be susceptible to increased risk of fish stranding because of the vessels associated with the Proposed Action.

4.7.5 Impacts

This section describes the potential direct and indirect impacts related to fish and fish habitat that would result from the construction and operation of the Proposed Action and the No-Action Alternative.[3]

4.7.5.1 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. The Applicant has identified the following design features and best management practices to be implemented as part of the Proposed Action, and were considered when evaluating potential impacts of the Proposed Action.

- The Applicant would design the trestle to be long and narrow, and at a height above OHW to minimize shading in the shallow water zone. From shore, the trestle would measure 24 feet in width for 700 feet, and 51 feet in width for the final 150 feet. The top of the deck would be +22 feet Columbia River Datum and the bottom of the deck +19.5 feet Columbia River Datum. Therefore, the bottom of the deck would be more than 8 feet above OHW. This design would minimize overall impacts in shallow water, including impacts on habitat connectivity along the shoreline.
- The Applicant would locate Docks 2 and 3 entirely in deepwater habitat to distance the structure and terminal activities from shallow water areas.
- The Applicant would locate the berthing area at depths of at least -20 feet Columbia River Datum to avoid habitat conversion from shallow to deepwater during dredging.

[3] Acreages presented in the impacts analysis were calculated using Geographic Information System (GIS), thus, specific acreage of impacts are an estimate of area based on the best available information.

- The Applicant would locate the berthing area in deepwater closer to the navigation channel to minimize the scope of future maintenance dredging.
- The Applicant would direct project lighting downward or at structures, and would incorporate shielding to avoid spillage of light into aquatic areas.
- The Applicant would include a pinpoint light source at the end of the shiploading boom, aimed straight down into the ship hold area to avoid a broader beam that could cause light spillage.
- The Applicant would remove the piles slowly to minimize sediment disturbance and turbidity in the water column.
- Prior to pile extraction, the Applicant would break the friction between the pile and substrate to minimize sediment disturbance.
- The Applicant would prepare a mitigation plan in coordination with the Corps, Ecology, and Cowlitz County to address the impacts on wetlands and aquatic habitats. Mitigation actions may be implemented at one or several locations to ensure that a wide range of ecological functions is provided to offset identified, unavoidable impacts of the Proposed Action. The mitigation actions may include applicant-sponsored mitigation actions or use of credits from existing or proposed mitigation banks.
- The Applicant would conduct impact pile-driving using a confined bubble curtain or similar sound attenuation system capable of achieving approximately 9 dB of sound attenuation.
- During pile removal and pile-driving, the Applicant would place a containment boom around the perimeter of the work area to capture wood debris and other materials released into the waters as a result of construction activities. The Applicant would collect all accumulated debris and dispose of it upland at an approved disposal site. The Applicant would deploy absorbent pads should any sheen be observed.
- The Applicant would provide a containment basin on the work surface on the barge deck or pier for piles and any sediment removed during pulling. The Applicant would dispose of any sediment collected in the containment basin at an appropriate upland facility, as with all components of the basin (e.g., straw bales, geotextile fabric) and all pile removed.
- Upon removal from substrate, the Applicant would move the pile expeditiously from the water into the containment basin. The Applicant would not shake, hose, strip, or scrape the pile, nor leave it hanging to drip or any other action intended to clean or remove adhering material from the pile.
- The Applicant would limit the impact of turbidity to a defined mixing zone and will otherwise comply with WAC 173-201A.
- The Applicant would not stockpile dredged material on the river bottom surface.
- The Applicant would contain all dredged material in a barge prior to flow lane disposal; dredged material would not be stockpiled on the riverbed.
- During hydraulic dredging, the Applicant would not operate hydraulic pumps unless the dredge intake is within 3 feet of the bottom.
- The Applicant would remove any floating oil, sheen, or debris within the work area as necessary to prevent loss of materials from the site. The Applicant would be responsible for retrieval of any floating oil, sheen, or debris from the work area and any damages resulting from the loss.

- The Applicant would dispose materials to the flow lane using a bottom-dump barge or hopper dredge. These systems release material below the surface, minimizing surface turbidity.
- The Applicant would have a spill containment kit, including oil-absorbent materials, on site to be used in the event of a spill or if any oil product is observed in the water.
- The Applicant would not allow barges to ground out during construction.
- The Applicant would be required to retrieve any floating debris generated during construction using a skiff and a net. The Applicant would dispose of debris at an appropriate upland facility. If necessary, the Applicant would install a floating boom to collect any floated debris generated during in-water operations.
- The Applicant would not allow land-based construction equipment to enter any shoreline body of water except as authorized.
- The Applicant would store, handle, and use all fuel and chemicals in a fashion to ensure that they do not enter the water.

Construction activities that could affect fish or fish habitat include the following.

- Permanent removal or temporary alteration of fish habitat and prey resources from dredging and pile installation.
- Noise impacts on fish associated with pile-driving.
- Shading of aquatic habitat during construction from construction vessels and construction of docks.
- Spills and leaks during construction from equipment or storage of potentially hazardous materials.

Operation activities that could impact fish or fish habitat include the following.

- Shading of aquatic habitat from Docks 2 and 3 and vessels.
- Spills and leaks of potentially hazardous materials associated with operations (i.e., fuel, hydraulic fluids, lubricants or other chemicals).
- Vessel generated noise.
- Vessel generated wakes resulting in fish stranding.
- Impacts on fish and benthic habitat during maintenance dredging.
- Coal dust deposition in aquatic environments.

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).

Temporarily Alter and Permanently Remove Aquatic Habitat

Construction of the proposed docks would temporarily alter or permanently remove aquatic habitat in the Columbia River adjacent to the project area. A total of 610, 36-inch-diameter steel piles would be placed in-water, permanently removing 0.10 acre (4,312 square feet) of benthic habitat. The majority of this habitat is located in the DWZ, and pile placement would result in the loss of benthic habitat and primary and secondary production from affected benthic habitat. Benthic, epibenthic (i.e., living at the water-substrate interface), or infaunal (i.e., beneath the surface of the river floor) organisms within the footprint of individual piles at the time of pile-driving would likely perish.

Existing creosote-treated piles would be removed from portions of two existing timber pile dikes. Removal of approximately 225 lineal feet of pile dike would result in long-term benefits by removing a source of creosote, a mixture of polycyclic aromatic hydrocarbons (PAHs) and other chemicals that are toxic to aquatic organisms (Brooks 1995). However, removal could temporarily increase suspended sediments, resulting in short-term contamination of water and long-term contamination of sediments from creosote piling that have been in place for many years, which may be mobilized during extraction and result in temporary water contamination.

Dredging would permanently alter a 48-acre area of benthic habitat in the DWZ by removing approximately 500,000 cubic yards of benthic sediment to achieve a depth of -43 feet Columbia River Datum, with a 2-foot overdredge allowance. Water depth would be increased by up to 16 feet in the dredge prism (i.e., extent of the area to be dredged). The majority of benthic, epibenthic, and infaunal organisms within the proposed dredge prism would be removed during dredging. Recolonization by benthic, epibenthic and infaunal organisms would be rapid, and disturbed habitats would return to reference conditions following recolonization by benthic organisms (McCabe et al. 1996). Typically 30 to 45 days is the amount of time required for benthic organisms to recolonize disturbed environments.

Sediment sampling from within, adjacent to, and upstream of the project area has demonstrated that in deepwater areas of the Columbia River, sediments are typically composed of silty sands with a low proportion of fines (e.g., silt or mud) and very low total organic carbon. Further, sediments sampled from deepwater areas in the project vicinity have consistently met suitability requirements for flow lane disposal or beneficial use in the Columbia River (Grette Associates 2014c). Thus, it is anticipated that sediment within the dredge prism for Docks 2 and 3 would be deemed suitable for flow lane disposal or beneficial use in the Columbia River. However, prior to obtaining permits for the Proposed Action, including dredging, the Applicant would conduct site-specific sediment sampling to characterize the proposed dredge prism and ensure compliance with the dredged materials management plan (Grette Associates 2014c). The disposal area for dredged materials is anticipated to be approximately 80 to 110 acres. The actual acreage and specific location of the disposal site would be determined by the permitting agencies and would be based on sediment characteristics (i.e., consistency and density of sediments). Recent authorizations for flow lane disposal of dredged materials in the Columbia River in the vicinity of the project area were generally in or adjacent to the Columbia River navigation channel between approximately river miles 60 and 66 (Grette Associates 2014b). Riparian vegetation at the project area is sparse and degraded. Project construction would not result in measurable impacts on riparian vegetation or habitat conditions.

Cause Physical or Behavioral Reponses from Elevated Turbidity during Pile Driving and Dredge Disposal

Removal of piles and the dredging and disposal of dredge materials would temporarily increase turbidity. The Proposed Action would permanently affect approximately 48 acres of benthic habitat due to dredging activities (i.e., removal of benthic habitat and benthic organisms) and 610 piles for construction of the docks. Suspended sediment concentrations near dredging activity do not typically cause gill damage to salmonids (Servizi and Martens 1992; Stober et al. 1981).

Behavioral effects related to increased turbidity are another consideration. Some of the documented behavioral effects of turbidity on fish include avoidance, disorientation, decreased reaction time, increased or decreased predation and increased or decreased feeding activity. However, many fish species (especially estuarine species) have been documented to prefer higher levels of turbidity for cover from predators and for feeding strategies. For example, increased foraging rates for juvenile Chinook salmon were attributable to increase in cover provided by increased turbidity, while juvenile steelhead and coho salmon had reduced feeding activity and prey capture rates at relatively low turbidity levels. Juvenile Chinook salmon were also found to have reduced predator-avoidance recovery time after exposure to turbid water. (ECORP Consulting 2009). Thus, while there may be some beneficial behavioral effects from increased turbidity, it is expected that for many of the focus fish species and native non-focus fish species behavior effects from increased turbidity would generally be negative. Although it is difficult to determine exactly how much of a temporary increase in turbidity would result from the construction activities, increases in suspended sediments are expected to be relatively short term, occurring during in-water construction activities and maintenance dredging. Thus, in-water construction and maintenance activities would not result in chronic sediment delivery to adjacent waters, because sediments would be disturbed only during in-water work and, thus, temporary.

The temporary increase in turbidity from the Proposed Action is expected to be short term and would not result in chronic sediment delivery to adjacent waters. Construction-related dredging is proposed to occur from August 1 through December 31, when many fish species would be present in the study area.

Cause Physical or Behavioral Responses to Underwater Noise during Pile Driving

Installation of 610 structural steel piles to support Docks 2 and 3 would generate underwater noise during pile-driving (Grette Associates 2014b). Most piles would be installed to a depth approximately 140 to 165 feet below the mudline to provide the necessary resistance to support Docks 2 and 3, the shiploaders, and conveyors (Grette Associates 2014a). The duration of vibratory and impact pile-driving required to install each pile would depend on the depth at which higher-density materials (e.g., volcanic ash or dense sand and gravels) are encountered; shallower resistance would require less vibratory and more impact driving, while deeper resistance would require more vibratory and less impact driving.

Pile driving would occur over two construction seasons, with multiple rigs operating simultaneously between September 1 and December 31. The sequence of pile-driving and the number of pile-driving rigs operating at the same time would be determined during permitting. Each pile would be installed using a vibratory driver until it meets resistance, at which point an impact pile driver would be used to proof the pile to the necessary weight-bearing capacity. Impact pile-driving would be expected to last 20 to 120 minutes per pile.

Noise attenuation and fish movement models predicted that underwater noise thresholds would be exceeded, resulting in injury or behavior impacts, at distances ranging from 45 feet (single sound strike) to 3.92 miles (cumulative sound). The specific distances and effects on ESA-listed fish are provided in Table 4.7-6. Because the number of pile strikes per day would be variable, it was assumed that a minimum of 5,000 strikes/day would occur. Increasing pile strikes beyond 5,000 would not affect the distance at which thresholds would be exceeded for all federally protected fish. Predicted noise reduction using confined or unconfined bubble curtains or similar attenuation devices would be at least 9 dB, based on observations at the Columbia River Crossing (David Evans Associates 2011) and at Puget Island (Washington State Department of Transportation 2010).

Table 4.7-6. Underwater Noise Thresholds and Distances to Threshold Levels

Species	Effect Type	Threshold	Distance to Effect Threshold[a]
All Federally Protected Fish	Injury, cumulative sound (≥2 grams)	187 dB_{SEL}	1,775 feet[b]
	Injury, cumulative sound (<2 grams)	183 dB_{SEL}	1,775 feet[b,c]
	Injury, single strike	206 dB_{PEAK}	45 feet[d]
	Behavior	150 dB_{RMS}	3.92 miles

Notes:

[a] Impact Pile Driver Operation, 36-inch steel pile with 9 dB attenuation from use of confined bubble curtain.

[b] This represents the point at which the model for distance to threshold for cumulative sound no longer increases with increased pile strikes. For 187 dB_{SELcum} (fish ≥ 2 grams), this is at 5,003 strikes; for 187dB_{SELcum} (fish >2 grams), this is at 1,992 strikes. The concept of effective quiet makes the 1,775-foot distance applicable to both thresholds and therefore is applicable to fish both greater than and less than 2 grams.

[c] Given the On-Site Alternative location and adherence to the proposed in-water work window, most salmonids in the area during construction are assumed to be > 2 grams (187 dB_{SELcum} threshold), except possibly for very early subyearling chum salmon in December

[d] Because the distance to cumulative sound thresholds are greater than the distance to the single-strike sound threshold, this analysis follows the NMFS dual criteria guidance and moves forward solely considering the larger values.

dB_{SEL} = decibels sound exposure level; dB_{PEAK} = decibels at peak sound level; dB_{RMS} = decibels root mean square

Underwater sound generated by impact pile-driving could affect fish in several ways, ranging from alteration of behavior to physical injury or mortality. The impact would depend on the intensity and characteristics of the sound, the distance and location of the fish in the water column relative to the sound source, the size and mass of the fish, and the fish's anatomical characteristics (Hastings and Popper 2005).

Based on calculations of where underwater noise thresholds would be exceeded by pile-driving noise (Section 4.7.3.2, *Impact Analysis, Assessing Noise Impacts*), the area where cumulative sound levels could reach or exceed the injury threshold (potential injury area) would extend from the proposed trestle and dock to a maximum distance of 1.1 miles along the shoreline (1,775 feet upstream and downstream plus the 2,300-foot length of Docks 2 and 3). The total potential injury area would encompass 0.44 square mile. Although the thresholds were developed for salmonids, they would apply to other fish species. The potential for injury or behavioral effects depends on the duration of the fish in the potential injury area.

Five threatened salmon species could occur in the study area during the in-water work window of September 1 through December 31 (Table 4.7-7). All life history stages of the Snake River spring/summer-run Chinook salmon, upper Columbia River spring-run Chinook salmon, Snake River sockeye salmon, and upper Willamette River steelhead populations units would likely be absent from the study area and not affected by pile-driving. Bull trout are expected to occur infrequently and in very low numbers relative to all other salmonids. The likelihood of bull trout presence at any given time is very low, and the potential for pile-driving activities to affect bull trout is, therefore, considered negligible. According to the USFWS (2002), bull trout in the Lower Columbia River Recovery Unit could have migrated seasonally from tributaries downstream into the Columbia River to overwinter and feed. However, the extent to which bull trout in the Lower Columbia River Recovery Unit currently use the mainstem Columbia River is unknown.

Table 4.7-7. Salmonids in the Study Area during the Proposed Work Window (September 1–December 31) by Life Stage

Species	Federal Status	Shallow-water Subyearling	Deepwater Subyearling	Deepwater Yearling	Adult
Chinook Salmon					
Snake River fall-run ESU	T[a]	X[b]	X		Sept–Oct
Lower Columbia River ESU	T	X	X	X	Sept–Oct
Upper Willamette River ESU	T	X	X	X	
Coho Salmon					
Lower Columbia River ESU	T	X			Sept–Dec
Chum Salmon					
Columbia River ESU	T	X			Sept–Dec
Steelhead Trout					
Snake River DPS	T				Sept–Oct
Upper Columbia River DPS	T				Sept–Oct
Middle Columbia River DPS	T				Sept–Oct
Lower Columbia River DPS	T				Sept–Dec
Green Sturgeon	**T**				**Sept–Dec**
Eulachon	**T**	**December**			**Nov–Dec**

Notes:
[a] T denotes federally threatened (no Endangered in this table).
[b] X denotes expected presence; see Grette Associates (2014c).
ESU = Evolutionary Significant Unit; DPS = Distinct Population Segment

Green sturgeon, eulachon, and other salmonid populations could be present in the study area during the proposed in-water work window. For these species, pile-driving could affect fish migrating in the SWZ and the migrants and residents in the DWZ. Approximately 0.09 of the 0.44-square-mile potential injury area would be in the SWZ. The risk of injury could be lower for some populations, depending on their abundance or absence during in-water work, but juvenile salmon present as shallow water subyearlings could be at risk of injury. Larger subyearling or yearling individual salmonids could occur in all of the 0.44-square-mile potential injury area.

Adult salmon could migrate upstream through the study area during the proposed in-water work window, but none of the salmon populations spawn in the potential injury area. Chinook salmon, chum salmon, and steelhead migrate approximately 19 to 25 miles per day (Keefer et al. 2004; English et al. 2006; Buklis and Barton 1984). Coho salmon migrate approximately 9 to 20 miles per day (Sandercock 1991). These migration rates suggest that adult salmon would move through the study area relatively quickly, travelling through the potential injury area in approximately 20 to 90 minutes, depending on the species and actual rate of travel. These migration patterns could limit the potential for and duration of exposure; however, adult salmon migrating through the study area could be injured by pile-driving noise. Injuries to adult salmon could include temporary and long-term hearing damage, referred to as Temporary Threshold Shifts (TTS) and Permanent Threshold Shifts (PTS), respectively (Grette Associates 2014b). Exposure to very loud noise, or loud noise for extended periods of time may result in permanent reductions in sensitivity or PTS. Generally, TTS would occur at lower levels than those resulting in auditory tissue damage, which result in PTS. The effect of hearing loss in fish may relate to the fish's reduced fitness, which may increase the vulnerability to predators or result in a reduced ability to locate prey, inability to communicate, or inability to sense their physical environment (Hastings and Popper 2005). Popper et al. (2005) found fish experiencing TTS were able to recover from varying levels of TTS, including substantial TTS, in less than 18 hours post exposure. Meyers and Corwin (2008) reported evidence that fish can replace or repair sensory hair cells that have been damaged in both the inner ear and lateral line, indicating that fish may be able to recover from PTS over a period of days to weeks. Measures to reduce the risk of TTS and PTS to salmonids includes noise attenuation measures to be implemented during in-water pile-driving activities (i.e., use of confined bubble curtain or similar noise attenuation and implementing a soft-start when initiating pile-driving). See Section 4.7.7, *Potential Mitigation Measures*, for further information.

Sound pressure levels could exceed the threshold for behavioral impacts up to 3.92 miles from pile-driving activities per the *SEPA Fish Technical Report*. A line-of-sight rule, meaning that noise may propagate into any area that is within sight of the noise source, is used to determine the extent of noise propagation in river systems. Fish in the potential injury area could exhibit behavioral responses, which could include reduced predator avoidance and foraging efficiency. Based on studies by Carlson et al. (2007) the potential injury area would extend approximately 10 meters (33 feet) from the pile-driving activity. Because the potential injury area would be limited to such a small area, it is extremely unlikely that adult fish would experience injury.

Increase Temporary Shading that Affects Aquatic Habitat

Overwater structures, barges, and vessels required for construction would increase shading to the aquatic environment beneath and adjacent to the structure, which could result in changes to primary productivity, fish behavior, predation and migration. The use of these structures and vessels would primarily be during the in-water construction period for installation of support piling for Docks 2 and 3. Pile-driving activities would be expected to be much more disruptive to fish than the shading created by construction-related barges and vessels, and would likely affect migration and foraging opportunities in the study area to a greater extent.

Cause Spills and Leaks that Temporarily Contaminate Water Quality

Construction activities could result in temporary water quality impacts from the release of hazardous materials such as fuels, lubricants, hydraulic fluids, or other construction- related hazardous materials. Spills could affect aquatic habitat or fish near the discharge point, resulting in potential toxic acute or subacute impacts that could affect the respiration, growth, or reproduction of the affected fish. It is assumed that a spill would be relatively small (e.g., less than 50 gallons) because limited quantities of potentially hazardous materials would be stored and used during construction at the project area. However, a spill could cause potential impacts on fish based on the location, weather conditions, quantity and material spilled. The potential risks, impacts, and mitigation measures related to water quality are addressed in Section 4.5, *Water Quality*. Appropriate training and implementation of prevention and control measures would guard against these risks, greatly reducing the potential for these types of impacts.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on fish because construction impacts are immediate and no construction impacts would occur later in time or farther removed in distance than the direct impacts.

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*.

Increase Shading that Affects Fish and Fish Habitat

Overwater structures (Docks 2 and 3 and large vessels) would increase shading to the aquatic environment, which could result in changes to primary productivity as well as fish behavior, predation and migration. Permanent shading could reduce primary productivity by phytoplankton and macrophytes (Carrasquero 2001). Less primary productivity contributes to less energy for epibenthic communities and ultimately the fish that prey on epibenthic organisms. Shadows may also directly affect fish migration, prey capture, and predation. Juvenile salmon tend to migrate along the edges of shadows rather than passing through them (Simenstad et al. 1999). Low levels of underwater light are also favorable for predatory fish such as bass and northern pikeminnow to see and capture their prey, including juvenile salmonids. Reduction of primary productivity in DWZ habitat would not likely translate to reductions of epibenthic communities, which are more prevalent in SWZ habitat.

Light attenuation could affect fish migration, prey capture and predation. While salmon fry are known to use darkness and turbidity for refuge, they generally migrate along the edges of shadows rather than penetrate them. Foraging opportunities for juvenile fish are generally associated with SWZ habitat, which are expected to provide greater availability of benthic organisms as compared to DWZ habitat. Juvenile salmon primarily migrate in SWZ habitat, although larger juveniles do migrate in DWZ habitat. Juveniles migrating in DWZ habitat are likely migrating relatively quickly and not rearing for extended periods in any particular area. The trestle is the only structure that would generate shade in SWZ habitat. The potential shading created by the trestle would be relatively limited because the trestle is elevated over the OHW by approximately 8 feet. The height of the trestle would allow light to penetrate beneath the structure and would, therefore, not be expected to have measurable shading effects on primary productivity or fish behavior, migration, or predation in SWZ habitat.

The trestle would shade 0.3 acre of SWZ habitat, while Docks 2 and 3 and a portion of the trestle would shade 4.83 acres of DWZ habitat. Vessels loading at Docks 2 and 3 during operations would further increase the shading of DWZ habitat. If two Panamax vessels were being loaded simultaneously, they would shade an additional 4.7 acres of DWZ habitat, or 9.83 total shaded acres. The study area (Figure 4.7-1) encompasses approximately 1,300 acres, primarily DWZ habitat. Shading created by Docks 2 and 3 as well as vessels being loaded at the docks would shade approximately 0.8%. Because, juvenile salmonids tend to migrate in SWZ habitat, shading of DWZ habitat would likely affect juvenile salmonids to a lesser extent than adults or larger juveniles that tend to migrate in DWZ habitat. Shading of DWZ habitat would have low impacts on primary productivity, as primary productivity tends to be higher in SWZ habitat. Based on the location of Docks 2 and 3 over DWZ habitat, and the relatively small area shaded in relation to the overall study area, the overall shading impact would be low.

The trestle is the only structure that would cross the SWZs where juvenile salmon may be present. The design, orientation (north-south), narrow width (24 feet), and height above the water surface (8 feet) would allow some natural light to pass under the structure during all seasons and limit the potential impacts of shading on fish and fish habitat. The dock and moored vessels would be located over DWZ habitats, where shaded habitat could provide suitable conditions for larger predatory fishes and piscivorous (i.e., fish-eating) birds. Piles and moored vessels may also create flow conditions favorable for predatory fishes. The extent or magnitude to which an increase in overwater surface area could alter the predator–prey relationship in the study area is unknown, but it is assumed that the relationship would change and an increase in predation would be likely.

Cause Spills or Leaks that Contaminate Water Quality

Operations activities on land as well as in- and over-water could result in temporary water quality impacts from a release of hazardous materials such as fuels, lubricants, hydraulic fluids, or other chemicals. Spills could affect aquatic habitat or fish that occur near the discharge point, resulting in potential toxic acute or subacute impacts that could affect the respiration, growth, or reproduction of the affected fish. Overall, it is assumed that a spill would be relatively small (e.g., less than 50 gallons) because limited quantities of potentially hazardous materials would be stored and used during operations at the project area. Refueling of vehicles during operations would occur off site at approved refueling stations, or fuel would be delivered to the site by a refueling truck (capacity of 3,000 to 4,000 gallons). Refueling trucks are required to carry appropriate spill response equipment, thereby reducing the potential risk and impact associated with a fuel spill. Vessel bunkering (i.e., a vessel receiving fuel while at the dock) would not occur at the project area. Thus, there would be no increased risk of spills associated with vessel transferred associated with the Proposed Action. The potential risks, impacts, and mitigation measures related to water quality are addressed in Section 4.5, *Water Quality*. Refer to Section 4.9, *Energy and Natural Resources,* as well as Chapter 3, Section 3.6, *Hazardous Materials,* and Chapter 5, Section 5.4, *Vessel Transportation*, for more information related to fuel and refueling activities associated with the Proposed Action. Similarly, appropriate training and implementation of prevention and control measures would guard against these risks, greatly reducing the potential for these types of impacts.

Cause Physical or Behavioral Responses to Vessel Noise

Vessels transit the Columbia River carrying oil, freight, and materials to and from ports along the river. Source sound levels of bulk carrier vessels were measured in Puget Sound at between 187.9 and 198.2 dB sound pressure level at 1 meter when vessels were travelling between 9.0 and 11.1 knots (Hemmera Envirochem et al. 2014). These source sound levels exceed identified thresholds for potential behavioral disturbance for fish and may cause avoidance or other behavioral responses (Fisheries Hydroacoustic Working Group 2008). Fish near transiting vessels could experience behavioral responses to the vessel noise but would not likely be injured.

Generate and Disperse Coal Dust in the Aquatic Environment

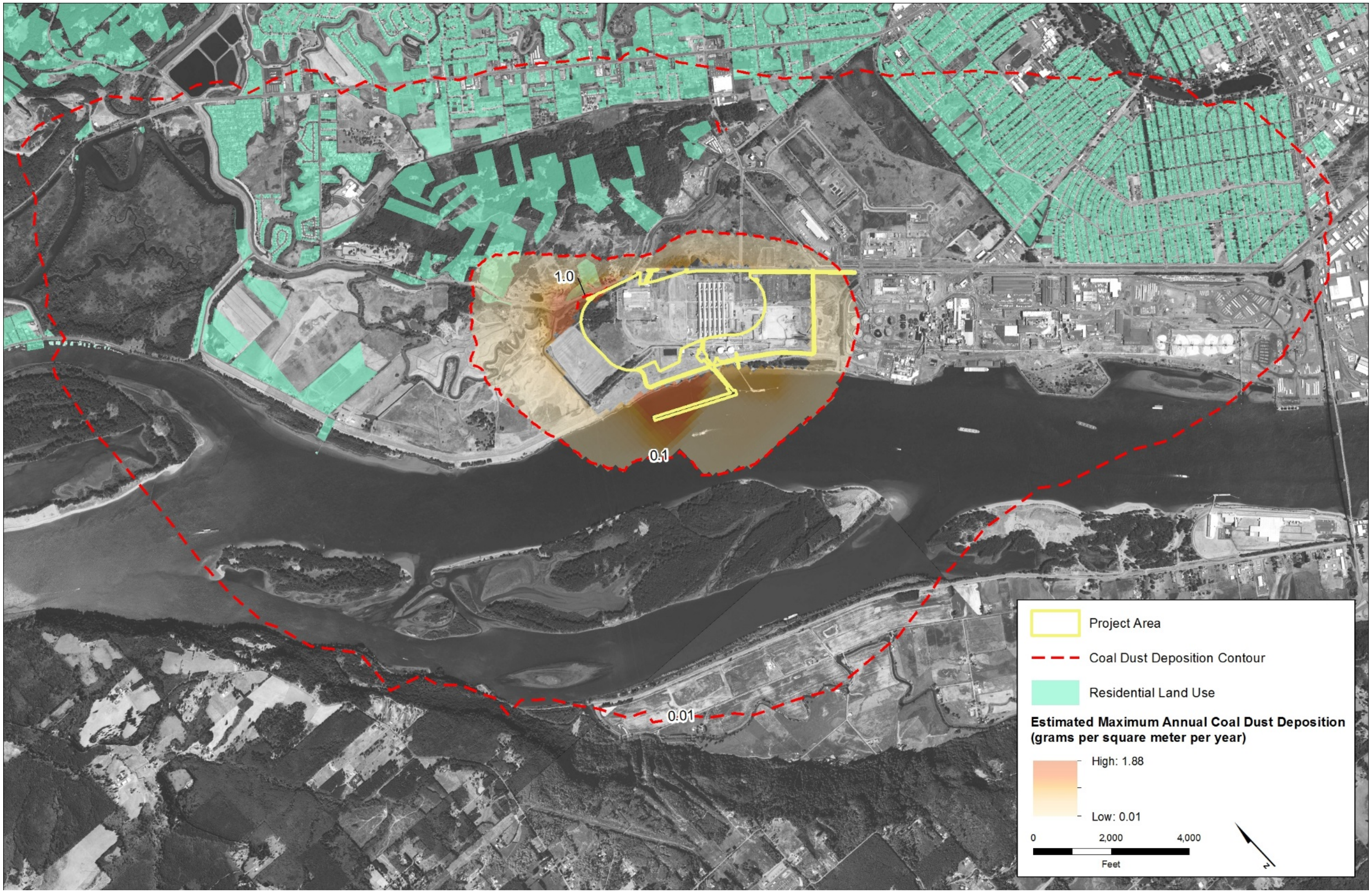
Fugitive coal dust particles would be generated by the Proposed Action through the movement of coal into and around the project area, as well as during transfer onto vessels (Chapter 5, Sections 5.6, *Air Quality,* and 5.7, *Coal Dust*). Coal dust could also become airborne from stockpiles located within the project area. Modeled fugitive coal dust concentrations (Figure 4.7-4) indicate that deposition would range from 1.88 grams per square meter per year (g/m^2/year) adjacent to the coal export terminal to 0.0003 gram per square meter 2.5 miles from the proposed terminal (Chapter 5, Section 5.7, *Coal Dust*). One review of the chemical composition of coal dust (U.S. Geological Survey 2007) suggests that the risk of exposure to concentrations of toxic materials (e.g., PAHs and trace metals) from coal are low because the concentrations are low and the chemicals bound to coal and not easily leached. Particles would also be transported downstream by the flow of the river and distributed over a broad area, thus diluting any potential impacts.

Spill Coal during Operations of the Proposed Action

Direct impacts on the natural environment from a coal spill during operations of the Proposed Action could occur. Direct impacts resulting from a spill during coal handling at the coal export terminal would likely be minor because the amount of coal that could be spilled would be relatively small. Also, impacts would be minor because of the absence of aquatic environments in the project area and the contained nature and features of the terminal (e.g., enclosed belt conveyors, transfer towers, and shiploaders). Potential physical and chemical effects of a coal release on the aquatic environments that occur adjacent to the terminal are described below.

Aquatic environments could potentially be affected from a coal spill both physically and chemically. A coal spill could have physical effects on aquatic environments, including abrasion, smothering, diminished photosynthesis, alteration of sediment texture and stability, reduced availability of light, temporary loss of habitat, and diminished respiration and feeding for aquatic organisms. The magnitude of these potential impacts would depend on the amount and size of coal particles suspended in the water, duration of coal exposure, and existing water clarity (Ahrens and Morrisey 2005). Therefore, the circumstances of a coal spill, the existing conditions of a particular aquatic environment (e.g., pond, stream, wetland), and the physical effects on aquatic organisms and habitat from a coal spill would vary.

Figure 4.7-4. 3-Year Annual Average Coal Dust Deposition for the Proposed Action



Similarly, cleanup of coal released into the aquatic environment could result in temporary impacts on habitat, such as smothering, altering sediment composition, temporary loss of habitat, and diminished respiration and feeding for aquatic organisms. The recovery time required for aquatic resources would depend on the amount of coal spill and the extent and duration of cleanup efforts, as well as the environment in which the incident occurred. It is unlikely that coal handling in the upland portions of the coal export terminal would result in a spill of coal that would affect the Columbia River. This is unlikely because the rail loop and stockpile areas would be contained, and other areas adjacent to the coal export terminal are separated from the Columbia River by an existing levee, which would prevent coal from being conveyed from upland areas adjacent to the rail loop to the Columbia River. Coal could be spilled during shiploading operations as a result of human error or equipment malfunction. However, such a spill would likely result in a limited release of coal into the environment due to safeguards to prevent such operational errors, such as start-up alarms, dock containment measures (i.e., containment "gutters" placed beneath the docks to capture water and other materials that may fall onto and through the dock surface) to contain spillage /rainfall/runoff, and enclosed shiploaders.

The chemical effects on aquatic organisms and habitats would depend on the circumstances of a coal spill and the existing conditions of a particular aquatic environment (e.g., stream, lake, wetland). Some research suggests that physical effects are likely to be more harmful than the chemical effects (Ahrens and Morrisey 2005).

A recent coal train derailment and coal spill in Burnaby, British Columbia, in 2014, and subsequent cleanup and monitoring efforts provide some insight into the potential impacts of coal spilled in the aquatic environment. Findings from spill response and cleanup found there were potentially minor impacts in the coal spill study area, and that these impacts were restricted to a localized area (Borealis Environmental Consulting 2015).

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*.

Cause Fish Stranding from Vessel Wakes

At full build-out, 70 cargo vessels per month (840 per year) would be used for the Proposed Action. The vessels would consist of the newer Panamax and Handymax vessels. Panamax vessels measure approximately 738 feet long by 105 feet wide with a draft of 43 feet. Handymax vessels measure approximately 490 to 655 feet long by 105 feet wide with a draft of 36 feet.

Subyearling Chinook salmon appear to be more susceptible to stranding, accounting for approximately 80% of the fish stranded by vessel wakes along the lower Columbia River (Hinton and Emmett 1994; Dawley et al. 1984; Pearson et al. 2006) despite being less common (i.e., 49%) in beach seine samples along the same shorelines (Pearson et al. 2006).

Studies indicate that juvenile salmon and other fish are at risk of stranding on wide, gently sloping (i.e., less than 5% slope) beaches as a consequence of wakes generated by deep-draft vessel passage (Bauersfeld 1977; Hinton and Emmett 1994; Pearson et al. 2006; ENTRIX 2008). Depending on various factors—such as the slope and breadth of a beach, river stage, tidal stage, depth of water vessel is transiting in, and vessel size—direction of travel and speed, wakes from passing vessels can travel a considerable distance. When these wakes meet the shoreline, they can carry fish and deposit them, essentially stranding them on the beach where they are susceptible to stress, suffocation, and predation before than can return to the water.

The Proposed Action would result in an increase in vessel traffic, which characteristically produces wakes that would contribute to stranding, and many of the sites in the study area where fish stranding could occur are located near the project area. For example, Lord Island is just across the channel from the project area, and Barlow Point is about 1.2 miles downstream. Vessels maneuvering near the project area would be either slowing to stage off shore if the docks are full or slowing to prepare for docking. Once vessels are loaded, they would be maneuvering back to the navigation channel and would then proceed to transit downstream toward the Pacific Ocean. It is assumed that such maneuvering would result in little risk of stranding near the proposed docks, as very little wake would be expected from vessels moving at slow speeds in this area. Sites farther downstream near Puget Island would be more likely to have a risk of fish stranding from vessel wakes as the vessels are transiting. Thus, it is likely that fish stranding associated with wakes from project–related vessels would occur because of the Proposed Action.

Fish stranding in the Lower Columbia River appears to be associated with various factors, but is generally believed to be an issue when wakes produced by deep-draft vessels (i.e., those with a draft of 26 feet or more) transiting the river during low tides encounter shorelines with shallow sloping beaches (i.e., less than a 5% slope). The issue is particularly prevalent on beaches that are highly permeable (i.e., high rates of infiltration). However, beaches are not necessarily conducive to stranding at all times. For example, stranding may occur less frequently or not at all during high tide or during periods when the river is at a certain stage, when the beaches are more inundated and less exposed. The potential for fish stranding on any given beach is also likely affected by fish migration changes through the area. In 2028, with full coal terminal export throughput, the Proposed Action would represent approximately 27% of the projected vessel traffic volume in the lower Columbia River. The additional traffic associated with the Proposed Action would result in an increased risk of fish stranding.

It is also worth noting that vessel operations in the Lower Columbia River are federally regulated, including the size, speed, and navigation within the Lower Columbia River. Additionally, large vessels are required to be operated by pilots within the Lower Columbia River, whom are licensed by the Coast Guard to perform this function. The navigation channel and its ongoing maintenance are also managed and regulated at the federal level, including dredging and dredged material disposal.

Periodically Remove or Alter Aquatic Habitat during Maintenance Dredging

Maintenance dredging would be scheduled to occur on a multiyear basis, but could occur annually or following extreme flow conditions, as needed, to maintain required depths at Docks 2 and 3 and to allow for navigation between the docks and the navigation channel (WorleyParsons 2012). Maintenance dredging would require separate permitting beyond those permits issued for construction of the Proposed Action. Maintenance dredging would follow the same methods and have the same impacts as those described for construction-related dredging.

Generate and Disperse Coal Dust in the Aquatic Environment

Indirect impacts associated with fugitive coal dust particles would be the same as those described previously for operational direct impacts.

Spill Coal during Rail Transport

The magnitude of the potential indirect impact from a coal spill on the aquatic environments would be similar to those described previously and would depend on the location of the spill, the volume of the spill, and success of efforts to contain and clean up the spill, none of which can be predicted.

The potential impact of a coal spill from a Proposed Action-related train is directly related to the probability of a Proposed Action-related train incident occurring. Section 5.2, *Rail Safety*, estimates the number of Proposed Action-related train incidents that could potentially occur during coal transport within Cowlitz County and Washington State. In Cowlitz County, the predicted number of loaded coal train incidents is approximately one every 2 years. The predicted number of loaded coal train incidents within Washington State is approximately five per year.

Not every incident of a loaded coal train would result in a rail car derailment or a coal spill. A train incident could involve one or multiple rail cars, and could include derailment in certain circumstances. The size and speed of the train and the terrain where an incident were to occur would influence if the incident resulted in a coal spill. A broad range of spill sizes from a partial rail car to multiple rail cars could potentially occur from a Proposed Action-related train accident.

Additionally, containment and cleanup efforts for coal spills from a rail incident factor into the potential impact on the environment. It is expected that coal spills in the terrestrial and built environments would be easier to contain and clean up than spills occurring in an aquatic environment. Spills occurring on land may have a quicker response time and cleanup in some locations due to their visibility and access for cleanup equipment, as compared to spills into aquatic environments.

Potential physical and chemical effects of a coal release into aquatic environments would be the same or similar to those described above under direct impacts.

Research suggests that the bioavailability of contaminants in coal is limited, and that at levels of coal contamination at which estimates of bioavailable concentrations of contaminants might give cause for concern, the acute physical effects are likely to be more harmful than the chemical effects (Ahrens and Morrisey 2005). However, the variable chemical properties of coal could conceivably result in contaminant mobility and enhanced bioavailability in the aquatic environment. Coal can be a source of acidity, salinity, trace metals, PAHs, and chemical oxygen demand (a measure of organic pollutants found in water). Interactions between coal and water could alter pH and salinity, release trace metals and PAHs, and increase chemical oxygen demand. However, if and how much these alterations occur in the aquatic environment and whether the alterations are significant enough to be potentially toxic to aquatic organisms depends on many factors, including the type of coal, the relative amount of time the coal is exposed to water, dilution, and buffering.

In summary, fugitive coal dust from project operations is not expected to increase suspended solids in the Columbia River to the point that there would be a demonstrable effect on fish distribution, abundance, or survival, or acute physical effects. Additionally, the potential risk for exposure to toxic chemicals contained in coal (e.g., PAHs and trace metals) would be relatively low because these chemicals tend to be bound in the matrix structure and not quickly/easily leached. Any coal particles would be transported downstream by the flow of the river and either carried out to sea or distributed over a broad area, further reducing the potential for adverse impacts on fish from suspended solids.

Affect Commercial and Recreational Fishing

Project-related increases in vessel traffic in the lower Columbia River and associated underwater noise could affect the fishing in study area. Increases in vessel traffic could cause behavioral responses including quicker migration or avoidance of the navigation channel. The 70 large commercial vessels anticipated per month under the Proposed Action, would be limited to the navigation channel. Adult fish targeted in commercial and recreational fishing would likely migrate outside of the navigation channel to avoid the increased underwater noise levels. It is also likely that commercial and recreational fishing vessels would not be fishing within the navigation channel when large vessels are present. The Proposed Action would, therefore, be unlikely to significantly reduce commercial or recreational fishing catches or limit access for fishing activities. See Chapter 5, Section 5.4, *Vessel Transportation,* for potential impacts on commercial and recreational fishing vessels associated with Proposed Action-related vessels.

4.7.5.2 No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the Proposed Action. Current operations would continue and the existing bulk product terminal site would be expanded. Any expansion activities would not require a permit from the U.S. Army Corps of Engineers (Corps) or a shoreline permit from Cowlitz County. Therefore, no construction impacts on aquatic habitats or species would be expected to occur as a result of an expansion of the existing bulk production terminal under the No-Action Alternative.

4.7.6 Required Permits

The Proposed Action would require the following permits related to fish and fish habitat.

- **Shoreline Substantial Development and Conditional Use Permits—Cowlitz County**. Cowlitz County administers the Shoreline Management Act through its Shoreline Management Master Program. The project area would have elements and impacts within jurisdiction of the act (Washington Administrative Code (CCC 19.20) and would thus require a Shoreline Substantial Development and Conditional Use permit from Cowlitz County and Ecology.
- **Critical Areas Permits—Cowlitz County**. The Proposed Action would require local permits related to impacts on regulated critical areas. Chapter 19.15 of the Cowlitz County Code regulates activities within and adjacent to critical areas and in so doing regulates fish and wildlife habitat conservation areas (including streams and their buffers), frequently flooded areas, and other sensitive areas.
- **Construction and Development Permits—Cowlitz County**

The Proposed Action would require fill and grade permits (CCC 16.35) and construction permits (CCC 16.05) for clearing and grading and other ground disturbing activities, as well as construction of structures and facilities associated with the Proposed Action.

- **Clean Water Act Authorization—U.S. Army Corps of Engineers.** Construction and implementation of the Proposed Action would affect waters of the United States, including wetlands. Because impacts would exceed 0.5 acre, Individual Authorization from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and appropriate compensatory mitigation for the acres and functions of the affected wetlands would be required.

  An Individual Water Quality Certification from Ecology under Section 401 of the Clean Water Act and a National Pollution Discharge Elimination System permit under Section 402 of the Clean Water Act would also be required for construction of the Proposed Action. Additional details regarding the permitting process related to the Clean Water Act can be found in the *SEPA Water Quality Technical Report.*

- **Rivers and Harbors Act—U.S. Army Corps of Engineers.** Construction and implementation of the Proposed Action would affect navigable waters of the United States (i.e., the Columbia River). The Rivers and Harbors Act authorizes the Corps to protect commerce in navigable streams and waterways of the United States by regulating various activities in such waters. Section 10 of the RHA (33 USC 403) specifically regulates construction, excavation, or deposition of materials into, over, or under navigable waters, or any work that would affect the course, location, condition, or capacity of those waters.

- **Hydraulic Project Approval—Washington Department of Fish and Wildlife.** The Proposed Action would require a Hydraulic Project Approval from WDFW because project elements would affect and cross the shoreline of the Columbia River. The approval would consider impacts on riparian and shoreline/bank vegetation in issuance and conditions of the permit, including for the installation of the proposed docks and piles, as well as for interior culverts or other crossings of drainage features.

4.7.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to fish 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.

Additionally, the Corps is conducting a review of the Proposed Action under NEPA, as the lead federal agency, and will be consulting under Section 7 of the federal ESA with both the USFWS and the NMFS. Additional measures may be identified under one or both of these processes that could further reduce potential impacts on fish and fish habitat.

4.7.7.1 Applicant Mitigation

The Applicant would implement the following measures to mitigate impacts on fish.

MM FISH-1. Implement Best Available Noise Attenuation Method for Pile-Driving.

To minimize underwater noise impacts on fish during pile-driving, the Applicant will employ the best available noise attenuation methods during pile-driving. These methods may include, but are not limited to, confined bubble curtain, temporary noise attenuation pile, double-walled noise attenuation pile, or other similar technology. The Applicant is currently proposing use of a confined bubble curtain, but other methods may be found to be better at attenuating noise impacts during the Endangered Species Act Section 7 consultation or by the time construction begins. Should other methods in the future prove to attenuate underwater noise better than a confined bubble curtain, those methods will be employed.

MM FISH-2. Implement a "Soft-Start" Method during Pile-Driving.

To minimize underwater noise impacts on fish during pile-driving, the Applicant will commence impact pile-driving using a "soft-start," or other similar method. The "soft-start" method is a method of slowly building energy of the pile driver over the course of several pile strikes until full energy is reached. This "soft-start" method cues fish and wildlife to pile-driving commencing and allows them to move away from the pile-driving activity.

MM FISH-3. Monitor Pile-Driving and Dredging Activities for Distress to Fish and Wildlife.

To minimize the potential harm to marine mammals, diving birds, or fish, a professional biologist will observe the waters near pile-driving and dredging activities for signs of distress from fish and wildlife during these activities. If any fish or wildlife species were to show signs of distress during pile-driving, the biologist will issue a stop work order until the species are recovered, moved, or relocated from the area. The Applicant will immediately report any distressed fish or wildlife observed to the appropriate agencies (i.e., Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service) and determine the appropriate course of action.

MM FISH-4. Conduct Eulachon Surveys.

The Applicant will conduct underwater surveys for eulachon spawning and larval activity within those areas where in-water work will occur (i.e., Docks 2 and 3 and the dredge prism). Surveys will be conducted prior to any in-water work occurring (i.e., construction of the Docks 2 and 3, as well as construction and operations related maintenance dredging). Survey design and results will be provided to Washington Department of Fish and Wildlife and the National Marine Fisheries Service. Should eulachon spawning and larval activity be observed, the Applicant will coordinate with the fish and wildlife agencies on the appropriate measures to avoid and minimize impacts to spawning and larval eulachon.

MM-WQ-2. Develop and Implement a Coal Spill Containment and Cleanup Plan

To limit the exposure of spilled coal to the terrestrial, aquatic, and built environments during coal handling, the Applicant will develop a containment and cleanup plan. The plan will be reviewed by Cowlitz County and Ecology and implemented prior to beginning operations.

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-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.

4.7.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the voluntary measures and mitigation measures described above would reduce impacts on fish. There would be no unavoidable and significant adverse impacts.

4.8 Wildlife

A rich diversity of wildlife species historically inhabited or used the waters of, and terrestrial habitat adjacent to, the Columbia River. Although development along the river has altered the natural environment, many wildlife species occur or depend on habitats found in the study area. Wildlife includes terrestrial and marine mammals, birds, reptiles, amphibians, and invertebrates, including species that are currently protected or proposed for protection under the federal Endangered Species Act (ESA) or other federal and state regulations. Fish species are also covered under the ESA and are discussed in the *SEPA Fish Technical Report* (ICF International 2016a).

This section describes wildlife in the study area. It then describes impacts on wildlife 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.

4.8.1 Regulatory Setting

Laws and regulations relevant to wildlife are summarized in Table 4.8-1.

Table 4.8-1. Regulations, Statutes, and Guidelines for Wildlife

Regulation, Statute, Guideline	Description
Federal	
Endangered Species Act (16 USC 1531 *et seq*.)	Requires that applicants seeking a federal action, such as issuing a permit under a federal regulation (e.g., NEPA, Clean Water Act, Clean Air Act) undergo consultation with USFWS and/or NMFS. This will ensure the federal action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. NMFS is responsible for managing, conserving, and protecting ESA-listed marine species. USFWS is responsible for terrestrial and freshwater species. Both agencies are responsible for designating critical habitat for ESA-listed species.
Migratory Bird Treaty Act of 1918, as amended (16 USC 703–713)	Makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. Under the regulatory authority of USFWS.
Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668–668c)	Prohibits the taking of bald eagles, including their parts, nests, or eggs without a permit issued by USFWS, and provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle... [or any golden eagle], alive or dead, or any part, nest, or egg thereof."

Regulation, Statute, Guideline	Description
Marine Mammal Protection Act of 1972, as amended (50 CFR 216)	Protects marine mammals from "take" without appropriate authorization, which may only be granted under certain circumstances. NMFS and USFWS enforce the act. Animals under the jurisdiction of NMFS may be present in the study area. An incidental harassment authorization or letter of authorization (specific authorization to be determined) may be required pursuant to the act.
State	
Washington State Environmental Policy Act (197-11 WAC, RCW 43.21C)	Requires state and local agencies in Washington to identify potential environmental impacts that could result from governmental decisions.
Washington State Growth Management Act (RCW 36.70A)	Defines a variety of critical areas, which are designated and regulated at the local level under city and county critical areas ordinances. These critical areas may include portions of wildlife habitat.
Washington State Shoreline Management Act (RCW 90.58)	Requires cities and counties (through their Shoreline Master Programs) to protect shoreline natural resources.
Washington State Hydraulic Code (RCW 77.55)	WDFW administers the hydraulic project approval program under the state hydraulic code in or near state waters.
Clean Water Act Section 401 Water Quality Certification	Ecology issues permits for in-water construction activities to ensure compliance with state water quality standards and other aquatic resources protection requirements under Ecology's authority.
WAC 220-660-160 –Marinas and Terminals in Freshwater Areas	Applies to constructing, maintaining, and repairing marinas and terminals in freshwater areas and addresses fish life concerns.
Local	
Cowlitz County SEPA Regulations (CCC 19.11)	Provide for the implementation of SEPA in Cowlitz County.
Cowlitz County Critical Areas Ordinance (CCC 19.15)	Requires the County to designate critical areas such as wildlife habitat conservation areas.
Cowlitz County Shoreline Master Program (CCC 19.20)	Regulates development in the shoreline zone, including the shoreline of the Columbia River, a Shoreline of Statewide Significance.
City of Longview Shoreline Master Program (LMC 17.60)	Adopts Cowlitz County Shoreline Master Program by reference. Regulates development in the shoreline, including the shoreline of the Columbia River.
City of Longview Critical Areas Ordinance (LMC 17.10.140)	Regulates activities within and adjacent to critical areas and in so doing regulates fish and wildlife habitat conservation areas.

Notes:
USC = United States Code; NEPA = National Environmental Policy Act; USFWS = U.S. Fish and Wildlife Service; NMFS = National Marine Fisheries Service; ESA = Endangered Species Act; CFR = Code of Federal Regulations; RCW = Revised Code of Washington; WDFW = Washington Department of Fish and Wildlife; WAC = Washington Administrative Code; CCC = Cowlitz County Code; SEPA = State Environmental Policy Act; LMC = Longview Municipal Code

4.8.2 Study Area

Three study areas have been identified for the wildlife analysis.

4.8.2.1 Terrestrial Species and Habitats Study Area for Direct Impacts

The terrestrial study area for terrestrial species and habitats extends 0.5 mile beyond the project area (Figure 4.8-1). This distance accommodates noise and visual disturbance thresholds set by the U.S. Fish and Wildlife Service (USFWS) for some sensitive species (U.S. Fish and Wildlife Service 2006).

4.8.2.2 Aquatic Species and Habitats Study Area for Direct Impacts

The aquatic study area for direct impacts on aquatic species and habitats includes the main channel of the Columbia River and extends approximately 5.1 miles upstream and 2.1 miles downstream from the upstream and downstream ends of the proposed docks (Docks 2 and 3), respectively (Figure 4.8-1). The aquatic study area is based on the distances where underwater noise is estimated to reach harassment levels (Section 4.8.3.3, *Impact Analysis*).

4.8.2.3 Terrestrial and Aquatic Species and Habitats Study Area for Indirect Impacts

The study area for indirect impacts extends to the rail and shipping corridors to and from the project area. This study area captures the potential impacts of increased rail and vessel traffic on terrestrial and aquatic species and habitat.

4.8.3 Methods

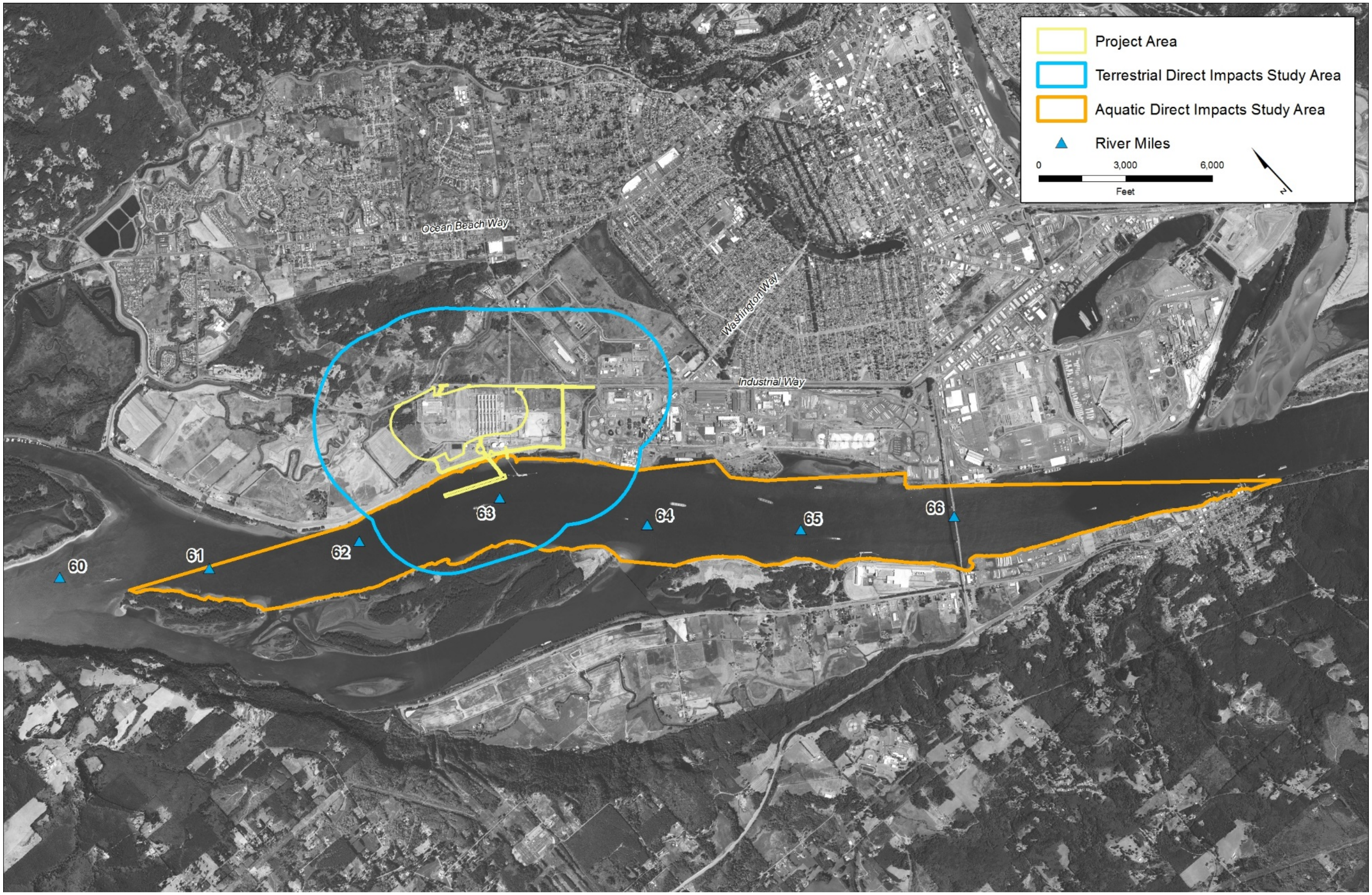
This section describes the sources of information used to evaluate the potential impacts on wildlife and wildlife habitat associated with the construction and operation of the Proposed Action and No-Action Alternative.

4.8.3.1 Information Sources

The following sources of information were used to identify the potential impacts of the Proposed Action and No-Action Alternative on wildlife in the study area. A detailed list is provided in the *SEPA Wildlife Technical Report* (ICF International 2016b).

- Two site visits conducted by ICF International biologists on April 8, 2014, and December 12, 2014
- Reports prepared by Grette Associates for the Applicant as part of the permit application materials (Grette Associates 2014a through 2014p)
- National Marine Fisheries Service (NMFS) (2015) west coast region species list
- USFWS (2015) Information, Planning, and Conservation system online database

Figure 4.8-1. Boundaries for the Terrestrial and Aquatic Study Areas for Direct Impacts of the Proposed Action



4.8.3.2 Terrestrial and Aquatic Species and Habitats Study Area for Indirect Impacts

The study area for indirect impacts includes the project area and those lands near the project area where project-related disturbances to wildlife and wildlife habitat could occur. Indirect impacts that could occur outside of the project area include wildlife injuries (e.g., deer and elk injury or mortality from an increase in rail traffic), coal dust impacts on terrestrial and aquatic habitats, and impacts on streaked horned lark habitat downstream of the project area due to an increase in vessel traffic.

The following sources of information were used to define the existing conditions relevant to wildlife and evaluate potential impacts of the Proposed Action and No-Action Alternative in the terrestrial and aquatic study areas. A detailed list is provided in the *SEPA Wildlife Technical Report*.

- Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species (PHS) Statewide List and Distribution for Cowlitz County (2015a); PHS spatial data (Washington Department of Fish and Wildlife 2015b)
- Washington Department of Natural Resources (2015) online Herpetological Atlas spatial database

4.8.3.3 Impact Analysis

Potential wildlife and wildlife habitat that could be affected by the construction and operation of the Proposed Action were determined as described below. For more information on these methods, see the *SEPA Wildlife Technical Report*.

Identifying Resources in the Terrestrial and Aquatic Study Areas

The following species and habitat characteristics were identified and quantified, where possible.

- Documented species occurrences
- Species likely to occur in the terrestrial and aquatic study areas
- Suitable habitat conditions

While impacts on wildlife habitat can be quantified, impacts on wildlife species are qualitatively described. Wildlife species are mobile and their presence and abundance in the terrestrial and aquatic study areas cannot be quantitatively predicted. For documented occurrences, the focus was on wildlife species identified in the WDFW PHS database. Geospatial PHS data containing mapped locations of priority species occurrences and priority habitats were obtained from WDFW (Washington Department of Fish and Wildlife 2014). These data were overlaid with the study area to determine presence of documented priority species and habitat occurrences.

- A list of special-status wildlife species was compiled for the study area, consisting of those species federally listed as threatened, endangered, proposed, or candidate species; wildlife species listed in the WDFW PHS database; and marine mammals.
- A list of federally listed wildlife species for Cowlitz County was generated from the USFWS iPAC online planning tool (U.S. Fish and Wildlife Service 2015).

- A list of state priority species that occur in Cowlitz County was obtained from the WDFW PHS program website (Washington Department of Fish and Wildlife 2013).
- A list of federally protected marine mammals that could occur in the study area was compiled from the NMFS (2015) West Coast Region website.

Assessing Noise Impacts

An animal's response to sounds depends on various factors, including noise level and frequency, distance and event duration, equipment type and conditions, frequency of noisy events over time, slope, topography, weather conditions, previous exposure to similar noises, hearing sensitivity, reproductive status, time of day, behavior during the noise event, and an animal's location relative to the noise source (Delaney and Grubb 2003 in Washington State Department of Transportation 2015). However, USFWS has established some noise and visual distance thresholds for some sensitive species that occur in Washington, including the bald eagle (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus*), Northern spotted owl (*Strix occidentalis caurina*), and Columbia white-tailed deer (*Odocoileus virginianus leucurus*) (U.S. Fish and Wildlife Service 2006) (Table 4.8-2). The bald eagle has the lowest threshold for disturbance and, therefore, the greatest protective distance (0.5) mile. Therefore, this distance is a conservative proxy for assessing potential impacts on other terrestrial wildlife species. The terrestrial study area was delineated based on the greatest distance where disturbance or harassment could result from construction and operation of the Proposed Action.

Table 4.8-2. Harassment Distances for Federally Listed Species in Washington State

Species	Scientific Name	Activity and Harassment Distance
Bald eagle	*Haliaeetus leucocephalus*	Noise: 0.25 mile[a] Visual: 0.5 mile
Marbled murrelet	*Brachyramphus marmoratus*	Pile-driving: 33 feet[b] Visual: 300 feet
Northern spotted owl	*Strix occidentalis caurina*	Pile-driving: 180 feet
Columbia white tailed deer	*Odocoileus virginianus leucurus*	Noise: 0.25 mile

Notes:

[a] Noise level disturbance varies on bald eagles. It has been found that visual disturbance is more likely to provoke escape behavior than noise disturbance (U.S. Department of Transportation 2004).

[b] Injury would occur at 202decibels at this distance (Washington State Department of Transportation 2015.

Source: U.S. Fish and Wildlife Service 2006.

For marine mammals, NMFS has established standard underwater noise thresholds under the Marine Mammals Protection Act. NMFS has established Levels A and B harassment thresholds for pinnipeds (i.e., seals and sea lions) from impact and vibratory pile-driving (Grette Associates 2014a) (Table 4.8-3). Refer to the *SEPA Wildlife Technical Report* for further information regarding these harassment levels.

Table 4.8-3. NMFS Underwater Sound Level Effect Thresholds for Marine Mammals

Effect Type	Effect Threshold (dB_{RMS})
Impulse Sound (Impact Driver Operation)	
Level A harassment	190
Level B harassment	160
Continuous Sound (Vibratory Driver Operation)	
Level B harassment	120

Notes:
Source: Grette Associates 2014a.
dB_{RMS} = decibel root mean square

Harassment of pinnipeds can occur between 178 feet and 5.4 miles from the noise source without attenuation, depending on the method of pile-driving. With a bubble curtain, the distance drops to between 45 feet and 4,459 feet. Harassment can include hearing-related injuries and behavior changes. These criteria were used to establish impact thresholds for pinnipeds in the aquatic study area.

For diving birds, USFWS has established impact thresholds for the federally listed marbled murrelet (Table 4.8-2), which can provide some guidance on underwater noise thresholds for other diving birds in the aquatic study area. The thresholds for behavioral change, auditory injury, and nonauditory injury range from 150 decibels root mean square (dB_{RMS}) to 208 decibels sound exposure level (dB_{SEL}); underwater noise below 150 dB_{SEL} does not cause injury (Washington State Department of Transportation 2015). These criteria were used to establish impact thresholds for diving birds in the aquatic study area.

Specifics about these analysis methods and criteria are provided in the *SEPA Wildlife Technical Report*.

4.8.4 Existing Conditions

This section describes the existing environmental conditions in the terrestrial and aquatic study areas related to wildlife that could be affected by the construction and operation of the Proposed Action and No-Action Alternative.

Extensive modifications of the lower Columbia River (flood control, industrial development, deep-draft vessel traffic) have altered the habitat conditions in the study area available to wildlife species using terrestrial and aquatic habitats. Floodplain habitats have been disconnected from the riverine environment and in some cases eliminated. The shoreline and riparian environment has been substantially altered (armoring and protection, overwater structures, and development), affecting habitat in adjacent upland and riparian zones. Industrial and transportation development inland have further altered the landscape and habitat conditions, thus changing the biological communities associated with these habitats.

4.8.4.1 Terrestrial Habitat

The project area is on a disturbed industrial site developed with roads and industrial buildings. Undeveloped areas are relatively small and fragmented. Patches of potentially suitable habitat could support foraging and cover for small to large mammals, foraging and nesting for a variety of birds, and foraging, breeding, and nesting for amphibians (Grette Associates 2014c, 2014d, 2014e, 2014h). Upstream of the project area, the heavily developed shoreline lacks suitable habitat and wildlife species are not present. Downstream of the project area are upland, wetland, and riparian habitats as well as disturbed areas. Habitat conditions for wildlife are similar to those of the project area: disconnected patches of suitable habitat.

North of the project area is a triangular area of the Applicant's leased area bordered by Industrial Way to the south and Consolidated Diking Improvement District (CDID) #1 drainage ditches to the east and west. The habitat likely supports foraging and cover for small to large mammals; foraging and nesting for a variety of birds; and foraging, breeding, and refuge for amphibians and reptiles.

South of the project area, the terrestrial study area consists of a levee with managed vegetation and riparian shoreline that borders the Columbia River. The riparian area likely provides foraging and cover for small and large mammals, foraging and nesting for a variety of bird species, and foraging, breeding, and refuge for amphibians and reptiles (Grette Associates 2014d).

A small portion of Lord Island, in the Columbia River is located within the terrestrial study area. Previously used for dredged material disposal, the forested island connects to Walker Island, downstream, by a narrow band of sand. Between the two islands lies a tidal marsh and shallows. With the exception of several transmission towers, the island is undeveloped and contains wildlife habitat. More detail on Lord Island wildlife species and habitat is provided in the *SEPA Wildlife Technical Report*.

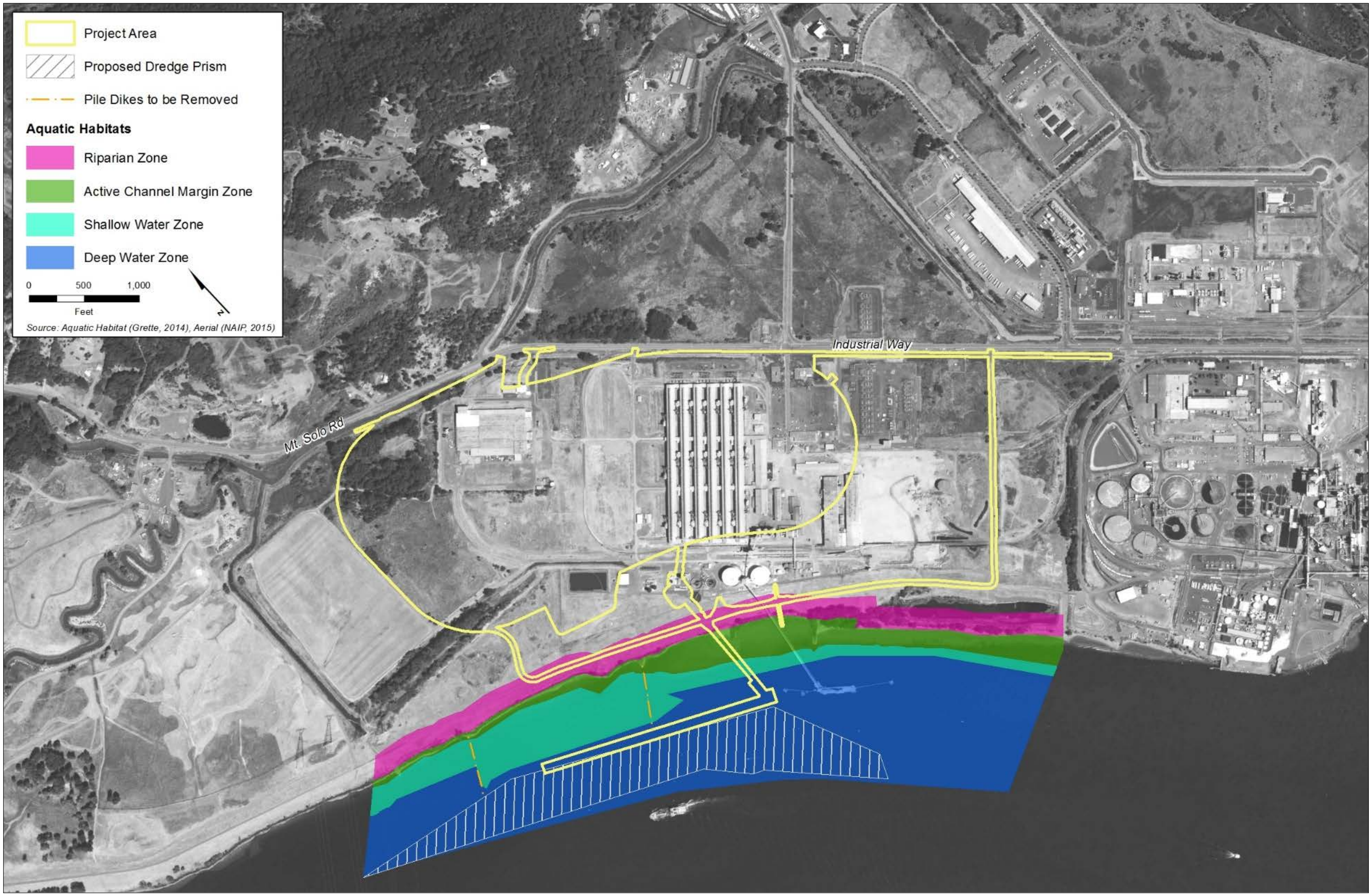
Habitat types in the terrestrial study area include developed (i.e., disturbed), upland, wetland, and riparian vegetation cover classifications, which are described in Section 4.6, *Vegetation*.

4.8.4.2 Aquatic Habitat

The aquatic study area includes the Columbia River; in the terrestrial study area there are smaller areas of open water, including various surface and stormwater ditches and a pond created along the Columbia River that provide aquatic habitat. Ditches in the aquatic study area include those maintained by CDID #1 and privately owned stormwater ditches. The Columbia River supports marine mammals, fish, birds, and a variety of invertebrates (which serve as forage to support wildlife higher on the food chain). Fish are discussed in Section 4.7, *Fish*. Ponds and ditches in the aquatic study area could support common species of invertebrates and amphibians as well as small mammals and birds.

Habitat types in the Columbia River include the deepwater zone, shallow water zone, and the active channel margin (Figure 4.8-2) (Grette Associates 2014i). The active channel margin includes the shoreline and nearshore edge habitat extending toward the water from the ordinary high water mark out to a depth of 11.1 feet Columbia River Datum. In general, the shoreline adjacent to the aquatic study area is highly modified by extensive levees and riprap armoring with scattered large woody debris.

Figure 4.8-2. Aquatic Habitats for the Proposed Action



The conditions in the shallow water zone are relatively narrow and more steeply sloped making it unlikely to support aquatic vegetation (Grette Associates 2014j). The benthic (i.e., river bottom) habitats of the Columbia River are subjected to strong currents and reduced light penetration with depth and, therefore, support little to no aquatic vegetation.

4.8.4.3 Wildlife Species

Wildlife likely to be found in the terrestrial study area include common species of birds, rodents, amphibians, reptiles, and invertebrates. Larger and more mobile species of mammals could also be present.

Animals likely to be found in the terrestrial and aquatic study area include common species of birds (waterfowl, raptors, shorebirds, marine birds, and passerine birds), rodents, frogs, salamanders, snakes, lizards, and invertebrates. Larger and highly mobile species of mammals that are habituated to developed environments may also be present in the study area, including coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*) and deer (*Odocoileus* sp.).

During the December site visit, two Columbian black-tailed deer (*Odocoileus hemionus columbianus*) were observed in the forested wetland area (Wetland A) at the northwest portion of project area, and two nutrias (*Myocastor coypus*) were observed on the sloped bank of the CDID #1 Ditch 10, on the north side of Industrial Way. Other signs of mammal presence were observed during both site visits, including several unidentified small mammal scats, a coyote scat along the dike road, a beaver (*Castor canadensis*)-chewed tree in the riparian habitat along the Columbia River, and an unidentified species of sea lion heard barking from the Columbia River navigation channel.

Several common bird species were recorded in the terrestrial study area during the site visits, including red-winged blackbird (*Agelaius phoeniceus*), sparrows (*sp*.), robins (*Turdus migratoius*) and other songbirds, American coot (*Fulica Americana*), bufflehead (*Bucephala albeola*), mallards (*Anas platyrhnchos*) and other unidentified ducks, Canada geese (*Branta Canadensis*), cormorants (*sp*.), scaup (*sp*.), gulls (*sp*.), and great blue heron (*Ardea herodias*). A turkey vulture (*Cathartes aura*), red-tailed hawk, kestrel (*Falco sparverius*), and bald eagle (*Haliaeetus leucocephalus*) were observed flying overhead. During the December 2014 site visit, a small flock of Canada geese were observed grazing on wetland grasses at the project area, and several unoccupied raptor nests were also observed in the forested habitat adjacent to the stormwater ditches on the southwest side of the project area and in an electrical tower near the west side of the dike road.

Grette Associates biologists conducted surveys for the federally threatened and state endangered streaked horned lark during the breeding season in 2013 and 2014 in the project area. No streaked horned larks were detected; however, 33 other bird species were recorded. A table listing these species is included in the *SEPA Wildlife Technical Report*. A few of these bird species are also special-status species, which are addressed in Section 4.8.4.4, *Special-Status Wildlife Species*.

Three species of pinnipeds may be present in the aquatic study area within the Columbia River: harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), and Steller sea lion (*Eumetopias jubatus*) (Jeffries et al. 2000). Because these marine mammals are all protected under the Marine Mammal Protection Act, they are described in more detail in Section 4.8.4.4, *Special-Status Wildlife Species*. Various bird species, including waterfowl, raptors, and shorebirds are supported by the Columbia River's aquatic habitats in the aquatic study area, as well as numerous fish species. Freshwater insects and other invertebrate species (i.e., mollusks, crayfish) inhabit the upper layers of the benthos and provide forage for many species of fish and birds. Fish and their habitats, are discussed in the *SEPA Fish Technical Report.*

4.8.4.4 Special-Status Wildlife Species

Special-status wildlife species are those listed as threatened, endangered, proposed, or candidate species under the ESA or are listed as a priority species by WDFW. Table 4.8-4 lists the special-status wildlife species likely to occur in the terrestrial and aquatic study areas. Further descriptions of each species are provided in the *SEPA Wildlife Technical Report*. Some of the PHS listings are not for individuals of a species (PHS Criteria 1) but for vulnerable aggregations (PHS Criteria 2) of individuals, such as western Washington nonbreeding concentrations. The likelihood of each species or vulnerable aggregations occurring in the terrestrial and aquatic study areas is listed as follows (Washington Department of Fish and Wildlife 2013).

- *Yes* (known to occur)
- *Possibly* (likely to occur due to presence of suitable habitat, but not documented)
- *Unlikely* (individuals may occur in the terrestrial or aquatic study areas but vulnerable aggregations are not documented in the PHS database)

A listing of *No* does not mean individuals of that species could not occur in the terrestrial or aquatic study areas, it only signifies that there are no documented vulnerable aggregations (the potential for individuals to occur in the terrestrial or aquatic study areas is provided in parenthesis).

Columbian White-tailed Deer (*Odocoilieus virginianus leucurus*)

The Columbia River population of the Columbian white-tailed deer is a federal and state listed endangered species. The Columbia River population is one of only two extant populations in the United States. The Columbia River population inhabits the lower Columbia River floodplain and islands within the river channel. The current range of the Columbian white-tailed deer overlaps with the study area, including Barlow Point and Fisher, Walker, and Lord Islands (Washington Department of Fish and Wildlife 2013).

WDFW has identified specific locations along the Columbia River for recovery (Washington Department of Fish and Wildlife 2013). The nearest recovery location to the study area is downstream of Longview, which includes Fisher, Hump, Lord, and Walker Islands (Washington Department of Fish and Wildlife 2013). The presence of white-tailed deer in the study area has been documented.

Columbian Black-tailed Deer (*Odocoileus hemionus columbianus*)

Black-tailed deer use upland slopes and closed-canopy coniferous forests as they require a mix of forest and openings for cover and forage (Washington Department of Fish and Wildlife 2014). Columbian black-tailed deer have been observed on the project area.

Table 4.8-4. Special-Status Wildlife Species that Could Occur in the Study Area

Wildlife Species	Potential for Occurrence[a]	Potential Habitat	State Priority Species Criteria[b]	Federal Status[c]	State Status[d]
Mammals					
Columbian black-tailed deer (*Odocoileus hemionus columbianus*)	Yes	Species documented on project area. Limited habitat on project area. May use forested portions of terrestrial study area.	3	N/A	N/A
Columbian white-tailed deer (*Odocoilieus virginianus leucurus*)	Yes	Species documented on project area.[e] Limited forage and cover on project area. Suitable habitat available on Lord Island.	1	E	E
Harbor seal (*Phoca vitulina*)	Yes	Present in Columbia River	2	N/A	N/A
California sea lion (*Zalophus californianus*)	Yes	Present in Columbia River	2	N/A	N/A
Stellar Sea lion (*Eumetopias jubatus*)	Yes	Present in Columbia River	1, 2	SC	T
Birds					
Streaked horned lark (*Eremophila alpestris strigata*)	Possibly	Not documented during surveys on project area. Potential suitable habitat on Lord Island.	1	T	E
Bald eagle (*Haliaeetus leucocephalus*)	Yes	Forested wetlands could provide roosting habitat. Suitable habitat on Lord Island.	1	SC	S
Peregrine falcon (*Falco peregrinus*)	Possibly	Potential foraging habitat	1	SC	S
Barrows goldeneye (*Bucephala islandica*)	Possibly (nonbreeding concentrations unlikely)	Open water	2, 3	N/A	N/A
Common goldeneye (*Bucephala clangula*)	Possibly (nonbreeding concentrations unlikely[f])	Open water	2, 3	N/A	N/A

Wildlife Species	Potential for Occurrence[a]	Potential Habitat	State Priority Species Criteria[b]	Federal Status[c]	State Status[d]
Bufflehead (*Bucephala albeola*)	Yes (nonbreeding concentrations unlikely[f])	Open water	2, 3	N/A	N/A
Waterfowl concentrations	Yes	Suitable habitat documented in terrestrial and aquatic study areas	2, 3	N/A	N/A
Vaux's swift (*Chaetura vauxi*)	Possibly	No large snags for nesting or roosting identified on project area but possible in terrestrial study area.	1	N/A	C
Pileated woodpecker (*Dryocopus pileatus*)	Possibly	Possible in forested habitat.	1	N/A	C
Purple martin (*Progne subis*)	Yes	Species documented in terrestrial study area, possible foraging.	1	N/A	C

Notes:

[a] Potential for individuals to occur based on multiple sources, including PHS data, scientific literature, and agency documents; Potential for vulnerable aggregations based on PHS data only.

[b] State PHS Species Criteria
1 – State-listed or candidate species
2 – Vulnerable aggregation
3 – commercial, recreational, or tribal importance

[c] Federal Status under the U.S. Endangered Species Act
E = Endangered
T = Threatened
SC = Species of Concern

[d] State Status
E = Endangered
T = Threatened
C = Candidate
S = Sensitive

[e] Grette Associates 2014j

[f] Western Washington Nonbreeding Concentrations

[g] Willapa Hills Audubon Society 2014

Streaked Horned Lark (*Eremophila alpestris strigata*)

The streaked horned lark is a federally threatened and state endangered species. Streaked horned larks prefer wide open spaces characterized by flat, treeless landscapes of 300 acres or more, sparse grass/forb vegetation, and few or no shrubs. In the lower Columbia River, they were historically known to nest on sandy beaches and spits. Now, they can be found nesting on dredge spoil depositions. At the project area and within the study area, there are a few small areas containing potentially suitable habitat (low vegetative cover and no woody vegetation) that are located adjacent to the Columbia River: the closed Reynolds landfill and edges of roadbeds. No streaked horned larks were observed during the surveys in the project area during the 2013 and 2014 breeding seasons (Grette Associates 2014j, 2014k).

Critical habitat has been designated on the east side of Crims Island by USFWS. All critical habitat areas within the lower Columbia River are located downstream from the study area, with the exception of one area. The closest designated critical habitat is on Crims Island, approximately 5 miles downstream of the study area. The only critical habitat upstream of the study area is on Sandy Island, Columbia County, Oregon at river mile 76, approximately 13 miles upriver (U.S. Fish and Wildlife Service 2012).

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles nest and forage for fish along the lower Columbia River. There are no documented bald eagle nests in the study area and no suitable nesting habitat exists on the project area. The nearest documented nest sites are located approximately 2 miles downstream and 4 miles upstream of the study area (Washington Department of Fish and Wildlife 2014). The study area provides foraging habitat for this species. Lord Island also provides suitable habitat that may be used by bald eagles (Pacific Coast Joint Venture 1994). Bald eagles were observed soaring over the study area during the April 8, 2014 site visit. Bald eagles were also observed in the study area during the July 12, 2013 streaked horned lark surveys (Grette Associates 2014j).

Peregrine Falcon (*Falco peregrinus*)

Peregrine falcons nest on cliff ledges but also use tall manmade structures such as bridges, overpasses, buildings, and power plants (Oregon Department of Transportation undated). The nearest documented nest location is approximately 3 miles south of the study area (Washington Department of Fish and Wildlife 2014). Peregrine falcons nesting within a few miles of the study area could use the study area for foraging.

Waterfowl

Nonbreeding concentrations of Barrows goldeneye (*Bucephala islandica*), common goldeneye (*B. clangula*), and bufflehead (*B. albeola*) are considered priority species (vulnerable aggregation) by WDFW. A few individual bufflehead were observed resting on open water (both in wetlands and on the Columbia River) in the study area during the April 8, 2013 site visit. However, within the study area there are no vulnerable concentrations of waterfowl documented by WDFW in the PHS database (Washington Department of Fish and Wildlife 2014). The nearest documented vulnerable concentration is located approximately 0.25 mile north of the study area. Lord Island and adjoining Walker Island support waterfowl and suitable habitat is located just outside of the study area in the tidal marsh area between the islands south of the sand spit (Pacific Coast Joint Venture 1994).

Purple Martin (*Progne subis*)

The purple martin is a state-listed species of concern. Purple martins were observed on the project area during the streaked horned lark surveys in July 2013 (Grette Associates 2014j). Several nest sites are documented in the Coal Creek Slough, approximately 3 to 4 miles downstream of the study area (Washington Department of Fish and Wildlife 2014).

Vaux's Swift (*Chaetura vauxi*)

The Vaux's swift is a state candidate species. They are summer (June to mid-August) residents in Washington, migrating north to Washington during the spring (April to late May) and south during the fall (mid-August to late September). There is no suitable nesting or roosting habitat on the project area; however, there are other forested areas in the study area that may contain suitable habitat. Vaux's swifts may fly through the study area during migrations or while foraging. They are commonly observed at the Mint Farm (Willapa Hills Audubon Society 2014) east of the study area.

Pileated Woodpecker (*Dryocopus pileatus*)

Pileated woodpeckers inhabit mature deciduous or mixed deciduous-coniferous forests. There is no suitable nesting habitat in the project area. Limited foraging habit may be available in the forested areas onsite. Forested portions of the study area may contain suitable habitat for nesting and foraging.

Pinnipeds

Three species of pinniped are found in the lower Columbia River in the study area: California sea lions (*Zalophus californianus*), Steller sea lions (*Eumetopias jubatus*), and harbor seals (*Phoca vitulina*). Sea lions use the lower Columbia River for foraging on fish and resting at haulout sites. Breeding areas (both mating rookeries and pupping sites) for California sea lions are located in California and Mexico. Steller sea lions are primarily present during the nonbreeding season.

Surveys conducted in the 1990s identified four haulout sites used by sea lions between the mouth of the Columbia River and its confluence with the Cowlitz River (Jeffries et al. 2000), which is approximately 4.5 miles upstream of the project area. There are no documented sea lion haulout sites in the study area, but individuals likely swim through the study area as they migrate up and down the Columbia River. Harbor seals are the most numerous of the pinnipeds found in Washington waters. Like sea lions, they forage and rest along the lower Columbia River, with dozens of haulout sites identified between the mouth of the river and the study area. There are no documented seal or sea lion haulout sites in the study area, but individuals swim through the study area as they migrate up and down the Columbia River.

4.8.5 Impacts

This section describes the potential direct and indirect impacts related to wildlife and wildlife habitat that could result from the construction and operation of the Proposed Action and the No-Action Alternative.[1] The Applicant identified the following design features and best management

[1] Acreages presented in the impacts analysis were calculated using geographic information system (GIS), thus, specific acreage of impacts are an estimate of area based on the best available information.

practices to be implemented as part of the Proposed Action, and were considered when evaluating potential impacts of the Proposed Action.

- The Applicant will design the trestle to be long and narrow, and at a height above ordinary high water to minimize shading in shallow water areas. From shore, the trestle would measure 24 feet in width for 700 feet, and 51 feet in width for the final 150 feet. The top of the deck would be +22 feet Columbia River Datum and the bottom of the deck +19.5 feet Columbia River Datum. Therefore, the bottom of the deck would be more than 8 feet above ordinary high water. This design would minimize overall impacts in shallow water, including impacts on habitat connectivity along the shoreline.
- The Applicant will locate Docks 2 and 3 entirely in deepwater habitat to distance the structure and terminal activities from shallow water areas.
- The Applicant will locate the berthing area at depths of at least -20 feet Columbia River Datum to avoid habitat conversion from shallow to deepwater during dredging.
- The Applicant will locate the berthing area in deepwater closer to the navigation channel to minimize the scope of future maintenance dredging.
- The Applicant will direct lighting for the Proposed Action downward or at structures, and will incorporate shielding to avoid spillage of light into aquatic areas.
- The Applicant will include a pinpoint light source at the end of the shiploading boom, aimed straight down into the ship hold area to avoid a broader beam that could cause light spillage.
- The Applicant will remove the piles associated with the pile dikes slowly to minimize sediment disturbance and turbidity in the water column.
- Prior to pile extraction, the Applicant will break the friction between the pile and substrate to minimize sediment disturbance.

4.8.5.1 Proposed Action

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

Construction activities that could affect wildlife include the following.

- Permanent removal of habitat and wildlife mortality in terrestrial and aquatic habitats associated with clearing and construction of the proposed terminal.
- Wildlife displacement and mortality associated with clearing and construction of the coal export terminal.
- Noise and visual impacts on terrestrial and aquatic wildlife associated with operation of construction equipment, general construction related noise and pile-driving.
- Spills and leaks associated with construction equipment and materials.

Operation activities that could affect wildlife include the following.

- Noise impacts on wildlife associated with operations such as train movements, transfer of coal, and general industrial operations.
- Spills and leaks from trains, vehicles or equipment.

- Vessel strikes of marine mammals.
- Underwater vessel noise impacts on pinnipeds and diving birds.
- Removal of habitat during maintenance dredging affecting wildlife and habitat.
- Coal dust deposition impacting terrestrial, wetland, and aquatic habitats and wildlife.

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).

Temporarily Alter or Permanently Remove Terrestrial Habitat

Construction of the Proposed Action would result in the permanent loss of terrestrial wildlife habitat in the study area (Table 4.8-5 and Section 4.3, *Wetlands*). Construction of the Proposed Action would result in the permanent loss of terrestrial wildlife habitat in the terrestrial study area (Table 4.8-5 and Section 4.3, *Wetlands*). Construction grading and clearing would permanently remove 201.95 acres of habitat, mostly in previously developed lands with surrounding areas of sparse vegetation. In general, these degraded habitats do not support wildlife.

Table 4.8-5. Permanent Terrestrial Habitat Loss by Type in the Study Area

Habitat Type	Direct Impact Area (acres)
Disturbed	151.61
Riparian	0.05
Upland	26.19
Wetland	24.10
Total	**201.95**

Animals inhabiting these areas could be displaced to other habitats outside of the project area and mortality of some less mobile individual species could occur. Highly mobile wildlife species, such as larger mammals and birds, would likely leave the terrestrial study area during construction activities. Some mortality of less mobile species could occur, such as burrowing mammals, reptiles, amphibians and insects. Typically, these species reproduce rapidly and any losses due to mortality would not be expected to affect the viability or fitness of the species at the population scale.

Temporary impacts on habitat could occur through soil disturbance, stockpiling, and erosion, causing an increase in total suspended sediments in the Columbia River and freshwater ditches on and adjacent to the project area. These types of impacts would be avoided or greatly reduced with the implementation of construction best management practices, avoidance and minimization measures, and compliance with permit requirements, such as those associated with the required 401 Water Quality Certification and hydraulic project approval. Section 4.5, *Water Quality,* describes the potential impacts of the Proposed Action on water quality.

Cause Temporary Displacement or Mortality

Wildlife present in the terrestrial habitat in the study area could be displaced, injured or killed by a collision with construction vehicles or equipment, placement of construction materials on the ground, or ground disturbance such as preloading activities. Approximately 151 acres (70%) of the project area are currently developed and wildlife would likely not be present in these areas due to the lack of suitable habitat. Although construction may affect a relatively small area of potentially suitable but degraded habitat, most wildlife species are mobile, and construction activities would be temporary; construction activities could result in the displacement and possibly the mortality of wildlife at the project area, particularly less mobile species such as burrowing mammals, reptiles, amphibians and insects. But of the approximate 200 acres of land that would be affected by the Proposed Action, approximately 49 of those acres provide suitable, but degraded wildlife habitat. The remaining 151 acres are developed or otherwise disturbed from past industrial activities at the property. Overall, the potential displacement or mortality of wildlife during construction would not have a measurable impact on wildlife species at the population scale or in terms of overall population fitness.

Cause Temporary Physical or Behavioral Responses to Construction Noise and Human Activities

Construction of the Proposed Action could affect both terrestrial and aquatic wildlife because of increased human presence, elevated noise levels, and/or ground-disturbing activities. While wildlife in and around the terrestrial and aquatic study area are likely habituated to human activity and noise levels associated with industrial and developed areas, noise levels at the project area would increase above ambient levels for the duration of construction, especially during impact pile-driving activities associated with dock and trestle construction.

Wildlife species exhibit different hearing ranges and all wildlife do not respond the same way to similar sound sources or levels. Wildlife response to sounds depends on numerous factors, including noise level, frequency, distance and event duration, equipment type and conditions, frequency of noise events over time, slope, topography, weather conditions, previous exposure to similar noises, hearing sensitivity, reproductive status, time of day, behavior during the noise event, and the animal's location relative to the noise source (Delaney and Grubb 2003 in Washington State Department of Transportation 2015). Therefore, an animal's reaction to elevated noise levels could range from mild disturbance with little or no reaction to escape behavior, which would displace individuals by forcing them to abandon the area of elevated noise levels, potentially resulting in significant impairment or disruption of normal behavioral patterns. Such displacement and disruption of behavior could reduce productivity and survival of individuals as the individual would likely expend more energy relocating to new suitable habitat, and would be less familiar with new habitat areas and at an increased risk of predation, potentially limiting survival of individual adults or offspring (e.g., abandoning young). These impacts would be exacerbated where there is no adjacent or nearby suitable habitat that is easily accessible. In addition, visible construction equipment, materials, and an increase in infrastructure could cause displacement because some species would avoid areas within the line-of-sight of construction equipment operations.

Dredging and the associated noise could affect birds, including streaked horned larks, during the nesting season. No studies specifically identify noise sensitivities of the streaked horned lark. However, noise sensitivity studies of the marbled murrelet, found that marbled murrelets are very sensitive to underwater noise such as pile-driving and to prolonged terrestrial noise that lasts longer than 10 to 15 minutes (Mountain Loop Conservancy 2010). Shorebird sensitivities are more closely related to those of sea lions because they spend most of their time above water and generally stay in the shallow water while hunting (Science Applications International Corporation 2011). Dredging activities have been shown to generate noise of 72 decibels in commercial or industrial areas (Epsilon Associates, Inc. 2006). Noise levels in this range could disturb birds, but would not likely result in injury.

Construction-related noise impacts and the presence of construction equipment and materials would be temporary, occurring over the estimated 6-year construction period. A lower density of development northwest of the terrestrial study area could connect to potentially suitable wildlife habitat where wildlife could relocate during and after construction. Because wildlife in the terrestrial study area are likely habituated to noise levels associated with industrial areas and are generally mobile, construction-related noise could affect individuals of a species, but would not affect a species' whole population or the overall fitness of a population.

Temporarily Alter or Permanently Remove Aquatic Habitat

Construction of the Proposed Action would result in the alteration or permanent loss of approximately 59 acres of aquatic habitat in the aquatic study area. Dredging to provide vessel access to Docks 2 and 3 would alter approximately 48 acres of benthic deepwater habitat and construction would result in the permanent loss of approximately 11 acres of aquatic habitat (ditches and ponds) throughout the terrestrial habitats of the project area.

These open areas of freshwater support common species of amphibians and may be used by small mammals and birds. Mammals and birds are highly mobile species and are expected to leave the vicinity during construction activities. Some mortality of amphibians could occur; however, these species typically reproduce rapidly and any losses due to mortality would not be expected to affect the viability or fitness of the species' populations.

The placement of 610 piles would permanently alter or remove benthic habitat in the Columbia River. Piles would displace approximately 0.10 acre (4,312 square feet) of river bottom habitat (7.07 square feet per pile multiplied by 610 piles), and the areas within each pile footprint would cease to contribute toward primary or secondary productivity. Construction of these docks would create 4.62 acres of new overwater surface area that would limit light penetration into the aquatic environment. Benthic, epibenthic, or infaunal organisms within the pile footprint at the time of pile-driving would likely perish.

Existing creosote-treated piles associated with two pile-dikes would be removed using vibratory extraction or direct-pull methods (Grette Associates 2014n). Removing creosote-treated woodpiles from the Columbia River could improve water quality over the long term; however, removing the piles could cause temporary, short-term increases in suspended sediments, short-term water contamination, and long-term sediment contamination from creosote released during extraction or long-term exposure to the water column.

Creosote and associated chemicals, particularly those that are water soluble and that persist in the water column are known to bioconcentrate in many aquatic invertebrates (Eisler 1987; Brooks 1997). Creosote contains a mixture 200 to 250 compounds, with primary components composed of polycyclic aromatic hydrocarbons (PAHs) (Brookes 1995; National Marine Fisheries Service 2009). PAHs are known to be toxic to aquatic organisms including invertebrates and fish and can cause sublethal and lethal effects (Eisler 1987; Brooks 1997). Most of the components of creosote are heavier than water and sink in the water column. PAHs from creosote accumulate in sediments and are likely to persist at the site of pile removal or wherever they settle after suspension until they degrade (National Marine Fisheries Service 2009). However, PAHs from sediment are less bioavailable to aquatic species and, thus, these organisms are not likely to bioaccumulate PAHs from sediments (Brooks 1997). Over the long term, the source of creosote would be removed or capped by the sediment falling into the hole left by the extracted pile. Water quality would improve, the concentration of creosote in the sediment would be expected to decrease, and the potential pathway of exposure for wildlife through contamination of prey would be reduced.

Dredging would permanently alter a 48-acre area of deepwater habitat by removing approximately 500,000 cubic yards of benthic sediment. Within the proposed dredge prism (i.e., extent of dredged area), the amount of deepening would vary based on existing depths, from no removal up to a depth of approximately 16 feet of removal. Permits for the Proposed Action, including dredging, would require site-specific sediment sampling to characterize the proposed dredge prism and ensure compliance with a dredged materials management plan.

Most bottom-dwelling benthic organisms are stationary or slow moving and would likely perish during dredging. Benthic organisms typically recolonize disturbed areas within 30 to 45 days. Dredging activities could also affect pinnipeds through collisions with vessels and dredge-related increases in turbidity. Collisions are possible but unlikely given the slow speeds of dredging vessels. Information on turbidity is limited; however, existing research indicates that dredge-related turbidity is not likely to cause substantial impacts on pinnipeds since they often inhabit naturally turbid or dark environments and are likely to use senses in addition to their vision (Todd et al. 2014). Noise could cause masking and behavioral changes but is unlikely to cause auditory damage to pinnipeds (Todd et al. 2014). Localized, temporary increases in turbidity would not likely cause long-term or negative impacts on pinnipeds.

Cause Temporary Physical or Behavioral Responses to Underwater Construction Noise—Pinnipeds

Installation of structural steel piles to support Docks 2 and 3 would generate underwater noise during pile-driving (Grette Associates 2014b) that could exceed the harassment thresholds described in Section 4.8.3.2, *Impact Analysis, Assessing Noise Impacts*. Pile installation and the applicable work windows would be provisioned in the Hydraulic Project Approval. Pile installation would likely occur over two in-water work window construction periods, due to the number of in-water piles required for the dock and trestle.

Impact Pile-Driving

Level A harassment could occur up to a radius distance of 178 feet of active impact pile-driving without any sound attenuation in place. With implementation of a bubble curtain to attenuate noise levels during impact pile-driving, there would be a reduction of at least 9 decibels at the source, which would decrease the Level A harassment area to a 45-foot radius around each pile as it is driven. Because the Columbia River is approximately 3,000 feet wide at the point where pile-driving would occur, there would be a wide area of the river that pinnipeds could utilize and avoid exposure to the small area where underwater noise reaching Level A harassment would be generated. Based on the seasonal use patterns for California sea lion, Steller sea lion, and harbor seals in the study area, presence of individual pinniped species during impact pile-driving would be unlikely.

It is estimated that Level B harassment could occur up to a radius distance of 3.36 miles of active impact pile-driving without any sound attenuation in place. With implementation of a bubble curtain to attenuate sounds, it is estimated that there would be a reduction of at least 9 decibels at the source, which would decrease the Level B harassment area to a 4,459-foot radius around each pile as it is driven. In the event these pinnipeds pass through the study area during impact pile-driving, they would be exposed to sound in excess of the Level B harassment threshold.

Vibratory Pile-Driving

Vibratory pile-driving may occur during much or all of each working day during the proposed in-water work window. Considering multiple pile-driving rigs, given variable subsurface conditions there would be days where periods of vibratory pile-driving would be shorter and/or discontinuous throughout the working day. California sea lions, Steller sea lions, and harbor seals are considered unlikely to be present during much of the vibratory pile-driving period, based on their typical occurrence and the in-water pile-driving construction timing. This would minimize the likelihood that individual pinnipeds would experience sound in excess of the 120 dB_{RMS} Level B harassment threshold for continuous pile-driving sound. Individuals that occur within 5.4 miles (28,512 feet) of vibratory pile-driving would experience elevated sound levels. If an individual were to initially avoid the area of elevated sound it would be expected to eventually move through the study area, either once acclimated to the sound or once pile-driving has ceased.

Cause Temporary Physical or Behavioral Responses to Underwater Construction Noise—Diving Birds

Installation of the piles could result in underwater noise impacts on diving birds. Based on the USFWS thresholds for marbled murrelet (Section 4.8.3.2, *Impact Analysis, Assessing Noise Impacts*), given the small area where these noise levels would be reached, and assuming the presence of construction equipment, vessels, and humans during pile-driving, it is likely a diving bird would avoid the area and not be exposed to the injury thresholds. However, it is possible that diving birds could experience the behavioral threshold of 150 dB_{RMS} at slightly beyond 4,500 feet.

The reaction of a diving bird that is exposed to underwater noise levels above 150 dB_{RMS} (but below 202 dB_{SEL}) could range from mild disturbance to escape behavior, which would displace individuals by forcing them to abandon the area of elevated noise levels, potentially resulting in impairment or disruption of normal behavioral patterns. Such displacement and disruption of behavior could interrupt feeding and diving, and reduce productivity and survival of individuals as the individual would likely expend more energy relocating to a new area. However, impact pile-driving noise impacts would be temporary, occurring over 2 years, during the approved in-water work window, and it is not anticipated that underwater impact pile-driving noise would affect the overall fitness of diving bird populations.

Cause Temporary Spills and Leaks that Affect Species or Habitat

Construction activities would occur on land as well as in and over waters of the Columbia River. Construction activities could result in temporary water quality impacts from the release of hazardous materials such as fuels, lubricants, hydraulic fluids, or other construction- related hazardous materials. Spills could affect aquatic and terrestrial wildlife near the discharge point, potentially affecting the respiration, growth, or reproduction of these species, or contaminating their habitat. The risk of a spill or release of hazardous materials is low because of the requirements associated with the handling, transfer, use, and storage of most construction-related hazardous materials. The potential risks, impacts, and mitigation measures related to impacts on water quality are addressed in Section 4.5, *Water Quality*. The potential for these types of impacts would be avoided or greatly reduced given protective measures to guard against these risks, including construction best management practices, avoidance and minimization measures, in-water work restrictions, and compliance with regulatory and permit requirements, such as those associated with 401 Water Quality Certification. However, a spill may have potential impacts on wildlife based on the location, weather conditions, and type and amount of material.

Construction—Indirect Impacts

Construction of the Proposed Action would not result in indirect impacts on wildlife or wildlife habitat because construction of the coal export terminal would be limited to the project area.

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*.

Cause Periodic Spills or Leaks that Contaminate Terrestrial or Aquatic Habitat

Routine operations at the project area could result in spills or leaks of hazardous materials from vehicles, trains, or equipment. Contaminants could affect terrestrial habitat as well as water quality, thus degrading aquatic habitat in the Columbia River and drainage ditches in the aquatic study area. Training, oil discharge prevention briefings, and regulatory compliance would reduce these risks and the potential for impacts. Additional measures are outlined Section 4.5, *Water Quality*, and Chapter 3, Section 3.6, *Hazardous Materials*.

Cause Periodic Physical or Behavioral Reponses to Noise

Operations could result in increased terrestrial noise, which could affect wildlife by causing disturbance or avoidance behavior. Species present in the terrestrial study area are likely habituated to the elevated noise levels associated with industrial, commercial, and residential uses. These species are generally mobile and avoid disturbing noise levels and human activities. Noise generated by the Proposed Action would be similar to the existing, adjacent land uses and would not have a measurable impact on wildlife species in the terrestrial study area.

Generate and Disperse Coal Dust in Terrestrial and Aquatic Habitats

Coal dust and fugitive coal particles could be generated during operation of the Proposed Action through the movement of coal onto the project area, around the project area, and onto vessels. Coal dust could also become airborne from the large stockpiles that would be located within the project area.

The potential extent and deposition rate of coal dust particles less than 75 microns was modeled as part of the analysis conducted relative to air quality. Based on this modeling, the highest rate of coal dust deposition would be expected in the immediate area surrounding the coal export terminal, but smaller particles would also be expected to deposit in a zone extending around and downwind of the terminal. Deposition rates could range from 1.88 grams per square meter per year (g/m^2/year) adjacent to the project area, gradually declining to less than 0.1 g/m^2/year approximately 2,500 feet from the project area and 0.01 g/m^2/year approximately 1.5 miles from the project area. Based on the models, the zone of deposition would extend primarily northwest of the project area and over the Columbia River. Deposition rates of less than 0.1 g/m^2/year are projected to occur over the forested habitats of Lord Island within the study area, with declining concentrations across the island and to the south and west toward Walker Island.

Windborne coal could potentially affect wildlife through physical or toxicological means. Coal particles could affect aquatic wildlife in a manner comparable to any form of suspended particulates, such as tissue abrasion, smothering, obstruction or damage to feeding or respiratory organs, and other effects resulting from reduced quantity or quality of light. Another potential manner in which coal could affect aquatic wildlife is through coal leachates. Unburnt coal can be a source of acidity, salinity, trace metals, hydrocarbons, chemical oxygen demand, and potentially macronutrients if they leach from the coal matrix into aquatic habitats. Toxic constituents of coal include PAHs and trace metals, which are present in coal in variable amounts and combinations dependent on the type of coal. Some PAHs are known to be toxic to aquatic animals and humans. Metals and PAHs could also potentially leach from coal to the pore water of sediments and be ingested by benthic-feeding organisms, providing a mechanism for subsequent ingestion by other organisms throughout the food chain. However, the low aqueous extractability and bioavailability of the contaminants minimizes the potentially toxic effects.

Spill Coal during Operations of the Proposed Action

Direct impacts on the natural environment from a coal spill during operations of the Proposed Action could occur. Direct impacts resulting from a spill during coal handling at the coal export terminal would likely be minor because the amount of coal that could be spilled would be relatively small. Also, impacts would be minor because of the absence of terrestrial and aquatic environments in the project area and the contained nature and features of the terminal (e.g., fully enclosed belt conveyors, transfer towers, and shiploaders). Potential physical and chemical effects of a coal release on the aquatic and terrestrial environments that occur adjacent to the terminal are described below.

A coal spill could have physical effects on aquatic environments, including abrasion, smothering, diminished photosynthesis, alteration of sediment texture and stability, reduced availability of light, temporary loss of habitat, and diminished respiration and feeding for aquatic organisms. The magnitude of these potential impacts would depend on the amount and size of coal particles suspended in the water, duration of coal exposure, and existing water clarity (Ahrens and Morrisey 2005). Therefore, the circumstances of a coal spill, the existing conditions of a particular aquatic environment (e.g., pond, stream, wetland), and the physical effects on aquatic organisms and habitat from a coal spill would vary. Similarly, cleanup of coal released into the aquatic environment could result in temporary impacts on habitat, such as smothering, altering sediment composition, temporary loss of habitat, and diminished respiration and feeding for aquatic organisms. The recovery time required for aquatic resources would depend on the amount of coal spilled and the extent and duration of cleanup efforts, as well as the environment in which the incident occurred. It is unlikely that coal handling in the upland portions of the coal export terminal would result in a spill of coal that would affect the Columbia River. This is unlikely because the rail loop and stockpile areas would be contained, and other areas adjacent to the coal export terminal are separated from the Columbia River by an existing levee, which would prevent coal from being conveyed from upland areas adjacent to the rail loop to the Columbia River. Coal could be spilled during shiploading operations as a result of human error or equipment malfunction. However, such a spill would likely result in a limited release of coal into the environment due to safeguards to prevent such operational errors, such as start-up alarms, dock containment measures (i.e., containment "gutters" placed beneath the docks to capture water and other materials that may fall onto and through the dock surface) to contain spillage /rainfall/runoff, and enclosed shiploaders.

The chemical effects on aquatic organisms and habitats would depend on the circumstances of a coal spill and the existing conditions of a particular aquatic environment (e.g., stream, lake, wetland). Some research suggests that physical effects are likely to be more harmful than the chemical effects (Ahrens and Morrisey 2005).

A coal train derailment and coal spill in Burnaby, British Columbia, in 2014, and subsequent cleanup and monitoring efforts provide some insight into the potential impacts of coal spilled in the aquatic environment. Findings from spill response and cleanup found there were potentially minor impacts in the coal spill study area, and that these impacts were restricted to a localized area (Borealis Environmental Consulting 2015).

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*. Under the Proposed Action, 1,680 vessel transits a year and 16 trains a day would operate at full build-out.

Cause Periodic Injury or Mortality from Vessel Strike—Pinnipeds

Operations of the Proposed Action would increase vessel traffic in the Columbia River (Chapter 5, Section 5.4, *Vessel Transportation*) by 840 ships a year. Increased vessel traffic related to operations at the project area could increase the risk of vessel collisions with pinnipeds in the indirect study area. Most available research and literature on marine mammal vessel strikes is associated with vessel-whale collisions at sea. Compared to pinnipeds, whales are typically much larger, slower-moving, and therefore, are assumed to be more vulnerable to vessel strikes. Vessel strikes on marine mammals are usually described as massive blunt-force trauma (Geraci and Lounsbury 1993 in Horning and Mellish 2009), but are considered extremely rare for pinnipeds (Andersen et al. 2007 in Horning and Mellish 2009). A blunt-force trauma that results from a marine mammal collision with a vessel can result in death or injury.

The potential for a pinniped strike with a vessel in the indirect study area would depend on many factors, including time of year, vessel type, vessel size, pinniped species, vessel location, vessel speed, and location of animal relative to vessel. The behavior of a pinniped in the path of an approaching vessel in the study area is uncertain, but it is likely that an individual would have the ability to avoid and swim away from the vessel. In addition, pinniped vessel strikes are rare, pinnipeds in the Columbia River would likely be habituated to existing Columbia River vessel traffic, and vessel speed in the indirect study area would be less than 14 knots. Therefore, the potential risk for a vessel collision with a pinniped in the indirect study area would be generally be considered low.

Cause Periodic Physical or Behavioral Responses to Vessel Noise and Maintenance Dredging—Pinnipeds

Proposed Action-related vessels would increase vessel traffic and underwater noise in the Columbia River (Chapter 5, Section 5.4, *Vessel Transportation*). Studies in the Salish Sea have shown that the greater the ship size, the greater the underwater source level due to cavitation, with the exception of tug vessels that show greater source noise levels underwater while performing activities such as berthing or accelerating a ship (Hemmera Envirochem et al. 2014). While this information is from studies in the Salish Sea, it is expected that noise levels from vessels would be similar in the Columbia River.

The peak hearing sensitivity frequencies of Steller sea lion, California sea lion, and harbor seal are generally outside of the noise frequencies generated by vessels (generally ranging between 10 Hertz and 1 kilohertz (Wright 2008) and these species are habituated to existing Columbia River vessel noise levels. Any response to project-related vessel noise would likely be minimal.

Periodically Remove or Alter Habitat during Maintenance Dredging

Maintenance dredging is anticipated to occur on a multiyear basis; however, it may occur as frequently as annually or following extreme flow conditions to maintain required depths at Docks 2 and 3 and to allow for navigation between the docks and the navigation channel (WorleyParsons 2012). Impacts on the benthic invertebrate community would be similar to those described for initial construction related dredging associated with construction activities (Section 4.8.5.1, *Proposed Action, Construction—Direct Impacts*). Compared to the initial construction dredging, maintenance dredging would remove a relatively small amount of material, including bottom dwelling organisms. Maintenance dredging would result in mortality of invertebrate organisms in the maintenance dredge prism and temporary disruption of benthic productivity. Benthic productivity is expected to be low in this deepwater habitat (McCabe et al. 1997). Maintenance-related dredging could affect pinnipeds and benthic organisms in a manner similar to the initial construction dredging (Section 4.8.5.1, *Proposed Action, Construction—Direct Impacts*). As mentioned above, benthic organisms typically recolonize in 30 to 45 days following disturbance. Thus, should dredging occur on an annual basis it would not prevent recolonization of the benthic habitat.

Generate and Disperse Coal Dust in Terrestrial and Aquatic Habitats

Coal dust and fugitive coal particles could be generated during operation of the Proposed Action through the movement of coal by rail along the rail corridor. Coal transported by vessel would be enclosed in cargo holds and is not likely to result in deposition along the vessel route. The potential impacts from coal dust for the indirect study area would be similar to the impacts described previously for the direct study area.

Spill Coal during Rail Transport

The magnitude of the potential indirect impact from a coal spill on the aquatic and terrestrial environments would be similar to those described previously and would depend on the location of the spill, the volume of the spill, and success of efforts to contain and clean up the spill, none of which can be predicted.

The potential impact of a coal spill from a Proposed Action-related train is directly related to the probability of a Proposed Action-related train incident occurring. Chapter 5, Section 5.2, *Rail Safety*, estimates the number of Proposed Action-related train incidents that could potentially occur during coal transport within Cowlitz County and Washington State. In Cowlitz County, the predicted number of loaded coal train incidents is approximately one every 2 years. The predicted number of loaded coal train incidents within Washington State is approximately five per year.

Not every incident of a loaded coal train would result in a rail car derailment or a coal spill. A train incident could involve one or multiple rail cars, and could include derailment in certain circumstances. The size and speed of the train and the terrain where an incident were to occur would influence if the incident resulted in a coal spill. A broad range of spill sizes from a partial rail car to multiple rail cars could potentially occur from a Proposed Action-related train accident.

Additionally, containment and cleanup efforts for coal spills from a rail incident factor into the potential impact on the environment. It is expected that coal spills in the terrestrial and built environments would be easier to contain and clean up than spills occurring in an aquatic environment. Spills occurring on land may have a quicker response time and cleanup in some locations due to their visibility and access for cleanup equipment, as compared to spills into aquatic environments.

Potential physical and chemical effects of a coal release into aquatic and terrestrial environments would be the same or similar to those described above under direct impacts.

Cause Wildlife Strikes along the Rail Corridor in Washington State

The rail corridors in Washington State cross through a variety of habitat types, which broadly include lowland and montane forests, sagebrush prairie, and shrub-steppe. Various species of wildlife are associated with each of these terrestrial habitats. Increased rail traffic associated with the Proposed Action could result in an increase in train strikes of wildlife species that occur along the rail corridor.

Dorsey (2011) found that some wildlife may use railroads for movement, which could be considered a positive impact. Wildlife move on or along railroads while foraging, accessing critical resources (e.g., water), migrating, and dispersing. Wildlife tend to move along railroads for at least three reasons, including; railroads are often co-aligned with high quality habitats and natural movement corridors (e.g., valley bottoms and mountain passes); wildlife may move along railroads because foods (i.e., edge vegetation, carrion from strikes, and spilled agricultural grains) are available along rights-of-way or on the railbed, and; the flat railbed provides an easily traversable route particularly apparent in regions receiving significant amounts of snowfall where railroad beds may offer a relatively snow-free travel path.

However, Dorsey (2011) indicated that various factors are likely to contribute to the frequency of wildlife and rail interactions and the potential for train strikes and wildlife mortality. For example, train speed, rail alignment, and train volume—as well as wildlife abundance, behavior and habitat quality and use (i.e., migration or foraging) along rail corridors—could individually, or in combination, affect the likelihood and frequency of train strikes of wildlife. The relative abundance of wildlife along a railroad may be the primary factor affecting strike rates (Dorsey 2011), although Kusta et al. (2014) did not find abundance of roe deer in the Czech Republic and train strikes to be correlated. Dorsey (2011) cited several studies that have documented more herbivore than carnivore mortalities from train strikes, which reflects their relatively greater abundance in most landscapes. Although Dorsey (2011) points out that foods found on and along railroads may also be a factor affecting strikes by increasing the time wildlife spend directly on or adjacent to railroads. Foods found along railroads may consist of natural vegetation, carrion and agricultural products spilled from train cars.

Overall, the Proposed Action would increase the number of trains traveling through Washington State by approximately 16 trains per day at full build-out (8 loaded trains arriving and 8 empty trains leaving each day). This increase in train traffic from the Proposed Action through Washington State would increase the risk of wildlife strikes by trains.

4.8.5.2 No-Action Alternative

Under the No Action Alternative, the Applicant would not construct the Proposed Action. Current operations would continue, and the existing bulk product terminal site would be expanded. However, any expansion would be limited to activities that would not require a permit from the U.S. Army Corps of Engineers (Corps) or a shoreline permit. Therefore, no construction impacts on aquatic habitats would be expected to occur as a result of an expansion of the existing bulk product terminal under the No-Action Alternative.

Growth in the region would continue, which would allow continued operation of the coal export terminal and the adjacent bulk terminal site within the 20-year analysis period (2018 to 2038). New construction, demolition, or related activities to expand the bulk product terminal could occur on previously developed upland portions of the project area. This could affect upland areas and terrestrial habitats that provide suitable wildlife habitat. The specific extent cannot be determined at this time.

Cleanup activities, relative to past industrial uses, would continue to occur. These could affect developed areas and associated disturbed upland habitats. Vessel traffic would continue and any aquatic wildlife disturbance or injury associated with vessel movements would continue at levels similar to current conditions.

4.8.6 Required Permits

The Proposed Action would require the following permits for wildlife.

- **Endangered Species Act Consultation—U.S. Fish and Wildlife Service and National Marine Fisheries Service.** The Proposed Action could affect wildlife species or designated critical habitats protected under the ESA. In accordance with Section 7(a)(2) of the ESA, as amended, any action that requires federal authorization or funding, or is carried out by a federal agency, must undergo consultation with the USFWS and/or NMFS to ensure the action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat.
- **Clean Water Act Authorization, Section 404—U.S. Army Corps of Engineers.** Construction and operation of the Proposed Action would affect waters of the United States, including

wetlands. Because impacts would exceed 0.5 acre, Individual Authorization from the Corps under Section 404 of the Clean Water Act and appropriate compensatory mitigation for the acres and functions of the impacted wetlands would be required.

- **Clean Water Act, Section 401 Water Quality Certification—Washington State Department of Ecology.** The Proposed Action would result in the construction and operation of a facility that would discharge into the navigable waters and would require a Clean Water Act, Section 401 water quality certification. This certification is administered by Ecology. The dredged materials management plan requires site-specific sediment sampling to characterize sediments and determination of suitability of dredged material for disposal.
- **Local Critical Areas and Construction Permits—Cowlitz County.** The Proposed Action would require local permits related to clearing and grading of the project area and relative to impacts on regulated critical areas. Cowlitz County would issue a fill and grade permit, and would review the Proposed Action for consistency with the County's critical areas ordinance.
- **Hydraulic Project Approval—Washington Department of Fish and Wildlife.** The Proposed Action would require a hydraulic project approval from WDFW because project elements would affect and cross the shoreline of the Columbia River.

The following were identified by the Applicant as measures that would be implemented during construction and/or operations. These measures are assumed to be conditions or requirements of permits identified above that would be issued for the project, and thus are described here. These measures were considered when evaluating the potential impacts of the project:

- While the Applicant will plan construction for an 8- to 10-hour day, 5 days per week. On occasion, dredging may occur 7 days per week to complete work within specific fish windows.
- The Applicant will limit the impact of turbidity to a defined mixing zone and would otherwise comply with WAC 173-201A.
- The Applicant will not stockpile dredged material on the river bottom surface.
- The Applicant will contain all dredged material in a barge prior to flow lane disposal; dredged material would not be stockpiled on the riverbed.
- During hydraulic dredging, the Applicant will not operate the hydraulic pumps unless the dredge intake is within 3 feet of the bottom.
- The Applicant will remove any floating oil, sheen, or debris within the work area as necessary to prevent loss of materials from the site. The contractor will be responsible for retrieval of any floating oil, sheen, or debris from the work area and any damages resulting from the loss.
- For material being transported to flow lane disposal sites, the Applicant will remove all debris (larger than 2 feet in any dimension) from the dredged sediment prior to disposal. Similar-sized debris floating in the dredging or disposal area will also be removed.
- The Applicant will dispose materials to the flow lane using a bottom-dump barge or hopper dredge. These systems release material below the surface, minimizing surface turbidity.
- The Applicant will limit all construction activities to daylight hours to ensure that construction noise levels would be controlled and within local and state noise limits.
- The Applicant will install and maintain a noise-monitoring station at an appropriate location on or near the site boundary to create 24-hours-per-day noise record during construction. The

measurements would be recorded and monitored on a real-time basis, and the contractor would take actions to halt or alter construction activities that exceed noise levels.

- To reduce the sound along the rail line, the Applicant will work with the Longview Switching Company to convert both the Oregon Way and Industrial Way crossings to quiet crossings and would fund such improvements to the rail line as necessary to achieve this mitigation.
- The Applicant will plan construction for an 8- to 10-hour day, 5 days per week. On occasion, it may be necessary to work 6 or 7 days per week depending on the nature of the task. For example, dredging may occur 7 days per week to complete work within specific fish windows.
- The Applicant will use activity-specific work windows designed to minimize specific impact mechanisms that may affect individual species (or populations within those species) of concern. These proposed work windows would protect species of concern while providing feasible construction periods for the in-water portion of construction over a 2-year schedule.
- The Applicant will conduct impact pile-driving using a confined bubble curtain or similar sound attenuation system capable of achieving approximately 9 decibels of sound attenuation.
- Where possible, the Applicant will keep extraction equipment out of the water to avoid "pinching" pile below the water line in order to minimize creosote release during extraction.
- During pile removal and pile-driving, the Applicant will place a containment boom around the perimeter of the work area to capture wood debris and other materials released into the waters as a result of construction activities. The Applicant will collect all accumulated debris and dispose of it upland at an approved disposal site. The contractor will deploy absorbent pads should any sheen be observed.
- The Applicant will provide a containment basin on the work surface on the barge deck or pier for piles and any sediment removed during pulling.
- Upon removal from substrate, the Applicant will move the pile expeditiously from the water into the containment basin. The contractor will not shake, hose, strip, or scrape the pile, nor leave it hanging to drip or any other action intended to clean or remove adhering material from the pile.

4.8.7 Potential Mitigation Measures

This section describes the mitigation measures that would reduce impacts related to wildlife 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.

4.8.7.1 Applicant Mitigation

The Applicant would implement the following mitigation measures to mitigate impacts on wildlife.

MM FISH-2. Implement a "Soft-Start" Method during Pile-Driving.

To minimize underwater noise impacts on fish during pile-driving, the Applicant will commence impact pile-driving using a "soft-start," or other similar method. The "soft-start" method is a method of slowly building energy of the pile driver over the course of several pile strikes until full energy is reached. This "soft-start" method cues fish and wildlife to pile-driving commencing and allows them to move away from the pile-driving activity.

MM FISH-3. Monitor Pile-Driving and Dredging Activities for Distress to Fish and Wildlife.

To minimize the potential harm to marine mammals, diving birds, or fish, a professional biologist will observe the waters near pile-driving and dredging activities for signs of distress from fish and wildlife during these activities. If any of fish or wildlife species were to show signs of distress during pile-driving, the biologist will issue a stop work order until the species are recovered, moved, or relocated from the area. The Applicant will immediately report any distressed fish or wildlife observed to the appropriate agencies (i.e., Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and National Marine Fisheries Service) and determine the appropriate course of action.

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-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 application of surfactants along the rail routes for Proposed Action-related trains.

MM-WQ-2. Develop and Implement a Coal Spill Containment and Cleanup Plan

The Applicant will develop a containment and cleanup plan to limit the exposure of spilled coal to the terrestrial, aquatic, and built environments during coal handling (i.e., transfer from train to terminal and terminal to ship). The plan will be reviewed by Cowlitz County and Ecology and implemented prior to beginning operations.

4.8.7.2 Other Measures to Be Considered

The co-lead agencies recommend BNSF identify and monitor wildlife-train collision and migration barrier hotspots along the rail corridors to determine whether current and projected levels of rail traffic would result in levels of mortality or migration barrier effects that could measurably affect the status of local wildlife populations. If levels of collision mortality and delays to wildlife movement are determined to have a measurable effect on the status of local wildlife populations, suitable wildlife crossing structures and other measures, such as fencing, should be considered as appropriate. BNSF should consult with WDFW and USFWS in designing approaches to identify and monitor hotspots and in identifying suitable crossing structures and other measures.

4.8.8 Unavoidable and Significant Adverse Environmental Impacts

Compliance with laws and implementation of the voluntary measures and mitigation measures described above would reduce impacts on wildlife. There would be no unavoidable and significant adverse environmental impacts.

4.9 Energy and Natural Resources

The availability and conservation of energy and natural resources are important factors to consider for large projects, such as the Proposed Action. Construction, operations, and transportation to and from the project area would require energy and natural resources.

This section describes energy and natural resources in the study area. It then describes impacts on energy and natural resources 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.

4.9.1 Regulatory Setting

No federal, state, or local laws or regulations pertaining to the use of energy and natural resources apply to the Proposed Action.

4.9.2 Study Area

The study area for direct impacts on energy and natural resources is the project area for the Proposed Action. The study area for indirect impacts on energy and natural resources is the area within 0.25 mile of the project area. When assessing the availability of energy and natural resources, the analysis considers those resources that are available regionally, beyond the 0.25-mile study area.

4.9.3 Methods

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

4.9.3.1 Information Sources

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

- Applicant-provided data
- Cowlitz Public Utility District
- Cowlitz Conservation District
- Cascade Natural Gas
- U.S. Energy Information Administration

4.9.3.2 Impact Analysis

The following methods were used to evaluate the potential impacts of the Proposed Action and No-Action Alternative on energy and natural resources.

Energy Consumption

Energy consumption was evaluated quantitatively. Potential impacts on energy were evaluated based on the estimated energy consumed during construction and operation of the Proposed Action and the estimated change in fuel consumption in the study area. Estimated hours of operation and types of fuel consumed were used to quantify energy consumption. Baseline energy usage and energy usage with the Proposed Action were estimated using data provided by the Applicant.

Natural Resource Consumption

Natural resource consumption was evaluated qualitatively. Potential impacts on natural resources were estimated based on the proposed consumption of resources during construction. The following assumptions were made for the analysis.

- Heavy construction materials, such as gravel, sand, concrete, and timber would be sourced locally to the extent possible.
- Adequate quantities of natural resources needed to support the Proposed Action would be readily available.
- Long-distance transport of these materials would be undesirable because of associated transportation costs.
- Steel used in construction would be available from both local and regional sources.

4.9.4 Existing Conditions

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

4.9.4.1 Energy

This section describes the energy sources and usage local to the area and project area.

Local Energy Sources

The following describes local energy sources (electricity, natural gas, and diesel fuel) in the project area.

Electricity

Electricity is provided to the project area by Cowlitz Public Utility District (PUD), which supplies electricity throughout Cowlitz County. Cowlitz PUD buys over 90% of its wholesale power from Bonneville Power Administrative (BPA). The majority of the BPA power comes from the Columbia River system hydroelectric projects.

Cowlitz PUD provides service throughout Cowlitz County and is among the largest public utility districts in Washington State. Cowlitz PUD estimates that customers will use 609 average megawatts and 821 peak megawatts of electricity in 2015 (Cowlitz Public Utility District 2015). Approximately 14% of Cowlitz PUD’s power is sold to residential users, and approximately 8% to industrial users (22 companies or industries). Major industrial users consume approximately 71% of the power.

Small general service and street/area lighting account for the other electrical usage (Cowlitz Public Utility District 2015).

Natural Gas

Natural gas is provided to the project area by Cascade Natural Gas, which supplies residential, commercial, and industrial users throughout Cowlitz County and beyond. The Cascade Natural Gas service area is concentrated in western and central Washington, and central and eastern Oregon. Interstate pipelines transmit the company's natural gas from production areas in the Rocky Mountains and western Canada (Cascade Natural Gas Company 2014).

Diesel Fuel

Local suppliers provide diesel fuel in the Longview-Kelso area. In Washington State, approximately 88.36 million gallons of diesel fuel were sold annually to railroad-related uses in 2012 (U.S. Energy Information Administration 2014). This represents approximately 9% of total diesel sales for all uses in the state. The largest consumers were on-highway users, or motor vehicles, accounting for 62% of diesel sales, or approximately 618 million gallons, in Washington State in 2012.

Tank vessels primarily use diesel or residual fuel oil. Diesel fuel sales for vessel uses in Washington State (excluding the military) totaled 80.5 million gallons in 2012, which accounted for 8.2% of the total diesel sales in the state (U.S. Energy Information Administration 2014). In 2013, the total prime supplier sales volume of fuel oil was 469.86 million gallons for Washington State (U.S. Energy Information Administration 2014).

Project Area Energy Usage

Cowlitz PUD provides electricity to the project area via overhead 230-kilovolt and 115-kilovolt power lines along Industrial Way. Other power lines run perpendicular to the north end of the project area, where they converge with a BPA substation. The existing power configuration is sufficient for the current operations at the project area (URS Corporation 2014). The existing annual electricity use for the existing bulk product terminal (outside the project area but within the Applicant's leased area) averages 20 megawatts based on the average electrical usages for 2014.

Within the project area, administrative buildings use electricity provided by Cowlitz PUD. Other energy consumed comes from diesel- or gasoline-powered generators provided by local fuel suppliers.

4.9.4.2 Natural Resources

This section describes the natural resources local to the area and the natural resources available specifically in the project area.

Local Natural Resources

The Cowlitz County economy was historically centered on forestry and timber products. Weyerhaeuser manufactures wood and paper products at a facility near the project area along the Columbia River. Many other timber-industry companies are located in nearby Longview. Groundwater resources in the vicinity are an upper alluvium aquifer (i.e., shallow groundwater), and the deeper confined aquifer from which industries, small farms, and domestic well users withdraw groundwater. The Mint Farm Regional Water Treatment Plant, operated by the Beacon

Hill Water and Sewer District and located less than 1 mile north of the project area, began withdrawing groundwater from the deep confined aquifer in January 2013 (URS Corporation 2014). Numerous quarries and mines are located in Cowlitz County that provide crushed stone, sand, and gravel.

Project Area Natural Resources

No forest products are located in the project area. The Applicant currently holds several water rights to extract groundwater from the deep aquifer within the Applicant's leased area and in the project area (Kennedy/Jenks Consultants 2012). Based on information provided by the Applicant, existing demand is within water rights limits for groundwater pumping.

4.9.5 Impacts

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

4.9.5.1 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, and constructing supporting infrastructure (i.e., conveyors and transfer towers).

Heavy machinery would be operated to prepare foundations and footings for construction of the coal export terminal, associated services, and utilities. Diesel fuel and gasoline would be used in most construction equipment such as cranes, wheel loaders, dozers, dump trucks, excavators, graders, rollers, compactors, drill rigs, pile-driving equipment, portable ready-mix batch plant, ready-mix trucks, concrete pumps, elevated work platforms, forklifts, rail-track-laying equipment, water pumps, and other similar machinery (URS Corporation 2014a). A fuel truck would visit the site as required. The frequency during construction would vary based on usage and activities and could range from once or twice per day to once or twice per week. Fuel trucks that would be used during construction would have a 3,000-gallon to 4,000-gallon capacity. A temporary increase in fuel use would result from the need to transport employees and materials to the project area and to operate construction equipment.

Increase Energy Use

Construction-related energy uses would include the use of electricity, diesel fuel, gasoline, oil, and natural gas. Construction would require on average each month approximately 500 gallons of gasoline, 50 gallons of oil, and 20,000 gallons of diesel fuel.

Electricity from Cowlitz County PUD would be consumed to provide construction lighting and power tools and equipment. Natural gas would be used for minor purposes, including to heat water for showers and other sanitary uses, but not for industrial uses. Heavy machinery would operate during construction, which would increase fuel use. The demand for gasoline, oil, diesel fuel, and natural gas during construction would be minor compared to the current regional demand for these fuels and could be met by the existing local and regional supply.

Increase the Use of Natural Resources

Natural resources that would be consumed during construction would include water, gravel, fill dirt, steel, and wood.

Groundwater available in the project area would be used during upland construction as necessary for dust suppression, which would be approximately 40,000 gallons per day (URS Corporation 2014). Approximately 2.1 million cubic yards of fill material would be imported to the project area to be used as preload material, and approximately 2.5 million cubic yards of material would be moved around the project area during preloading activities (URS Corporation 2014). Dredging would occur as part of the construction of the two docks (Docks 2 and 3), which would include removing approximately 500,000 cubic yards of fill material. All regularly used roads in the project area would require gravel. Any new impervious surface area would generate stormwater, but all stormwater would be collected and treated to meet state and federal water quality requirements prior to discharge to the Columbia River. Rail loop construction would require importing and placing approximately 130,000 cubic yards of ballast rock for the rail foundations; placing railroad ties; laying steel rail lines; and installing signaling, switching equipment, and track lighting (URS Corporation 2014).

The demand for these natural resources during construction would be minor compared to the current regional demand for these resources and could be met by existing local and regional supply.

Construction—Indirect Impacts

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

Increase Energy Use

A temporary increase in fuel consumption would result from the transport of employees and materials to the project area during construction. This fuel consumption would be a minor amount compared to the current demand for these fuels in the study area, and could be met by the existing local and regional supply.

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*.

Increase Energy Use

Electricity, gasoline, oil, propane, and diesel fuel would be the primary energy types consumed during operations of the Proposed Action. Electricity would be used to heat buildings and light indoor and outdoor areas, to power the automated system used to unload coal from trains, store coal, reclaim the coal from storage, and load the vessels. Specific types of equipment used for these processes include rail car unloading facilities, stacking conveyers, bucket wheel reclaimers, the belt conveyer system, and shiploaders.

Operational electricity usage is estimated at approximately 6,624,000 kilowatts per hour, per year, and operational electricity requirements are estimated at 20 to 25 megawatts per year. At full operation, the Proposed Action's energy use would represent an average of approximately 4% of the total electricity supplied to users in the Cowlitz PUD service area. This electricity demand is anticipated to be met by existing regional supply because Cowlitz PUD currently has the capacity to meet the electricity demand.

Gasoline, propane, and diesel would be used to power vehicles and equipment used for standard operations and routine maintenance. Operations is anticipated to require each month on average approximately 100 gallons of gasoline, 75 gallons of oil, and 865 gallons of diesel.

The demand for energy during operations would be minor compared to the current regional demand for these fuels and could be met by the existing local and regional supply.

Increase the Use of Natural Resources

Natural resources that would be used would include water, gravel, fill dirt, and wood. Impacts on these resources are discussed below. Impacts on groundwater and water quality are discussed in Sections 4.4, *Groundwater*, and 4.5, *Water Quality*, respectively.

A water treatment facility would be designed to treat all surface runoff and process water with capacity to store the water for reuse. The use of stormwater in combination with a storage reservoir and groundwater would be used for processing water and fire protection. All of the stormwater would be processed through the water treatment facility prior to reuse. Water uses would include dust control, stockpile sprays, wash down, and clean up (URS Corporation 2014). Water would also be used to control dust from operating conveyors, transfer points, rail car unloaders, stockpiling, and ship loading. Approximately 120 million gallons per year would be reused from runoff during operations. Combined with the groundwater demand from existing activities in the project area (approximately 1,994 acre-feet per year), the total demand on groundwater supplies during operation of the Proposed Action would be approximately 3,019 acre-feet per year. Water would be sourced from existing production wells within the existing water rights, and there would be no need for new wells.

Specific quantities of gravel, fill dirt, and wood during operation of the Proposed Action are not known at this time. However, the quantities are anticipated to be met by existing local and regional supply considering the availability of these resources.

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*.

Increase Fuel Consumption

The Proposed Action would increase fuel consumption by the following.

- Approximately 240 unit trains arriving and 240 unit trains departing each month, which would increase rail locomotive fuel consumption in the study area.
- Approximately 70 vessel transits each month, which would increase vessel fuel consumption in the study area.
- Approximately 135 employees to operate the facility, which would generate approximately 270 trips per day assuming two employee trips per day. These vehicle traffic operations would increase vehicle fuel consumption in the study area.
- A fuel truck with a 3,000- to 4,000-gallon capacity would come to the project area as needed to supply vehicles and equipment with fuel for operations and maintenance. The frequency would vary based on usage and activities. This activity would increase fuel consumption in the study area.

Trains and vessels would not be fueled within the study area. Fuel consumption from employee and fuel truck trips would be a minor amount compared to the current demand for fuel within the study area, and could be met by the existing local and regional supply.

4.9.5.2 No-Action Alternative

Under the No-Action Alternative, the Applicant would not construct the coal export terminal, and the existing use of energy and natural resources would continue. However, the Applicant could expand the existing bulk product terminal onto the project area. Any new construction would be limited to uses allowed under existing Cowlitz County development regulations and federal and state permits. Potential impacts of the No-Action Alternative are described below.

Increase Energy Use

Any expansion of the existing bulk terminal would increase the demand for energy (natural gas, electricity, diesel fuel, and gasoline). Cowlitz PUD and Cascade Natural Gas have the capacity to meet the anticipated demand and local suppliers would be able to accommodate diesel and gasoline demand.

Increase Natural Resources Use

Any expansion of the existing bulk terminal would increase the demand for natural resources. Use of natural resources would not cause a noticeable impact on supplies in the area, and demand for natural resources would not adversely affect the supply from local and regional service providers.

4.9.6 Required Permits

The Proposed Action would require building and site development permits from the Cowlitz County Department of Building and Planning in relation to the use of energy and natural resources (such as electrical and mechanical permits).

4.9.7 Potential Mitigation Measures

This section describes the voluntary mitigation measures that would reduce impacts related to energy and natural resources 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.

4.9.7.1 Voluntary Mitigation

The Applicant has committed to implementing the following measures prior to or during construction to mitigate impacts on energy and natural resources.

- Prior to construction, prepare a Waste Management Plan in coordination with Cowlitz County's Solid Waste Management Plan. The plan will include measures to avoid and minimize the generation of wastes and promote waste reuse and recycling.
- Where feasible, turn off construction vehicles rather than idling engines.

The Applicant has committed to implementing the following measures during operations to mitigate impacts on energy and natural resources.

- Where appropriate, implement energy conservation measures, such as energy-efficient electrical system specifications, lighting, mechanical equipment, and building insulation.
- Switch on lighting in unoccupied areas only when needed and turn off lighting automatically.
- Maximize energy efficiency in facility and equipment specifications and selection, such as electric motors that have high power factors, conveyor drives with "quiet drives" that require less power to operate, and life-cycle costs advantage of energy efficient components.
- Use power factor correction equipment in substations.
- Use conveyor idlers to specify rim drag to reduce conveyor start up power.
- Revert office equipment to standby mode or switch off when not in use.
- Match vehicle size to the need of the task.
- Choose vehicles based on fuel efficiency.
- Use controlled temperature settings on switch room and office air conditioning.
- Use automatic shutdown controls for idle plant and equipment.
- Manage energy load by using submetering of offices, workshops, conveyors stackers, reclaimers, and shiploaders.
- Use soft-start electric motors to minimize peak power demand.

4.9.8 Unavoidable and Significant Adverse Environmental Impacts

Implementation of the voluntary measures and design features described above would reduce impacts on energy and natural resources. There would be no unavoidable and significant adverse environmental impacts.