Draft Environmental Impact Statement

March 2016



KALAMA SEPA

Manufacturing & Marine Export Facility

kalamamfgfacilitysepa.com

COWLITZ COUNTY WASHINGTON

Port OF KALAMA

Port of Kalama
110 West Marine Drive
Kalama, WA 98625

Cowlitz County, Building and Planning
207 Fourth Avenue North
Kelso, WA 98626

March 3, 2016

Dear Interested Parties, Jurisdictions, and Agencies:

The Port of Kalama (Port) and Cowlitz County, in accordance with the Washington State Environmental Policy Act (SEPA), request your review and comment on this draft environmental impact statement (DEIS) for the proposed construction and operation of the Kalama Manufacturing and Marine Export Facility (KMMEF). The KMMEF would be operated by Northwest Innovation Works, LLC – Kalama (NWIW) and would consist of a methanol manufacturing facility and a new marine terminal on the Columbia River at the Port's North Port site. The project would receive natural gas through a 3.1-mile pipeline and convert the natural gas to methanol for shipment by marine vessel to global markets, primarily in Asia.

The DEIS has been prepared in accordance with SEPA (Revised Code of Washington [RCW] 43.21c and Washington Administrative Code [WAC] 197-11), the Port's SEPA polices, and Cowlitz County Code. The purpose of the DEIS is to evaluate the potential environmental impacts of constructing and operating the proposed project and to identify measures that reduce or eliminate those impacts.

During the scoping phase of the DEIS process, the co-lead agencies identified areas associated with the proposed project that are addressed in the DEIS. The DEIS evaluates the impacts from construction, on-site operations, and off-site vessel transport related to two methanol production alternatives, as well as cumulative environmental impacts and the construction and operation of the gas pipeline and electrical services as connected actions. An alternative dock design, off-site alternative, and a no-action alternative also are evaluated in the DEIS.

The following elements of the environment are evaluated in the DEIS:

- Earth
- Air Quality and Greenhouse Gas Emissions
- Water Resources
- Plants and Animals
- Energy and Natural Resources
- Environmental Health and Safety
- Land and Shoreline Use, Housing and Employment
- Aesthetics and Visual Resources
- Historic and Cultural Resources
- Transportation
- Public Services and Utilities
- Noise
- Cumulative Impacts

The DEIS identifies possible mitigation measures for significant adverse environmental impacts and significant unavoidable adverse impacts.

The co-lead agencies have decided to extend the public comment period from 30 to 45 days. Comments on the DEIS will be accepted throughout the expanded 45-day comment period, which begins on March 3, 2016 and ends at 5:00 p.m. on April 18, 2016. Comments can be submitted by the following methods:

Online:

http://kalamamfgfacilitysepa.com/

By Mail:

KMMEF EIS
c/o SEPA Responsible Official
Port of Kalama
110 West Marine Drive
Kalama, WA 98625

In Person:

Public Hearing
On March 22, 2016, 6:00 to 9:00 p.m., at the Kalama High School Gymnasium,
548 China Garden Road, Kalama, WA 98625

Comments received on the DEIS during the comment period will be compiled, reviewed, and considered while developing the final environmental impact statement (FEIS). Responses to substantive comments received on the DEIS will be included in the FEIS when issued. Questions about the DEIS may be directed to Ann Farr, Port of Kalama SEPA Responsible Official, at 360/673-2390 or SEPA@KalamaMfgFacilitySEPA.COM.

Sincerely,

Ann Farr
SEPA Responsible Official
Port of Kalama

Elaine Placido
Director, Cowlitz County
Building and Planning Department

AF:EP:nb
Attachment

Fact Sheet

Project Name

Kalama Manufacturing and Marine Export Facility (KMMEF)

Description of Proposed Project and Alternatives

Northwest Innovation Works, LLC – Kalama and the Port of Kalama are planning to construct the KMMEF (the proposed project), which would consist of a methanol manufacturing facility and a new marine terminal on approximately 100 acres on the Columbia River at the Port's North Port site (the project site). In related actions, Northwest Pipeline LLC is proposing to construct and operate the Kalama Lateral Project (the proposed pipeline), a 3.1-mile natural gas pipeline to the proposed project, and Cowlitz County Public Utility District No. 1 is proposing to upgrade electrical service to provide power to the proposed project.

The proposed methanol manufacturing plant would convert natural gas to methanol, which would be stored on site and transported via marine vessel to global markets, primarily in Asia. The methanol is expected to be used for the production of olefins, which are the primary components in the production of consumer products, such as carpet, plastic goods, and cell phones.

The proposed marine terminal would accommodate the oceangoing vessels that would transport methanol to destination ports. It would also be designed to accommodate other vessel types and when not in use for loading methanol would be made available for general use by the Port for other cargo operations, as a lay berth where vessels could moor while waiting to use other Port berths and for topside vessel maintenance.

Alternatives considered in the draft environmental impact statement (DEIS) include two methanol production technology alternatives (collectively referred to as the Technology Alternatives), and two marine terminal design alternatives (collectively referred to as the Marine Terminal Alternatives). An Off-Site Alternative for the methanol manufacturing facility was also evaluated during the initial alternatives analysis but is not carried forward for the detailed EIS analysis because that alternative did not satisfy State Environmental Policy Act (SEPA) requirements for a reasonable alternative. Under the No-Action Alternative, the proposed project would not be developed, and the Port would continue to pursue other development opportunities on the project site.

Project Proponents

Northwest Innovation Works, LLC – Kalama and the Port of Kalama

Location

The proposed project would be located at the Port's North Port site at 222 West Kalama River Road in unincorporated Cowlitz County, Washington. The North Port site is located at approximately River Mile 72 along the east bank of the Columbia River. The BNSF Railway and Interstate 5 lie immediately to the east. The project site is approximately 100 acres in size and located in Sections 31 and 36, Township 7 North, Range 2 West Willamette Meridian. The

proposed project would also undertake wetland mitigation activities within parcels to the north of the project site.

Co-Lead Agencies

Port of Kalama and Cowlitz County

SEPA Responsible Officials

Ann Farr
SEPA Responsible Official
Port of Kalama
110 West Marine Drive
Kalama, WA 98625

Elaine Placido
Director, Building and Planning Department
Cowlitz County
207 Fourth Avenue North
Kelso, WA 98626

EIS Contact Person

Ann Farr
SEPA Responsible Official
Port of Kalama
110 West Marine Drive
Kalama, WA 98625
Phone: 360-673-2390
Website: www.KalamaMfgFacilitySEPA.com
E-mail: SEPA@KalamaMfgFacilitySEPA.com

List of Permits and Approvals

The proposed project and alternatives would require a number of permits and approvals, as detailed in the table below. Both Technology Alternatives and Marine Terminal Alternatives would require the same permits and approvals.

Required Permits, Authorizations, and Approvals

Permit/Authorization/Approval	Agency
Federal	
Rivers & Harbors Act Section 10/Clean Water Act Section 404 Permit	U.S. Army Corps of Engineers (USACE)
Endangered Species Act Section 7 Consultation	National Oceanic and Atmospheric Administration (NOAA)/U.S. Fish and Wildlife Service
Marine Mammal Protection Act	NOAA Fisheries
Private Aids to Navigation Permit	U.S. Coast Guard
Section 106 of the National Historic Preservation Act	USACE
State	
Hydraulic Project Approval	Washington State Department of Fish and Wildlife
Shoreline Conditional Use Permit	Washington State Department of Ecology (Ecology)

Permit/Authorization/Approval	Agency
401 Water Quality Certification	Ecology
Air Containment Discharge Permit	Southwest Clean Air Agency/Ecology
National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Ecology
Individual NPDES Wastewater Discharge Permit	Ecology
Local	
Shoreline Substantial Development and Conditional Use Permit	County
Critical Areas Permit	County
Floodplain Permit	County
Engineering and Grading	County
Building, Mechanical, Fire, etc.	County

Authors and Principal Contributors

This DEIS has been prepared under the direction of the co-lead agencies and in consultation with Cowlitz County, the City of Kalama, and other relevant agencies. The following firms were involved in the preparation of this EIS:

- BergerABAM: General EIS document coordination and production; Chapter 2, Proposed Project and Alternatives; Chapter 5, Water Resources; Chapter 6, Plants and Animals; Chapter 7, Energy and Natural Resources; Chapter 8, Environmental Health and Safety; Chapter 9, Land Use and Shoreline Use, Housing and Employment; Chapter 10, Aesthetics and Visual Resources; Chapter 13, Public Services and Utilities; and Chapter 15, Cumulative Impacts
- Geotechnical Resources, Inc.: Chapter 3, Earth
- RAMBOLL ENVIRON: Chapter 4, Air Quality and Greenhouse Gas Emissions; Chapter 14, Noise; and associated technical reports
- Archaeological Investigations Northwest, Inc.: Chapter 11, Historic and Cultural Resources, and associated technical reports
- Kittelson & Associates, Inc.: Chapter 12, Transportation, and associated technical report
- AcuTech Consulting Group: Health and Safety Aspects
- ECONorthwest: Economic Modeling

Date of Issue of the DEIS

The DEIS was issued on 3 March 2016.

End of DEIS Comment Period

All comments on the DEIS must be received on or before 5:00 p.m. on 18 April 2016.

Comments on the DEIS may be submitted by the following methods:

Online:
http://kalamamfgfacilitysepa.com/

By Mail:
KMMEF EIS
c/o SEPA Responsible Official
Port of Kalama
110 West Marine Drive
Kalama, WA 98625

In Person:
Orally or in writing at the Public Hearing (time, date, and location follows)

Public Hearing Time, Date, and Location

22 March 2016, 6:00 p.m. to 9:00 p.m.

Kalama High School Gymnasium
548 China Garden Road
Kalama, WA 98625

Projected Date of Issue of FEIS

Comments on the DEIS will be received and compiled. A final environmental impact statement (FEIS) will be published that includes responses to substantive comments on the DEIS. The FEIS is expected to be published in the summer of 2016 but this date is subject to change.

Agency Action and Projected Date for Action

The timing for agency decisions and actions is undetermined at this time. No agency decisions will be made until at least seven days after the issuance of the FEIS.

Subsequent Environmental Review

No subsequent environmental review of the proposed project, except for the completion of the FEIS, is anticipated.

Availability of the DEIS

Copies of DEIS and/or Notices of Availability have been distributed to agencies, tribal governments, and organizations on the Distribution List in the DEIS.

The DEIS may be viewed online and/or downloaded from the project website: www.KalamaMfgFacilitySEPA.com

Copies of the DEIS are also available for review at the following locations.

- Port of Kalama
  110 West Marine Drive
  Kalama, WA 98625
- Cowlitz County Building and Planning
  207 Fourth Avenue North
  Kelso, WA 98626
- Kelso Public Library
  351 Three Rivers Drive, Suite 1263
  Kelso, WA 98626
- Longview Public Library
  1600 Louisiana Street
  Longview, WA 98632

Printed copies of the DEIS are available for a fee through the Port of Kalama.

Availability of Background Materials

An electronic copy of the DEIS will be available online during the public comment period at www.KalamaMfgFacilitySEPA.com.

All materials developed specifically for this environmental review are available on the project website listed above.

All materials incorporated by reference and supporting technical memoranda are available for review at the following location.

Port of Kalama
110 West Marine Drive
Kalama, WA 98625

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List of Acronyms/Abbreviations

AADT	Average Annual Daily Traffic
ACS	American Community Survey
APE	Area of Potential Effect
ASILs	Acceptable Source Impact Levels
ASU	air separation unit
ATR	autothermal reformer
B&O	business and occupation
BA	biological assessment
BACT	best available control technology
BGEPA	Bald and Golden Eagle Protection Act
BMPs	best management practices

bgs	below the ground surface
BWMP	ballast water management plan
BWMS	ballast water management system
BPA	Bonneville Power Administration
CAA	Clean Air Act
CARA	critical aquifer recharge area
Cascade	Cascade Natural Gas
CCC	Cowlitz County Code
CDC	Center for Disease Control
CECC	Shanghai Bi Ke Clean Energy Technology Co., Ltd.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFATS	Chemical Facility Anti-Terrorism Standards
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLE	contingency level earthquake
CLS	cold-lime softener
CO_2e	CO_2 equivalents
Cowlitz PUD	Cowlitz County Public Utility District No. 1
CR	Combined Reformer
CRC	Clean Rivers Cooperative
CRD	Columbia River Datum
CSZ	Cascadia Subduction Zone
CWA	Clean Water Act
DAHP	Washington State Department of Archaeology and Historic Preservation
dB	decibels
dbh	diameter at breast height
DE	design earthquake
DEEP	diesel engine exhaust particulate
DEIS	draft environmental impact statement
DNR	Washington State Department of Natural Resources
DOT	U.S. Department of Transportation
DPM	diesel engine exhaust particulate matter
DPS	Distinct Population Segments
DWT	deadweight tonnage
EA	environmental assessment
ECA	emission control area
Ecology	Washington State Department of Ecology
EDI	electrodeionization
EDNA	environmental designation for noise abatement
EFH	essential fish habitat

EFSEC	State of Washington Energy Facility Site Evaluation Council
EIS	environmental impact statement
ELJ	engineered log jam
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERC	Environmental Research Consulting
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFRMS	Federal Flood Management Risk Standard
FR	Federal Register
GHG	greenhouse gas
GHR	gas-heated reformer
GMA	Growth Management Act
gpd	gallons per day
gpm	gallons per minute
HAZID	Hazard Identification
HDD	horizontal directional drilling
HPA	Hydraulic Project Approval
I-5	Interstate 5
IBC	International Building Code
IMO	International Maritime Organization
ISO	International Organization for Standardization
ITE	Institute of Transportation Engineers
KKMEF	Kalama Manufacturing and Marine Export Facility
kV	kilovolt
LED	light-emitting diode
LX	sound levels that are exceeded X percent of the time
Lmax	maximum sound level not to be exceeded
Ldn	day-night sound level
Leq	equivalent sound level
LNG	liquefied natural gas
LOC	limiting oxidant concentration
LOMR	Letters of Map Revision
LOS	level of service
LPG	liquefied petroleum gas
M	magnitude

MARPOL	International Convention for the Prevention of Marine Pollution from Ships, as modified by the protocol of 1978
MARSEC	U.S. Coast Guard Maritime Security
MBR	membrane bioreactor
MBTA	Migratory Bird Treaty Act
MCER	maximum considered earthquake
MFSA	Maritime Fire and Safety Association
MG	million gallons
mL	milliliter
MMBtu	one million British thermal units
MMPA	Marine Mammal Protection Act of 1972
MMT	million metric tonnes
mph	miles per hour
MSA	metropolitan statistical area
MSDS	material safety data sheets
MTCA	Model Toxics Control Act
MTSA	Maritime Transportation Security Act
NAAQS	national ambient air quality standards
NAICS	North American Industry Classification System
NAVD88	North American Vertical Datum 1988
NCP	National Contingency Plan
NDVI	normalized difference vegetation index
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Northwest	Northwest Pipeline LLC
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Department of Agriculture Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRT	National Response Team
NTU	nephelometric turbidity unit
NWACP	Northwest Area Contingency Plan
NWI	National Wetlands Inventory
NWIW	Northwest Innovation Works, LLC – Kalama
ODEQ	Oregon Department of Environmental Quality
OHWM	ordinary high water mark
OLE	operating level earthquake

ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
PHA	process hazard analysis
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHS	priority habitats and species
PMA	Pacific Maritime Association
Port	Port of Kalama
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSET	Portland Sediment Evaluation Team
PSM	Process Safety Management
PUD	Public utility district
PWS	public water supply
QRA	Quantitative Risk Analysis
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
REC	recognized environmental conditions
RHA	riparian habitat area
RM	River Mile/River Mouth
RO	reverse osmosis
RO-EDI	reverse osmosis and electrodeionization
ROW	right-of-way
RRT	Regional Response Team
SACTI	Seasonal Annual Cooling Tower Impact
SARA	Superfund Amendments and Reauthorization Act of 1986
SCBA	self-contained breathing apparatus
SCR	selective catalytic reduction
SCUP	Shoreline conditional use permit
SEF	Sediment Evaluation Framework
SEPA	State Environmental Policy Act
SLMs	sound level measurements
SMMP	Shorelines Management Master Program
SMA	Shoreline Management Act
SMR	steam-methane reformer
SOLAS	International Convention for the Safety of Life at Sea
SOx	sulfur oxide
SPCCP	spill prevention, control, and countermeasures plan
SSDP	Shoreline Substantial Development Permit

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SWCAA	Southwest Clean Air Agency
SWL	sound power level
SWPPP	stormwater pollution prevention plan
TAPs	toxic air pollutants
TMDL	total maximum daily load
TQ	threshold quantity
TWIC	Transportation Worker Identification Credential
UHMW-PE	ultra-high molecular weight polyethylene
UK-HSE	Health and Safety Executive of the United Kingdom
ULE	Ultra-Low Emissions
UNFCCC	U.N. Framework Convention on Climate Change
UPPR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VEAT	Vessel Entries and Transit
VGP	Vessel General Permit
VOC	volatile organic compound
WAC	State of Washington Administrative Code
WQC	Water Quality Certification
WDFW	Washington State Department of Fish and Wildlife
WHR	Washington Heritage Register
WISHA	Washington Industrial Safety and Health Act of 1973
WNHP	Washington Natural Heritage Program
WQPMP	Water Quality Protection and Monitoring Plan
WRIA	Water Resources Inventory Area
WSDOT	Washington State Department of Transportation
WWTP	wastewater treatment plant

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Chapter 1 Summary

1.1 Introduction

Northwest Innovation Works, LLC – Kalama (NWIW) and the Port of Kalama (Port) are proposing to construct the Kalama Manufacturing and Marine Export Facility (KMMEF) (proposed project) on the Columbia River at the Port's North Port site (the project site) located as shown on **Figure 2-1**. The proposed project is required to be reviewed for impacts to the built and natural environment under the State Environmental Policy Act (SEPA) for the state of Washington.

SEPA applies to decisions made by state and local agencies, including ports. The environmental review process helps state and local agencies to identify and consider possible environmental impacts that could result from government actions, including permit actions. A product of the environmental review process is the draft environmental impact statement (DEIS). This chapter provides an overview of the proposed project, the DEIS review, and conclusions.

1.1.1 Draft Environmental Impact Statement

SEPA requires an EIS if the project is likely to result in significant adverse impacts. The purpose of an EIS is to document the SEPA environmental review process. The process includes the following activities:

- Gather background information
- Develop alternatives
- Conduct analysis and review of the alternatives
- Identify potential environmental impacts from the alternatives
- Identify ways to reduce the effects of significant adverse impacts
- Conduct public involvement

The DEIS includes a description of the proposed project and the project purpose, project site information and history, reasonable alternatives for the proposed project that can meet the applicant's objectives, environmental impacts that may happen as a result of the proposed project, and ways to avoid or reduce adverse environmental impacts. Required federal, state, and local jurisdiction permits are also identified for the proposed project during the development of the DEIS.

The Port and Cowlitz County are serving as co-lead agencies for the SEPA environmental review of the proposed project. The lead agencies are responsible for conducting the environmental review for the proposed project and documenting it in the EIS.

Detailed information on the SEPA EIS process is available on the Washington State Department of Ecology (Ecology) website at http://www.ecy.wa.gov/programs/sea/sepa.

An online copy of the DEIS for the proposed project can be found at www.KalamaMfgFacilitySEPA.com. Paper copies of the document are available for review at

locations noted in the Fact Sheet. Comments on the DEIS will be accepted during a 45-day comment period.

1.1.2 Proposed Project

The proposed project has two parts: a methanol manufacturing facility and a marine terminal. The proposed methanol manufacturing plant would convert natural gas to methanol. The methanol would be stored on site and transported by ships to destination ports, primarily in Asia. The methanol is expected to be used for the production of olefins, which are the primary components in the production of consumer products, such as medical devices, glasses, contact lenses, recreational equipment, clothing, cell phones, furniture, and many other products. Construction is anticipated to begin as soon as authorizations are received (expected late 2016) and would be completed as early as mid-2018 and as late as mid-2020. More information about the project and the methanol manufacturing process is included in Chapter 2.

The proposed marine terminal would be used primarily for loading the methanol onto ships for export. The terminal would be available for general use by the Port for other cargo operations when not being used for loading methanol, such as a lay berth where vessels could moor while waiting to use other Port berths, and topside ship maintenance.

There are two proposed projects that are related to, but not a part of the methanol manufacturing facility:

- Northwest Pipeline LLC (Northwest) is proposing to construct and operate the Kalama Lateral Project (the proposed pipeline), a 3.1-mile natural gas pipeline to the proposed project. This proposed pipeline is undergoing a separate review through the Federal Energy Regulatory Commission (FERC). FERC completed a National Environmental Policy Act (NEPA) environmental assessment (EA) in July 2015 for that project.
- Cowlitz County Public Utility District No. 1 (Cowlitz PUD) is proposing to upgrade to the existing transmission line from the existing Kalama Industrial Substation to the project site, construction of an on-site substation, and construction of an alternative electrical supply line to the Kalama Industrial Substation to provide redundancy for electrical service. Cowlitz PUD is managing environmental reviews/permitting related to the electrical improvements.

1.1.2.1 Project Proponents

NWIW and the Port are planning to design, construct, and operate the proposed project. NWIW was formed for the purpose of developing cleaner sources for methanol production to meet global demands. More information regarding NWIW is available at http://nwinnovationworks.com.

The Port owns the existing industrial upland site where the manufacturing facility will be located and manages the state-owned land where the marine terminal will be located. The Port is a public agency and oversees a variety of industrial uses on property along the Columbia River in the city of Kalama and unincorporated Cowlitz County. Existing Port facilities are located along the Columbia River between approximately River Mile (RM) 72 and RM 77. The Port receives revenue from leases of various Port properties, buildings, and marine terminals; services associated with the grain terminal and breakbulk docks; and the Kalama marina. More information on the Port is available in Chapter 2 and at http://portofkalama.com.

1.1.2.2 Project Location

The proposed project would be located at the Port's North Port site at 222 West Kalama River Road in unincorporated Cowlitz County, Washington (**Figure 2-2**). The North Port site is located at approximately RM 72 along the east bank of the Columbia River. The project site is bounded by the Columbia River to the west; by Tradewinds Road, the Air Liquide industrial facility, and the Port's industrial wastewater treatment plant to the east; by Port property primarily used for open space, recreation, and wetland mitigation to the north; and by the existing Steelscape manufacturing facility to the south. The Port has leased approximately 90 acres of the 100-acre site to NWIW for construction and operation of the proposed facility.

1.1.2.3 History

The Port has owned the project site since 1979, and it has been used primarily as part of the U.S. Army Corps of Engineers (USACE) network of dredged material placement sites. The site was filled to its current elevation beginning in 1980 using material dredged from the Columbia River to maintain the federal navigation channel. The site was removed from the USACE dredged material placement sites network in 2015[1].

An existing 38,000-square-foot building is located on the southwest portion of the project site. The building is used as a warehouse, office space, and parking for Steelscape. This building and adjacent areas would be reused as part of the proposed project. The site has very little vegetation and is generally flat. It is primarily covered with sandy dredged material.

The Port has been actively pursuing development of the project site and has established and maintained wells and water rights. Four projects were previously proposed for the site but were cancelled because of economic considerations. In addition, the Port received federal, state, and local authorization to construct a cargo dock on the site.

1.1.3 Objectives

NWIW and the Port are pursuing the proposed project with the stated goal of reducing greenhouse gas (GHG) emissions globally by producing methanol from natural gas rather than coal. Global demand for methanol for use in production of olefin is high. Economic forecasts predict an increase in worldwide demand for methanol from 60 million tonnes in 2013 to 109 million tonnes in 2023 (IHS 2014). Increased demand for methanol in Asia is being met primarily by the construction of facilities in China that manufacture methanol from coal, which emits very high levels of GHG and generates toxic byproducts and wastes (Yang 2012). Producing methanol from natural gas produces substantially lower levels of GHG and fewer chemical byproducts. This DEIS evaluates two technology options for producing methanol from natural gas (discussed below), one of which is a new technology that produces even lower GHG and other emissions than conventional technologies for producing methanol from natural gas. NWIW has expressed its desire to use the new lower emitting technology consistent with its goal of global reduction of GHG emissions.

The project would provide economic benefits to the region by creating jobs and tax revenues during construction and operation and improving access to recreational resources at the Port.

[1] The Port of Kalama officially withdrew the Northport Dredge Disposal site on October 6, 2014 from the Columbia River Channel Improvements project. A confirmation letter from the USACE was received on November 24, 2015.

The project meets the Port's mission to "induce capital investment in an environmentally responsible manner to create jobs and to enhance public recreational opportunities."

1.1.4 Proposed Alternatives

The proposed project includes both the construction and operation of a methanol manufacturing facility and marine terminal. The alternatives evaluated in the DEIS include action alternatives and a no-action alternative. The action alternatives include two methanol production technology alternatives (Technology Alternatives), and two marine terminal design alternatives (Marine Terminal Alternatives). With the No-Action Alternative, the proposed project would not be constructed. An Off-Site Alternative for the methanol manufacturing facility was evaluated during the initial alternatives analysis but is not carried forward for the detailed EIS analysis because that alternative did not satisfy SEPA requirements for a reasonable alternative.

1.1.4.1 Technology Alternatives

The primary differences between the two Technology Alternatives are the energy efficiency and energy sources for the natural gas reforming step during the methanol production process. The other primary steps in the production process remain the same in both Technology Alternatives. The two technology alternatives are:

- Combined Reformer (CR) Alternative – This technology uses a combination of a steam-methane reformer and an autothermal reformer (as a secondary step) to produce methanol.
- Ultra-Low Emissions (ULE) Alternative – This technology uses a gas-heated reformer and an autothermal reformer (as a secondary step) to produce methanol.

Figures 2-3 and 2-4 illustrate the general methanol production process and the differences between the CR and ULE alternatives within the overall methanol production process. **Figures 2-5 and 2-6** show the site plans for each alternative.

The CR technology is widely used in the methanol industry to perform the primary reforming of natural gas with steam. With this technology, the energy used in the reforming reaction is generated mainly by burning natural gas. Natural gas as fuel combusts through firing burners and provides heat to allow natural gas steam reforming in the tubes of the steam-methane reformer, and the flue gas is emitted to the atmosphere. Waste heat is used to generate steam that drives rotating process equipment. CR technology results in substantially lower CO2 and GHG emissions than coal-based methanol production.

ULE technology is designed to use process heat directly to provide energy for the reforming reaction. The ULE rotating process equipment is driven by electricity, rather than with steam as in the CR technology. ULE is a proven technology commonly used for reforming other chemicals from natural gas. It has been used at a smaller scale for the production of methanol. If the ULE Alternative is selected, the proposed project would be the first large-scale application of ULE technology for methanol production in the United States.

Both the CR and ULE technology alternatives would require electricity and natural gas for energy. The CR Alternative requires more energy input and relies more heavily on natural gas. The ULE Alternative uses natural gas to power boilers, but the reforming process is powered by process heat from the autothermal reformer. The ULE Alternative requires more electricity to power compressors and pumps but less natural gas than the CR Alternative.

Cowlitz County PUD does not have adequate transmission capacity to supply all the electricity needs of the ULE Alternative and an on-site, natural gas-fired power generator would provide a portion of the power needed for operation. The ULE Alternative would produce lower GHG emissions than the CR Alternative.

1.1.4.2 Marine Terminal Alternatives

Two marine terminal alternatives evaluated for the DEIS are shown on **Figures 2-11 through 2-15**. The alternatives include:

- Marine Terminal Alternative 1 – The marine terminal would be a separate structure located approximately 380 feet north of the existing North Port dock.
- Marine Terminal Alternative 2 – The marine terminal would be a 1,000-foot northern extension to the existing dock.

Both Marine Terminal Alternatives would be located on the western portion of the project site at approximately RM 72. They both would consist of a dock and a single berth to accommodate the ships that would transport methanol to destination ports. Both Marine Terminal Alternatives would include a dock, a berth, loading equipment, utilities, and a stormwater system. The terminals are designed to support the necessary methanol transfer equipment and safely moor the ships. For both alternatives, the berth would be designed to accommodate other types of ships when not in use for loading methanol.

The primary differences between the two Marine Terminal Alternatives would be the location of the dock relative to the existing North Port dock, design of the dock and trestles, and the resulting number of piles and area of overwater coverage. Marine Terminal Alternative 1 requires the least number of piles and the least overwater coverage.

1.1.5 Related Actions

The two "related actions" (the pipeline and the electrical supply improvements) are evaluated in the DEIS but are not being undertaken or permitted by the project proponents. They are evaluated in the DEIS because they are being constructed primarily for natural gas and electricity supply to the proposed project. These two projects are responsible for their own separate environmental review and permitting processes, but the impacts, if any, are considered in the DEIS. These related action projects are described below.

1.1.5.1 Kalama Lateral Project

The proposed project would use natural gas as the feedstock for methanol production. Northwest is proposing to construct and operate the Kalama Lateral Project (proposed pipeline). The proposed pipeline is a 3.1-mile, 24-inch-diameter natural gas pipeline and related facilities that will provide natural gas service to the proposed project.

An application to approve the construction and operation of the proposed pipeline pursuant to Section 7(c) of the Natural Gas Act and required FERC regulations was submitted by Northwest to FERC on October 27, 2014 (Docket No. CP15-8-000). The proposed pipeline would be constructed in accordance with U.S. Department of Transportation and FERC regulations.

1.1.5.2 Electrical Service

Cowlitz PUD would upgrade an existing transmission line from its existing Kalama Industrial Substation (located east of the project site at the northwest corner of N. Hendrickson Drive and Wilson Drive) to the project site by installing new lines on existing towers within the existing transmission line corridor to provide electrical service to the proposed project for either of the Technology Alternatives. This line originates at the substation and continues north along N. Hendrickson Drive before crossing the Kalama River and continuing north to the project site. New equipment (e.g., 115-kilovolt [kV] breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility.

Cowlitz PUD will also construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation located on the west side of Interstate 5 (I-5) and an existing 115-kV transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, the railroad, and N. Hendrickson Drive and would require installation of new poles. **Figure 2-20** illustrates the location of these improvements.

1.1.6 Dismissed Alternatives

An Off-Site Alternative for the methanol manufacturing facility was evaluated during the initial alternatives analysis. This alternative would construct the methanol manufacturing facility on the Port's East Port site located east of the project site and I-5 and convey the finished product via pipeline to a marine terminal on the North Port site. The alternative was eliminated from further analysis because it did not satisfy SEPA requirements for a reasonable alternative as described in WAC 197-11-440(5). This alternative had the potential to result in greater environmental impacts than locating either of the Technology Alternatives on the project site. This conclusion is based primarily on:

- potential impacts to existing wetlands and/or other habitat;
- visual, noise, and safety issues due to proximity to residences;
- distance from the marine terminal; and
- inconsistency with existing comprehensive plan and zoning designation.

See section 2.6.3 for more information on the Off-Site Alternative.

1.1.7 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed. However, the Port would pursue future industrial or marine terminal development at this site, consistent with the Port's *Comprehensive Scheme for Harbor Improvements.* Until such improvements take place, the proposed project site would remain in its current state.

1.2 Impact Assessment

This section summarizes how construction and operation of the proposed project, including off-site vessel operations, would likely impact each element of the built and natural environments. The resource areas addressed are listed below.

- Earth (Section 1.2.1)
- Air Quality and Greenhouse Gas Emissions (Section 1.2.2)

- Water Resources (Section 1.2.3)
- Plants and Animals (Section 1.2.4)
- Energy and Natural Resources (Section 1.2.5)
- Environmental Health and Safety (Section 1.2.6)
- Land and Shoreline Use, Housing and Employment (Section 1.2.7)
- Aesthetics and Visual Resources (Section 1.2.8)
- Historic and Cultural Resources (Section 1.2.9)
- Transportation (Section 1.2.10)
- Public Services and Utilities (Section 1.2.11)
- Noise (Section 1.2.12)

The proposed project for all Technology Alternatives and Marine Terminal Alternatives would be designed to meet local, state, and federal regulations and buildings codes. The impact assessment considered compliance with these standards, as well as design and other commitments by the applicant to avoid, reduce, and mitigate potential impacts.

1.2.1 Earth

All Technology Alternatives and Marine Terminal Alternatives would be constructed and operated on the same project site with the same existing resources, and would have the same potential impacts related to earth and geology. Therefore, potential impacts to earth resources are the same for all alternatives.

1.2.1.1 Construction Impacts

Soil Erosion

Construction activities, including clearing, excavation, filling and grading, ponds, utility placement, and ground improvement, could cause short-term effects from erosion as soil is exposed to wind and stormwater. Erosion can potentially damage natural or man-made features, but is not likely to impact human health. The erosion hazard for soil types on the surface of the site is low and potential impacts as a result of soil erosion would be minimized by best management practices (BMPs) and standard erosion control construction practices. Potential BMPs may include sediment basins for receiving stormwater, gravel construction entrance and exits, check dams and sediment traps, gravel filter berms, filtration bags or socks, fiber mats, and/or silt fences.

Dredging

The Marine Terminal Alternatives would require dredging about 126,000 cubic yards of material from deep-water areas of the Columbia River. Dredging may cause erosion, sediment loss, and turbidity. Dredging and in-water construction activities would be conducted in compliance with Surface Water Quality Standards for Washington (173-201A WAC) and other required permits and regulations. BMPs would be used to reduce impacts during dredging and dredged material placement at approved in-water or upland placement sites.

Topography Modification

The proposed project design is not expected to require extensive grading, deep excavation that disturbs native soils, or the use of imported fill materials (other than on-site stockpiled dredged material or dredged material from project dredging). Grading and excavation for utilities, ponds, and site preparation would also be necessary. Site grading and slope setbacks would be designed to meet Cowlitz County criteria. Site grading would not be expected to result in significant adverse impacts related to topography.

Slope Stability

Steep slope areas identified on the project site are along the banks of the Columbia River and along the northern boundary of the project site. The majority of construction activities would be located on flat upland areas and are not likely to increase potential risk of slope failures along the Columbia River. Construction of the marine terminal would require dredging. Dredging activities could potentially create oversteepened bank slopes and reduce slope stability. The project design would include dredge slope and construction sequencing that would avoid oversteepening of slopes and would reduce the potential for instability during dredging activities.

Related Actions

Construction of the pipeline will require earthwork, including grading, trenching, and horizontal drilling. These activities could potentially cause erosion. Soil erosion and associated potential impacts would be minimized by BMPs and standard erosion control construction practices.

The proposed electrical service improvements would not result in significant fill or grading activities, excavation, or substantial new impervious surfaces and, therefore, would not have the potential to result in impacts to earth and geology.

1.2.1.2 Operational Impacts

Earthquakes

Earthquakes could cause liquefaction-induced settlement, lateral spreading deformations, and strong ground-shaking motions and result in injury or death of on-site workers and damage to site structures. Structures at the site would be designed and constructed to minimize potential liquefaction, settlement, and lateral spreading impacts and will meet current seismic building codes. There is a low risk of earthquake-induced tsunamis or seiches that could impact the proposed project site.

Volcanic Eruptions

The proposed project site has a low potential to be affected by lahars but may be impacted by ash fall resulting from an eruption of Mount St. Helens. Ash fall could affect operation activities and result in damage to the project site and equipment. Ash fall impacts include falling fragments, suspension of abrasive fine particles in air and water, and burial of structures, transportation routes, and vegetation. Ash fall material could overload structures, clog machinery and filters, cause electrical short circuits and damage electronic equipment, cause surface corrosion, and make roads slippery. Regional communications and transportation systems may also be disrupted.

Related Actions

The potential for geologic impacts to the pipeline is low and known potential hazards can be mitigated.

The proposed electrical service improvements would not likely be impacted by geologic hazards.

1.2.2 Air Quality and Greenhouse Gas Emissions

1.2.2.1 Construction Impacts

Construction impacts would be the same for both of the Technology and Marine Terminal Alternatives. Dust from construction activities would contribute to ambient concentrations of suspended particulate matter. Emissions from diesel equipment could also reduce ambient air quality.

Construction activities, such as paving, could generate odors that may be perceptible for a short duration in close proximity to the source of the odor. These impacts are anticipated to be slight. Construction contractor(s) would be required to comply with Southwest Clean Air Agency (SWCAA) regulations requiring any source of emissions of odorous substances to use recognized good practice and procedures to reduce such odors.

Construction would require the use of a variety of large and small machinery and equipment and from vehicles used by workers to commute to the site, which would have GHG emissions. GHG emissions from construction would be minor in comparison to GHG emissions from the operation of the facility and typical of similar construction projects and would be similar among all alternatives.

1.2.2.2 Operational Impacts

Criteria Air Pollutants

Both Technology Alternatives would emit criteria air pollutants but off-site pollutant concentrations would be well below the levels allowed by the federal and Washington State standards.

CR Alternative

The CR Alternative would result in larger quantities of all criteria pollutants than the ULE Alternative during the methanol manufacturing process.

ULE Alternative

The ULE Alternative would result in reduced quantities of all criterial pollutants as compared with the CR Alternative.

Toxic Air Pollutants (TAPs)

Both Technology Alternatives would emit TAPs but off-site pollutant concentrations would be less than the respective screening level thresholds, with the exception of diesel particulate matter (DPM).

CR Alternative

TAP emissions under the CR Alternative would be greater than the ULE Alternative.

ULE Alternative

The proposed project sources of TAPs were found to comply with all emission standards, and off-site concentrations would be less than the respective screening level thresholds. Modeling of DPM emissions from both on-site and mobile sources associated with the project indicated that the ULE Alternative would result in DPM concentrations exceeding the Washington State Acceptable Source Impact Levels (ASIL). The areas in which DPM concentrations exceed the ASIL are limited primarily to tug and vessel activities within the river. Additional modeling was conducted and showed that DPM concentrations at the nearest residential areas would be less than allowed for direct emissions.

Cooling Tower Effects on Ground-Level Fog and Visibility

CR Alternative

The CR Alternative would have limited patterns of plume fogging to the north-northwest of the cooling towers. This projection is consistent with the wind patterns in the area. Areas of the fogging would not be expected to pose a driving hazard on nearby roadways or freeways and would not produce icing.

ULE Alternative

The ULE Alternative would have less plume fogging than the CR Alternative and would not be expected to pose a driving hazard on nearby roadways or freeways due to fogging or local icing. The frequency of visible plumes would be lower with the ULE Alternative.

Odor

The potential for odor impacts would be the same for both Technology Alternatives. There would be very limited potential for emission of odors, and the SWCAA requirements restricting offensive odors off site would not be exceeded.

GHG Emissions

Operation of the project and associated vessel transportation would result in the emission of GHGs. GHGs are quantified in terms of carbon dioxide equivalents.

CR Alternative

The CR Alternative manufacturing process is estimated to result in direct emissions of approximately 1.4 million tonnes of GHGs annually and 133,000 tonnes of GHGs annually from purchased power.

ULE Alternative

The ULE Alternative manufacturing process is estimated to result in direct emissions of approximately 976,000 tonnes of GHGs annually from methanol production and on-site power generation. Assuming purchased power comes from an average of northwest power sources, generation of purchased power would emit 266,000 tonnes of GHG annually. The ULE technology would result in an approximately 61 percent reduction in annual GHGs compared to the CR technology. When GHG emissions from on-site power generation are included, it would emit approximately 31 percent less GHG emissions than the CR Alternative.

Product Transport

Transport of the finished methanol product would involve oceangoing vessels and assist tugs that would emit GHGs. These emissions would be the same with all alternatives. Estimated annual emissions associated with vessel traffic within Washington State waters are approximately 3,900 tonnes.

Related Actions

Construction of the proposed pipeline would involve excavation and horizontal drilling activities that could result in temporary, localized increases in particulate concentrations due to emissions from construction-related sources.

There are no permanent sources of operational emissions for the proposed pipeline with the exception of minor fugitive methane emissions. Maintenance activity of the permanent right-of-way may result in small amounts of pollutants. Any emissions from the operation of the proposed pipelines would not result in impacts to local or regional air quality, including fugitive methane emissions.

The proposed electrical service improvements would result in limited construction activities and would not introduce new permanent sources of air emissions. It would not have the potential to result in significant adverse air quality impacts.

1.2.3 Water Resources

1.2.3.1 Construction Impacts

Surface Water

Both Technology Alternatives would have similar construction-related effects on surface water. Minor differences between the facility layouts of the technology alternatives would shift the location of the physical disturbances that could result in increased erosion, but would not result in measureable changes in the effects on water resources. During construction activities, water quality could be affected by surface water runoff from exposed soils that increase turbidity. In-water and overwater work could result in sediment, fuel, oil, grease, and other pollutant discharges that could affect water quality. Berth dredging in deep water could result in temporary, short-term turbidity. Overwater construction could introduce pollutants or debris through accidental spills.

A detailed construction stormwater pollution prevention plan (SWPPP) would be prepared and adhered to during construction as required by the construction stormwater permits granted by Ecology. Implementation of BMPs and compliance with permit requirements would ensure that state water quality standards are met.

Construction within the floodplain includes portions of the existing access road to the recreation area, infiltration pond, pumphouse and well facility, and the dock. The project would follow applicable codes and federal guidance, including Cowlitz County Code 16.25, Floodplain Management, and would not be expected to affect the elevation of floodwater measurably due to the size of the floodplain at this location is large and the volume of fill (inclusive of structures) would be negligible in comparison to the size of the Columbia River floodplain basin.

The proposed recreation access improvements would be constructed in the regulatory wetland buffer at the north end of the project site. Approximately 0.09 acre of moderately functioning wetland buffer would be eliminated. The mitigation proposed for the loss of wetland buffer includes riparian enhancement and invasive species management within adjacent wetland buffer at the north end of the project site.

1.2.3.2 Operational Impacts

The operation of the proposed project could result in impacts to water resources in terms of decreased water quality in surface waters and changes to surface water and groundwater from the operation of the new well. Water quality could be affected by operational water discharges, stormwater runoff, and accidental spills of methanol. Groundwater levels could be affected by the operation of the proposed well, which could affect water supplies at other wells located in the alluvial aquifer. The proposed use of approximately 3,340 gallons per minute of groundwater is approximately one-third of the Port's available water rights of approximately 10,450 gallons per minute and would not affect the aquifer or water availability to other users. There would be no operational impacts to floodplains or wetlands. Implementation of BMPs, including on-site infiltration of stormwater and on-site process water reuse and treatment, would ensure that the project meets state water quality standards.

1.2.3.3 Related Actions

The construction of the proposed pipeline may result in minor, short-term impacts on water resources for construction activities adjacent to stream channels and wetlands. Operation of the proposed pipeline would permanently affect less than 1 acre of wetland by converting it from a Palustrine Scrub Shrub (PSS) wetland to a Palustrine Scrub Shrub/Palustrine Emergent (PSS/PEM) wetland.

The proposed electrical service improvements would cross over a narrow slough that drains to the Kalama River and is located east of the existing rail lines and west of I-5. Construction adjacent to this slough could affect water quality in the slough temporarily due to soil and/or vegetation disturbance. Impacts would be temporary, localized, and minimized by the use of typical construction BMPs. No work would be conducted below the ordinary high water mark (OHWM) of the slough. The proposed transmission line improvements east of I-5, where the transmission lines would tie into the existing north-south line, could be emergent wetland, and work on the east side of I-5 could result in direct wetland impacts. Impacts to this area would be associated with utility pole footprints, and as such would have limited effect on wetlands. The area in which utility poles could be constructed would be within an existing utility right-of-way, in an area where an existing utility line is already established. This work would be completed as a separate activity conducted by Cowlitz County.

1.2.4 Plants and Animals

1.2.4.1 Construction Impacts

Technology Alternatives

Construction impacts to plant and animal resources would be the same with either Technology Alternative.

Habitat Impacts

Terrestrial

The construction of the proposed project would reduce the quantity of low-quality foraging, perching, and other habitat for the non-listed, ground-dwelling species now present on the project site but also would create new roosting and nesting opportunities for other species of birds that nest on buildings. The upland facilities would be located on developed portions of an existing industrial site with very little habitat function and native vegetation.

Upland construction activities could remove potentially suitable forage vegetation for the Columbian white-tailed deer. The use of the habitat is limited and the amount of vegetation that would be removed is not expected to result in significant adverse impacts to any Columbian white-tailed deer. Streaked horned lark have been documented on portions of the project site. However, most of the project site does not represent suitable nesting habitat for streaked horned lark.

Aquatic Habitat

Impacts to aquatic habitats associated with the construction of the upland portion of the facility for either Technology Alternative would be limited to temporary water quality impacts during construction. Implementation of BMPs would reduce the potential for impacts and result in the project meeting state water quality standards.

Riparian Habitat

The proposed project would result in direct permanent impacts to approximately 0.67 acre of riparian habitat area (RHA) buffer. Impacts to riparian habitats would be offset through the implementation of mitigation measures, including pile removal, engineered log jam installation, and riparian restoration activities.

Wetland Buffer

The proposed recreation access improvements at the north end of the project site would permanently impact approximately 0.09 acre of wetland buffer. These buffer impacts would be offset through implementation of buffer enhancement activities.

Temporary Construction Noise Impacts

Both Technology Alternatives would include a variety of activities, including pile driving, which would result in temporarily elevated terrestrial noise that may disturb terrestrial animals. Elevated noise level could cause wildlife at the project site or within the vicinity to temporarily avoid the area. The terrestrial portions of the project site that could experience temporarily elevated terrestrial noise levels provides only marginally suitable habitat. The terrestrial noise levels generated would not exceed any established injury thresholds for any special status species, and the effect to any special status species wildlife species present at the site would be expected to be limited to temporary avoidance of the site or vicinity.

Underwater noise generated by pile driving could potentially impact marine mammals and/or fish. Pile driving will be implemented using both vibratory and impact hammer equipment. Noise attenuation and marine mammal monitoring during pile installation would be used to mitigate impacts associated with underwater noise.

Temporary Water Quality Impacts

Temporary water quality impacts could affect fish habitat function and special status fish species both at the site and within the vicinity by reducing water quality, reducing visibility and increasing potential exposure to predators, and reducing habitat suitability for prey species. The potential for water quality impacts during construction would be minimized through adherence to the BMPs and compliance with state water quality standards.

Marine Terminal Alternative 1

The construction of the overwater portions of the proposed marine terminal under Marine Terminal Alternative 1 has the potential to affect plant and animal species at the project site and within the vicinity through direct habitat impacts (benthic habitat loss and overwater cover), by temporarily reduced water quality conditions during construction and dredging and through generation of temporarily elevated levels of underwater noise during pile installation and removal. Construction of Marine Terminal Alternative 1 would require the installation of approximately 320 concrete piles and 16 steel piles, resulting in the permanent loss of approximately 1,079 square feet of benthic habitat. The dock would result in a total of approximately 44,943 square feet of new solid overwater coverage that would reduce the suitability of aquatic habitat beneath the dock. The design minimizes impacts to shallow water habitat and approximately 34,018 square feet of overwater coverage would be located in deep water. The loss of benthic habitat and reduction in aquatic habitat suitability will be mitigated through pile removal, engineered log jam installation, and riparian restoration and wetland buffer enhancement.

Dredging will occur in deep water and will not result in the loss of aquatic habitat.

Marine Terminal Alternative 2

Marine Terminal Alternative 2 would require nearly twice as many piles and would result in nearly three times more overwater coverage as compared to Marine Terminal Alternative 1. Direct aquatic habitat impacts would be proportionally greater under Marine Terminal 2. Dredging impacts would be same as for Marine Alternative 1.

1.2.4.2 Operational Impacts

Operational impacts to plant and animal resources would be the same with all alternatives.

Operational water quality impacts under either Technology Alternative would include an increased potential for spills or leaks associated with on-site equipment and machinery, potential impacts associated with stormwater and wastewater, and impacts associated with water use. Potential impacts associated with spills are addressed in **Environmental Health and Safety**.

Wastewater and Stormwater

The proposed project under either Technology Alternative would generate wastewater and stormwater runoff at the project site, which could affect water quality and quantity for plant and animal resources. These discharges will comply with state and local standards and permit requirements. The normal operation of the proposed project would not result in significant adverse impacts to plant or animal species.

Water Use

The proposed project would require water for process uses and domestic uses (e.g., drinking, sanitation, etc.). Process water would be provided by a collector well (Ranney well) to be constructed by the Port near the Columbia River shoreline. The volume of water withdrawn from groundwater would be insubstantial (less than 0.0067 percent) relative to the flows in the Columbia River. For this reason, there would be no significant adverse impact to plant or animal resources as a result of the well and associated withdrawals.

Vessel Traffic

The operation of the proposed project would result in increased vessel traffic along the Columbia River from the project site to the mouth of the river. Increased vessel traffic has the potential to affect plants, animals, and/or aquatic resources from the effects of vessel wakes. However, the increase in vessel traffic would be small, approximately three to six ships per month (36 to 72 per year). The small increase in vessel traffic associated with the proposed project operations would potentially contribute a minor increase to the baseline condition on the river. This increase would not be expected to result in a significant adverse impact on any plant or animal resources, including fisheries or aquatic habitat.

1.2.4.3 Related Actions

Construction of the proposed pipeline and electrical service improvements may result in minor, short-term impacts on plant and animal resources. These impacts could occur because of activities located within or adjacent to stream channels, forested habitats, and wetlands. The potential impacts could include loss of vegetation through construction and operation, mortality of wildlife species from construction machinery and vehicles, temporary and permanent impacts to native wildlife habitats, and temporary disturbance of wildlife during construction. These impacts are not expected to result in significant adverse effects.

1.2.5 Energy and Natural Resources

1.2.5.1 Construction Impacts

Construction impacts would be the same with either Technology Alternative and either Marine Terminal Alternative. Construction would require fuel to power construction vehicles and equipment, personal vehicles for construction workers, temporary construction lighting, dredging vessels, and vessels and barges delivering construction modules to the project site. The demand for diesel and gasoline needed to fuel construction equipment is anticipated to be met by existing supplies. The construction of the proposed project would consume traditional building materials and would use a maximum of approximately 5.4 megawatts per day of temporary grid electric power. The volume and use of these resources would be typical of other construction projects of this size and scope, and these resources are not expected to be in short supply. Overall, construction of the proposed project would not result in significant adverse impacts to energy and natural resources.

1.2.5.2 Operational Impacts

Technology Alternatives

The primary differences in impacts between the CR and ULE Alternatives are energy consumption and the energy sources used in the methanol production process.

The ULE Alternative was assessed as the worst-case Technology Alternative for electricity demand and the CR Alternative was assessed as the worst-case Technology Alternative for natural gas demand.

Electricity Demand

Based on estimates provided by the applicant, the electricity demand for the ULE Alternative would be approximately 201 megawatts with both methanol production lines in operation. The ULE Alternative would include an on-site natural gas-fired power generator to produce approximately 101 megawatts, and the remaining 100 megawatts of electricity demand would be provided by the Cowlitz PUD.

The CR Alternative would require approximately 36 megawatts of electricity. This demand could be met entirely by the Cowlitz PUD and would not require an on-site power generation facility.

Neither Technology Alternative would result in a significant adverse impact related to electricity demand.

Natural Gas Demand

The CR Alternative would generate demand for approximately 290,000[2] dekatherms[3] of natural gas per day (including natural gas used for raw material and natural gas used for fuel). Under the ULE Alternative, the total natural gas demand would be approximately 270,000[4] dekatherm per day. The proposed pipeline has been designed to meet the higher demand of the CR Alternative.

Given the increasing production of natural gas in the United States, the ability to import additional natural gas supplies when needed, and the small amount of natural gas used by the proposed project relative to the overall U.S. consumption, the proposed project would not adversely affect the supply of natural gas for other consumers.

With respect to the availability of pipeline transmission capacity for natural gas, Northwest's Section 7(c) application to FERC,[5] states that on a typical day more than 500,000 dekatherms of operationally available capacity on the mainline has been historically available for natural gas deliveries to the Kalama area. As a result, the proposed project with either Technology Alternative would not adversely affect the availability of natural gas for other Northwest consumers.

Overall, the proposed project with either Technology Alternative would not result in significant adverse impacts to energy.

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[2] This is an estimate of the average natural gas consumption over the life of the reforming catalyst. This estimate is based on actual performance of combined reforming processes of similar design.
[3] A dekatherm is a unit of energy equal to 10 therms and one million British thermal units (MMBtu).
[4] This is also an estimated average over the life of the reforming catalyst. This is an estimate only; the actual natural gas usage may be lower or higher depending on the final engineering design and catalyst used and the heating value of the natural gas delivered to the project.
[5] This application is FERC docket CP15-8 and is available online at http://www.ferc.gov/docs-filing/elibrary.asp

Marine Terminal Alternatives

Both Marine Terminal Alternatives would have the same impacts to energy. The alternatives would generate demand for electricity for lighting, loading equipment, and the operations shack and dockworker shelter, as well as demand for electricity for the use of shore power (also known as "cold-ironing"). They would generate a peak electrical demand of approximately 3 megawatts, and an estimated annual electricity use of approximately 11,000 megawatt-hours based on preliminary engineering estimates. This electricity demand would be negligible compared to the approximately 5 million megawatt-hours of energy sales by the Cowlitz PUD in 2013. Therefore, the operation of the Marine Terminal Alternatives would not result in significant adverse impacts to energy and natural resources.

1.2.5.3 Related Actions

During construction of the proposed pipeline, building materials and fuel would be consumed. Construction activities would be temporary, lasting approximately five months, and energy use during construction, which would primarily be diesel and gasoline fuel use, is expected to be negligible compared to the approximately 87 million barrels (42 gallons per barrel) of distillate fuel and motor gasoline consumed in 2012 in Washington (U.S. Energy Information Administration 2012). During operation, the proposed pipeline and associated aboveground facilities would require very little energy. Therefore, the proposed pipeline-related action would not result in significant adverse impacts to regional energy or local natural resources.

It is expected that electrical service improvements to the Kalama Industrial Substation and new transmission lines, primarily on existing towers within the existing power line corridor, may be run to the project site under the ULE Alternative. The new transmission lines and substation improvement would constitute a related action on the part of the Cowlitz PUD. They would provide electric service to the proposed project with the ULE Alternative but would not generate demand for energy by themselves. Therefore, this related action would not result in significant adverse impacts to regional energy or local natural resources.

1.2.6 Environmental Health and Safety

The Technology and Marine Terminal Alternatives are assumed to generally pose the same potential for impacts to environmental health and safety.

1.2.6.1 Construction Impacts

Construction of the proposed project would have impacts similar to that of any large construction project and includes impacts to individual workers at the construction site and to the surrounding population.

If released, hazardous materials used and stored on site during construction on the upland portion of the proposed project could expose workers, plants, animals, adjacent wetland resources, soil, and groundwater to hazardous materials.

If hazardous materials are spilled into adjacent surface waters or onto the nearshore portion of the project site, they could contaminate Columbia River water and/or underlying groundwater. A release could expose plants, animals, aquatic habitats, shorelines, and people to contamination. The extent of the impacts from a release into surface water at the site would depend upon several factors, including the type and quantity of the material released, location of the release, physical and biological features of the environment, and the sensitivity of various species to the hazardous material.

Compliance with the applicable regulations, implementation of BMPs, and a spill prevention, control, and countermeasures plan (SPCCP) would avoid and minimize the potential for significant adverse impacts to environmental health due to spills during construction activities.

The proposed project would not have significant adverse impacts on environmental health during construction.

1.2.6.2 Operational Impacts

The Quantitative Risk Analysis (QRA) for the project quantified the potential risk to the public and workers from a large-scale emergency incident, such as a methanol release, fire, or explosion. The QRA concludes that there is a fatality risk to individual workers of one in 100,000 years within the project site, but that there is no measurable risk of fatalities outside the boundaries of the proposed facility or to the public generally.

The QRA modeling of the worst-case scenario indicated that the destructive force of an explosion at the proposed methanol facility would not extend beyond the plant site and would not result in deformation or collapse of any off-site buildings, and individuals off site would be protected from significant injury.

The risks and impacts to human health and safety associated with loading methanol onto ships and transport would include potential incidents that could result in spills of methanol into the Columbia River. The transport of chemicals in bulk is regulated by the International Convention for the Safety of Life at Sea and the International Convention for the Prevention of Pollution from Ships. The ships or vessels used to transport methanol would be double-hulled with segmented compartments for storing methanol during transport. The segmented compartments reduce the probability of a complete loss of vessel contents to a low potential.

Vessel incidents resulting in the accidental spills and releases of methanol are a risk from the proposed project along the Columbia River to its mouth and into the open ocean. The proposed project would only transport methanol, except for the fuel that operates the ship. The proposed project would result in approximately 36 to 72 additional ship transits per year (depending on vessel size). This increase in vessel traffic for the proposed project is minor and would be within historical trends. There is a moderate relative risk of cargo vessel-related fuel/oil spills in the west portion of the Columbia River. The proposed project would not significantly increase the existing risk of fuel spills into surface waters because the project vessel traffic represents a minor increase to existing traffic.

A potential methanol release into the Columbia River from shiploading or an accident involving a vessel in transport would have minor to no impact due to the very large size of the river and the short-lived duration of methanol in the environment. Complying with regulatory requirements and implementing BMPs and mitigation measures at the facility during vessel loading and transport as discussed below would reduce the chance of a release occurring and would improve emergency response in the event of a release.

Upland methanol releases could potentially occur as a result of damage to the on-site piping systems and storage tanks. These releases would likely be localized and temporary due to safeguards and the presence of pavement at the site that would prevent the release from entering soil or groundwater. As a result, there would be little potential for impacts to adjacent recreation activities, including the proposed project recreation improvements or adjacent land use activities.

Methanol has a half-life of one to seven days in soil, depending on soil characteristics (e.g., chemical and microbiological characteristics), and is highly soluble in water. Surface spills of methanol to soil may enter groundwater depending on the size of the spill and depth to groundwater, but would likely dissolve and/or degrade rapidly. Large methanol plumes would not likely form or persist in the subsurface because of the rapid rate methanol disappears in soil and groundwater and its ability to vaporize and biodegrade.

The proposed project would use diesel fuel for emergency generators and would use petroleum-based lubricants for machinery. Petroleum products are not expected to be stored on site in large quantities. Petroleum spills (i.e., fuel or oils) are not readily dissolvable and tend to bind to soil particles. Petroleum materials would be stored on site in designated areas with spill response kits located nearby. The implementation of an operational SPCCP would trigger a rapid cleanup response.

The proposed project would not result in significant adverse impacts to soil or groundwater from accidental spills of methanol or petroleum-based products due to all methanol storage tanks meeting regulatory requirements, methanol's ability to biodegrade and vaporize, leak detection systems, site paving, and the small volume of petroleum-based products stored on the site.

1.2.6.3 Related Actions

Risks associated with the proposed pipeline and the electrical transmission improvements are considered to be low and are representative of risks associated with small construction projects and typical substation operation. As a result, the substation is not addressed further. The construction impacts associated with the proposed pipeline are considered to be similar to the construction impacts of the proposed project.

1.2.7 Land Use and Shoreline Use, Housing, and Employment

The proposed project with either Technology Alternative and either Marine Terminal Alternative would have similar potential impacts on land and shoreline use and housing and population characteristics.

1.2.7.1 Construction Impacts

Land Use

Construction activities would be temporary and would not alter surrounding land uses or otherwise affect land use patterns of the surrounding area during construction. The proposed activities are consistent with Cowlitz County land use plans and ordinances, and permits would be obtained prior to construction. Therefore, construction of the proposed project would not result in any significant adverse impacts on land use.

The proposed project would employ approximately 1,000 workers at its peak during construction. The proposed project's construction employment would constitute approximately less than 0.1 percent of the total employment in the area. Given the number of people currently employed in the area and the availability of construction labor, it is anticipated that the proposed project could predominately utilize the existing construction labor pool and construction laborers would not represent a significant increase in population or impact the housing characteristics of the study area.

1.2.7.2 Operational Impacts

Land Use

The proposed project would introduce a more active and intensive industrial land use to the project site. Although this would constitute a substantial change to the land use character, the proposed project would be located in an area that already contains industrial uses and would be generally compatible and consistent with other nearby land uses. Use of the site for the proposed project is not expected to create any adjacent use compatibility impacts nor trigger any pressure for those adjacent land uses to change from their existing use and would not have significant adverse impacts to recreational uses.

The project site and adjacent parcels are unzoned and would not affect zoning designations in other portions of the study area. The applicant would be required to obtain permits and approvals to show compliance with County land use and shoreline management programs and ordinances. As a result, the proposed project would not result in significant adverse impacts to zoning.

The proposed project would further the Port's strategy for continued industrial development of the North Port site and is consistent with the highest and best use of the site, which has been identified as an expansion of the marine terminal and water-dependent industry. The proposed project would, therefore, be consistent with the Port's comprehensive scheme.

1.2.7.3 Related Actions

The proposed pipeline would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the construction area, as well as the introduction of a new use to some areas of the proposed pipeline route. The proposed pipeline would convert approximately 12.4 acres of forest land to maintained right-of-way (ROW) but would not result in the removal of any existing structures or land uses. Most the land disturbed by the proposed pipeline is already developed and the majority of the land uses would be allowed to continue, with restrictions, within the maintained ROW. The proposed pipeline is consistent with County plans and regulations.

Overall, it is not anticipated that the proposed pipeline would have significant adverse impacts on land use or public policy.

Electrical Service

The proposed electrical service improvements would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the area during construction. The upgrade to the existing transmission line would not involve additional clearing or other significant construction activities because it is located within an existing transmission corridor that has been maintained active for this use. The new transmission line would be located primarily over existing maintained transportation corridors (road and rail) and would be designed to result in no impacts to these existing land uses. The proposed electrical service improvements are consistent with County plans and regulations. Overall, it is not anticipated that the electrical service improvements would have significant adverse impacts on land use or public policy.

1.2.8 Aesthetics and Visual Resources

The size, layout, and appearance of the alternatives vary but differences would be minor and impacts would be similar among all alternatives.

1.2.8.1 Construction Impacts

Construction activities on the project site would be visible to residents, workers, commuters, recreationalists, and boat operators, but would be temporary and consistent with the general industrial context of the adjacent area. These activities would alter the context of some views by changing the use of an existing cleared site. However, construction of the proposed project would not alter the overall visual character or aesthetic quality of surrounding views. Overall, construction of the proposed project would result in a low level of temporary adverse effect to aesthetics and visual quality. Therefore, construction activities would not result in significant adverse impacts to aesthetics and visual resources.

1.2.8.2 Operational Impacts

The operation of the proposed project would introduce new visual features to the project site and accompanying new sources of light and glare that would be visible from viewpoints within the study area. The new visual features would include new structures and equipment on the project site, additional workers, and increased vehicle and ship movements on and adjacent to the site. These elements would result in varying levels of effect to aesthetics and visual resources depending on the type of viewer, the amount of use of the view, and the context of the view.

Water vapor exhaust plumes from cooling towers has the potential to result in visual and aesthetic impacts. Visual impacts also include vertical and horizontal movement, which tend to distract viewers, cause shadows or ground level fog in surrounding areas, and may reflect light during nighttime conditions. Plumes are expected to be visible to most viewers; however, viewers would see this project within the visual context of the Kalama and Longview industrial areas, which include numerous emission plumes. Additionally, conditions conducive to larger emission plumes also coincide with atmospheric cloud cover, precipitation and fog, which would reduce the visual and aesthetic impact of water vapor emissions from cooling towers.

Additional light from the proposed project would have little effect on night sky viewing conditions in the context of existing lighting along this industrial stretch of Columbia River and in the cities of Kalama and Longview.

1.2.8.3 Related Actions

Construction of the proposed pipeline, particularly the removal of trees from the route, would result in temporary and permanent effects on visual resources. However, the existing topography would be recontoured to as near preconstruction condition as practical, and the disturbed soils would be revegetated soon after the completion of pipeline construction except as required for pipeline safety. Visual impacts from the construction and operation of aboveground facilities would be minimal.

The electrical service improvements would have a low level of effect on visual resources. The transmission line crossing over I-5 and the substation upgrades may be visible to motorists on I-5, but these viewers have low sensitivity to aesthetic and visual resources because they tend to be focused on driving and have transitory views of short duration. The transmission line crossing would appear in the context of many other existing power lines along I-5 and the substation improvements would be within the existing substation next to existing electrical equipment. Therefore, the potential transmission line and substation improvements would not result in significant adverse impacts to aesthetics and visual resources.

1.2.9 Historic and Cultural Resources

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would be located on the same project site, would include similar ground-disturbing activities, and impacts would be similar among all alternatives.

1.2.9.1 Construction Impacts

No cultural or historic resources listed in or eligible for listing in the National Register of Historic Places or the Washington Historic Register are located within or near the project. However, resources could be found during construction and an inadvertent discovery plan will be developed and implemented during construction. This measure would avoid potential adverse impacts to unanticipated cultural resources on the project site.

1.2.9.2 Operational Impacts

Operations for the upland portion of the facility are not expected to impact cultural resources because of the absence of eligible or listed resources on the project site or surrounding area. Increased vessel traffic would result in a minor increase in vessel wakes. However, the Columbia River shoreline has little susceptibility to erosion because of the existing nature of the shoreline, and no impacts from shoreline erosion caused by vessel wakes on onshore cultural resources are anticipated.

1.2.9.3 Related Actions

The proposed pipeline route was found to contain three cultural resources: the Old Pacific Highway, the Northern Pacific Railroad, and the Mt. Pleasant Cemetery. The Old Pacific Highway and the Northern Pacific Railroad are not recommended to be eligible for listing on National Register of Historic Places or the Washington Historic Register. The historic-period Mt. Pleasant Cemetery has not been formally evaluated for eligibility by the Washington State Department of Archaeology and Historic Preservation (DAHP). The proposed pipeline would avoid all three resources by aligning the route to avoid the cemetery and using horizontal directional drilling and conventional boring to route the pipeline beneath the highway and railroad; therefore, no impacts to cultural resources would occur.

There are no recorded cultural resources within the area of the proposed electrical service improvements-related action that are listed in or determined eligible for listing in the National Register of Historic Places or the Washington Historic Register. Minimal ground disturbance is necessary for the electrical service improvements; therefore, no impacts to cultural resources would occur.

1.2.10 Transportation

The proposed project alternatives would be located on the same site and would result in the same construction and operational employment, and transportation impacts would be the same among all alternatives.

1.2.10.1 Construction Impacts

Construction would result in additional vehicle traffic from deliveries and workers. However, all intersections affected by construction traffic would operate within acceptable standards of delay. Some delivers could arrive by vessel during construction but the volume would be low in comparison to existing vessel traffic; therefore, no impacts are anticipated.

1.2.10.2 Operational Impacts

During operations, additional vehicular traffic will occur as a result of deliveries and workers. However, all intersections affected by project traffic would operate within acceptable standards of delay.

The small increase in vessel traffic associated with the proposed project operations would contribute a minor increase in vessel trips compared to 2014 volumes (less than 5 percent) but would remain at levels below the historic highs and the channel would be able to accommodate the increase. The increase in vessel traffic would increase the demand for assist tugs and pilots in the Columbia River and bar, but this demand, based on historic volumes, could be managed with existing resources.

1.2.10.3 Related Actions

Construction of the proposed pipeline would last approximately five months and would result in minor increases in traffic on area roadways from workers and deliveries. The amount of workers is small and the effects would be temporary, lasting only for the duration of construction activities. Operation of the proposed pipeline would not generate additional traffic with the exception of occasional inspections and maintenance activities; therefore, no impacts would occur.

Cowlitz PUD also has indicated that traffic flow would be maintained during construction activities and the upgraded transmission lines and substation would not generate additional trips during operation; therefore, no impacts would occur.

1.2.11 Public Services and Utilities

The proposed project alternatives would be located on the same project site and would result in the same demand on public services and utilities and impacts would be the same among all alternatives.

1.2.11.1 Construction Impacts

Construction of the proposed project would generate demands for fire, emergency, and police services. These demands would be typical of an industrial construction site, and would not result in substantial new demands on existing fire, emergency, and police service providers with the proposed security measures.

The proposed project would generate modest water demand during the first phase of construction. The need would be temporary, lasting only during the first phase of construction. Demand would be typical of industrial construction projects and would be satisfied by a temporary connection to the City's system. The on-site collector well would provide water for construction purposes during the second phase of construction. Therefore, water demands would be minimal during construction, and there would be no significant adverse impacts to public water systems.

No public sewage systems would be used during construction. Portable toilets would be used on site during construction. Therefore, there would be no significant adverse impacts to public sewage systems during construction.

Project construction is anticipated to require $1.8 billion in capital investment; $625 million of that is expected to be spent in the local region. Construction is expected to produce substantial

additional indirect spending by other businesses and government and induce spending by individuals for a total economic impact in the region of over $1 billion. The state, Cowlitz County, and taxing jurisdictions within the County would be positively impacted through payment of business and occupation (B&O) and sales taxes. Combined sales, use, and B&O taxes are estimated at $57.7 million during construction.

1.2.11.2 Operational Impacts

The proposed project could place new demands on fire and emergency services during its operation. These new demands would be offset by measures included in the operation and design of the proposed project, including the Port security plan, restricted on-site access, perimeter fencing, manned security gates, security cameras throughout the facility, and communications with the Cowlitz County Sheriff and Fire Departments. Proposed project emergency facilities will also include an on-site firehouse and workers trained in emergency response and firefighting. Fire suppression facilities (foam, water) will be located throughout the site.

Domestic water needs would be accommodated by the City of Kalama's water system, while process water needs would be met by the Port's proposed collector well.

Domestic wastewater from the project would be treated by the Port's existing wastewater treatment system. Process wastewater from the methanol production process would be treated on site in the proposed project's wastewater treatment system and would not impact Port or municipal wastewater systems.

The plant would have annual direct economic output of $1.286 billion. The facility would employ 192 full-time workers with a payroll of $21 million per year. The direct payments to employees, direct purchases of operating inputs (e.g., machinery, maintenance services, and overhead costs), and direct plant output from the local area would result in total (direct, indirect, and induced) impacts to the local economy of approximately $1.4 billion annually. Combined sales, use, property, leasehold, hazardous substances, and B&O taxes paid during operations would vary based on levy rates and other factors but are estimated to average approximately $36 million per year.

1.2.11.3 Related Actions

Construction and operation of the proposed pipeline would not generate new demands for water or sewer services. Overall, construction of the proposed pipeline would not result in significant adverse impacts on public services and utilities.

The proposed pipeline would transport natural gas to the project site. The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural gas and should an incident occur demands could be placed on local resources. The proposed pipeline would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures.

1.2.12 Noise

1.2.12.1 Construction Impacts

Noise from construction activities for both Technology and Marine Terminal alternatives would have similar impacts and would add to the noise environment in the immediate vicinity of the project site from typical construction activities along with in-water pile driving, potential upland pile driving, clearing, grading, paving, and building construction activities. Noise levels approximately 1,800 feet from the nearest residences are expected to be less than the noise level limits that would apply to long-term operational noise (and from which construction noise is exempt).

Construction would be temporary and limited to daytime hours, and construction activities and the associated noise are generally common in the Port area. Therefore, "typical" on-site construction activities under all alternatives would not result in significant adverse noise impacts. While the audible noise from pile driving may be perceived by some people as intrusive and possibly annoying, the noise levels would be relatively low and pile-driving activities would be temporary. Additionally, because construction would occur primarily during daytime hours, noise from these activities would be limited to daytime hours.

1.2.12.2 Operational Impacts

CR Alternative

Operations of the CR Alternative would generate noise from the various elements of the manufacturing process. Estimated sound levels from the CR Alternative would comply with the most restrictive nighttime noise limits at all off-site receivers nearest the site in both Washington and Oregon. The calculated increases in sound levels over existing levels would also comply with Oregon's noise standards.

ULE Alternative

Operation of the ULE Alternative would generate noise from the various elements of the manufacturing process. Unless mitigated, estimated sound levels would not comply with the most restrictive nighttime noise limits at off-site receivers nearest the project site in Oregon, and the calculated increases in sound levels over existing levels would exceed the 10 dBA limit on increases over the existing L50 sound levels in Oregon. In addition, estimated sound levels indicated that noise limits could be exceeded along portions of the eastern and northern project site boundary. Mitigation measures would be employed to reduce sound levels to meet standards and impacts would not be significant.

Marine Terminal

The Marine Terminal Alternatives primary noise would be the methanol loading equipment and short-term tug operations during ship berthing, which is accounted for in the analysis of the CR and ULE Alternatives. As indicated, there would be no significant noise impacts.

1.2.12.3 Related Actions

The Northwest pipeline project and the electrical improvements are expected to generate normal construction noise and minor operational noises. The noise levels are not expected to exceed local or state noise criteria during operation. Construction noise is generally exempt.

1.3 Unavoidable Significant Adverse Impacts

Implementation of the mitigation proposed for the project would reduce impacts and the proposed project would not result in unavoidable significant adverse impacts.

1.4 Impact Avoidance, Minimization, and Mitigation

Tables 1-1 and 1-2 summarizes the design features, BMPs, and methods that would be used to avoid, minimize, or mitigate potential project impacts. As a result of these measures, there would be no significant adverse impacts associated with the proposed project.

Table 1-1. Proposed Project Alternatives – Potential Impacts and Mitigation Summary

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
Earth	**Construction:** • Short-term soil erosion from grading and earthwork activities • Potential for spills of hazardous substances • Site grading **Operational:** • Risk of soil liquefaction, seismic lateral spreading, and ground shaking causing injury/death and structural damage during earthquakes • Risk of ash fall from volcanic eruptions causing interruption of operational activities and damage to project site and equipment	**Construction:** • SWPPP and BMPs to control stormwater runoff/erosion at the upland site • Conditions in the construction stormwater permits • SPCCP used for hazardous materials storage, handling, and cleanup **Operational:** • Foundation design with ground improvements, such as stone columns, drilled shafts, or other methods • Pile-supported structures • Structural design in accordance with current seismic codes	**Construction:** • Potential for sediment loss and turbidity during dredge activities in the Columbia River **Operational:** • Risk of soil liquefaction, seismic lateral spreading, and ground shaking causing injury/death and structural damage during earthquakes • Risk of ash fall from volcanic eruptions causing interruption of operational activities and damage to project site and equipment	**Construction:** • BMPs to minimize sediment loss and turbidity generation during dredging • Compliance with Surface Water Quality Standards for Washington (173-201A WAC) • Conditions specified in the Water Quality Certification **Operational:** • Design measures consistent with state and federal regulations, seismic and building code, and standard construction methods to avoid and minimize earthquake impacts • Measures to minimize ground movements and/or movements of structures as a result of seismically induced settlement and lateral spreading
Air Quality and Greenhouse Gas Emissions	**Construction:** • Dust could suspend particulate matter • Emissions from diesel equipment • Short duration odors • GHG emissions from construction activities **Operational:** • CR Alternative would result in larger quantities of all criteria pollutants and GHG emissions than the ULE Alternative during the methanol manufacturing process. • Limited patterns of fogging (water vapor) could appear to the north-northwest of the cooling towers, extending out to a distance of 500 meters. Areas of the fogging would not be expected to pose a driving hazard. Less plume fogging would occur with the ULE Alternative than the CR Alternative. • Odor impacts would be very limited and the SWCAA requirements restricting offensive odors off site would not be exceeded. • The CR manufacturing process is estimated to result in direct emissions of about 1.4 million tonnes of GHGs annually. • The ULE manufacturing process would emit substantially less GHGs than the CR Alternative. • 50 to 100 megawatts (depending on Technology Alternative) of purchased electricity would be required that would result in emissions of between 133,000 and 266,000 tonnes of CO2e annually.	**Construction:** • Construction activities would comply with applicable federal and state air quality rules requiring minimization of construction-related emissions. **Operational:** • Because both alternatives would be required to employ Best Available Control Technology GHGs, their GHG impacts would not be considered significant according to Ecology's SEPA guidance for GHG. • Using the ULE Alternative, all TAP sources would comply with emission standards and off-site concentrations would be less than the respective screening level thresholds. • Odor impacts would be very limited and the SWCAA requirements restricting offensive odors off site would not be exceeded. • Overall GHG emissions for the ULE Alternative (excluding on-site power generation) are about 61% lower than the CR Alternative. With on-site generation of electricity, the ULE Alternative GHG emissions are projected to be about 31.5% less than with the CR Alternative. **Additional Mitigation:** • The ULE Alternative would function as a mitigation measure compared to the CR Alternative.	**Construction:** • Emissions from diesel equipment • Short duration odors • GHG emissions from construction activities **Operational:** • Operational impacts of the marine terminal area are included in the Technology Alternatives impact. • Vessel traffic within Washington State waters would have emissions of about 3,900 tonnes of CO2e.	**Construction:** • Construction activities would comply with applicable federal and state air quality rules requiring minimization of construction-related emissions. **Operational:** • Vessel emissions during terminal operations are not expected to be significant because the increase in vessel traffic on the river would not be significant. **Additional Mitigation:** • No additional mitigation measures are warranted or proposed.
Water Resources	**Construction:** • Potential for short-term turbidity to surface water due to soil exposure, wind, and stormwater runoff. • Potential for pollutant discharges that could affect water quality during in- and overwater work. • Installation of ground improvements could result in slurry at the ground surface that could run off into adjacent surface waters.	**Construction:** • General BMPs. • Wetland buffer impacts will be mitigated by riparian enhancement activities. • Develop and implement a WQPMP for project construction. The WQPMP, at a minimum, shall include provisions for visual monitoring of adjacent surface water bodies and wetlands if stone column installation occurs within 100 feet of the surface water or wetland.	**Construction** • Marine Terminal Alternative 1 would require the installation of 336 piles plus temporary piles during construction. • Marine Terminal Alternative 2 would require the installation of 779 piles plus temporary piles during construction. Construction impacts would occur over a longer period as compared to Marine Terminal 1. • Short-term turbidity could result from pile installation and/or dredging activities.	**Construction:** • BMPs for general work, overwater work, pile installation, overwater concrete placement minimization, dredging, and dredge material placement. • Develop and implement a WQPMP. • Selection of the Marine Terminal Alternative 1 will minimize pile driving compared to Marine Terminal Alternative 2.

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
	• Risk of spills and the release of contaminants that could leach into the groundwater. • Removal of 0.09 acre of regulatory wetland buffer for recreation access improvements. **Operational:** • Water quality could be affected by wastewater discharges, stormwater runoff, and accidental spills of methanol or other substances.	• Develop and implement SWPPP and SPCCP. **Operational:** • Stormwater will be managed by infiltration and will not be discharged to surface water. • Runoff and accidental spills will be minimized by BMPs, SWPPP practices, and SPCCP controls. • NPDES permit for wastewater discharge will impose effluent limits to protect water quality with monitoring to ensure compliance. **Additional Mitigation** • There are no significant impacts identified for water resources; therefore, no additional mitigation measures are identified.	• The operation of equipment for overwater construction could release pollutants into surface water through spills. **Operational:** • Water quality could be affected by stormwater runoff and accidental spills of methanol.	**Operational:** • Stormwater will be managed by infiltration and will not be discharged to surface water. • Develop and implement a WQPMP, SWPPP, and SPCCP • Impacts of potential spills would be minimized by containment located on the dock and automatic shutoff valves. Stormwater system is designed with the ability to handle spills to the dock surface. **Additional Mitigation:** • There are no significant impacts identified for water resources; therefore, no additional mitigation measures are identified.
Plants and Animals	**Construction:** • Low-quality foraging, perching, and other habitat for the non-listed, ground-dwelling species would be reduced. • New roosting and nesting opportunities for other species of birds that nest on buildings would be created. • Existing Osprey nesting could be impacted. • Forage vegetation for the Columbian white-tailed deer could potentially be removed. • Soil erosion could impact water quality for aquatic habitat. • Direct impact of 0.67-acre RHA buffer. • Direct impact of 0.09-acre wetland buffer. • Pile driving for ground improvements could temporarily elevate terrestrial noise that may disturb terrestrial animals. • Ground improvements could impact fish habitat by reducing water quality. **Operational:** • The potential exists for spills or leaks associated with on-site equipment and machinery. • Wastewater and stormwater runoff could affect water quality for plant and animal resources. • Wastewater discharge from the facility could potentially affect the Columbia River water temperature, which could in turn affect fish or other aquatic species.	**Construction:** • Construction would be on the portion of the site that has no wetlands or other water bodies, has little substantial vegetation, has been identified for industrial development, and has been used as a dredged material placement site. • Osprey nesting platform will be relocated. • Stormwater from impervious surfaces associated with the upland methanol manufacturing facility would be infiltrated through on-site stormwater pond(s). • Facility design would be within the envelope of previously developed areas at the site, and would avoid direct impacts to the forested backwater wetland to the north. • BMPs would minimize potential impacts for general work, overwater work, pile installation, overwater concrete placement, dredging, and dredged material placement. **Operational:** • BMPs, SWPPP, and SPCCP would minimize potential impacts to plants and animals during operations. • Stormwater from impervious surfaces would be infiltrated through on-site stormwater pond(s). • Wastewater discharge temperature will not exceed 20°C per Washington water quality standards. **Compensatory Mitigation:** • Mitigation activities would include wetland buffer and riparian enhancement.	**Construction:** • Direct impact to 0.05 acre of RHA buffer. • Temporarily reduce water quality of aquatic habitat. • Temporarily elevate levels of underwater noise during pile installation and removal. • Marine Terminal 1 Alternative will require the installation of approximately 320 24-inch concrete piles, twelve 12-inch steel pipe piles, and four 18-inch steel pipe piles, resulting in the permanent loss of approximately 1,079 square feet of benthic habitat and install approximately 44,943 square feet of new solid overwater coverage. • Marine Terminal 2 Alternative would require nearly twice as many piles (637 total piles)and would result in nearly three times more overwater coverage (127,200 total square feet) as compared to Marine Terminal 1 Alternative. • The new dock structure could affect aquatic habitat function by increasing nearshore overwater shading and by reducing the quantity and quality of benthic habitats. **Operational:** • The terminal could generate stormwater runoff, which could affect water quality and quantity for plant and animal resources.	**Construction:** • Selection of the Marine Terminal 1 Alternative would minimize impacts to plants and animals due to the lesser amount of piles and overwater coverage. • Pile-driving noise would be attenuated as needed to comply with the Marine Mammal Protection Act, including using bubble curtains and minimizing impact hammer pile driving. • Dock design would include grated walkways to minimize shading. • The size and configuration of the structures would be the minimum capable of supporting their needed functions and place the vessels away from shallow water to reduce impacts from vessel operations. • Access trestle abutments would be designed and configured to eliminate the need for shoreline armoring. **Operational:** • Stormwater from the dock would be collected and conveyed to upland treatment and an infiltration swale. **Compensatory Mitigation:** • Compensatory mitigation is based on selection of Marine Terminal Alternative 1 and includes pile removal, riparian plantings, and enhancement.
Energy	**Construction:** • Fuel would be required for construction vehicles and equipment, lighting, dredging vessels, delivery vessels and barges, but would be met by existing supplies. • Grid electrical power needs would be approximately 5.4 megawatts per day, but is not anticipated to affect normal supply of electricity to the surrounding area.	**Mitigation:** • No mitigation is proposed.	**Construction:** • The Marine Terminal Alternatives would have similar energy impacts. • Fuel would be required for construction vehicles and equipment, vehicles, lighting, dredging vessels, delivery vessels, and barges but would be met by existing supplies.	**Mitigation:** • No mitigation is proposed.

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
	Operational: • Electrical demand would be less for the CR Alternative than the ULE Alternative, but the natural gas demand would be greater. • Demand for electricity and natural gas can be met with existing system capacity and would not affect supply for other local and regional users or increase local electricity or gas rates.		**Operational:** • The Marine Terminal Alternatives would have similar operational impacts to energy.	
Environmental Health and Safety	**Construction:** • Risk that hazardous materials used and stored on site on the upland portion of proposed project site would expose workers, plants, animals, adjacent wetland resources, soil, and groundwater to hazardous materials. • Risk that hazardous material spills into adjacent surface waters or onto the nearshore portion of the project site could contaminate Columbia River water and/or underlying groundwater. • Temporary, localized increases in particulate matter emissions. • Diesel emissions from heavy and small equipment could temporarily impact ambient air quality. • Slight and short duration odors within the area of the odor source. **Operational:** • A catastrophic tank failure or other worst-case incident could result in a pool fire, jet fire, or vapor cloud explosion. • Modeling of the worst-case scenario indicated that the destructive force of an explosion at the proposed methanol facility would not extend beyond the plant site. • The quantitative risk assessment concludes that there is a fatality risk to individual workers of one in 100,000 years within the project site, but that there is no measurable risk of fatalities outside the boundaries of the proposed facility or to the general public. • Surface spills of methanol to soil may enter groundwater depending on the size of the spill and depth to groundwater, but would likely dissolve and/or degrade rapidly.	**Construction:** • The contractor(s) would follow all required state and federal safety to ensure worker safety and would develop a SPCCP to protect human health and the environment from accidental spills and releases of toxic substances. • BMPs would be used to minimize odors. **Operational:** • The proposed project would be designed and constructed with comprehensive safeguards to prevent accidental spills, releases and leaks, detect releases, and contain and minimize the impacts of spills and releases in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. • Project design would include secondary containment berms around storage tanks to capture 110% of the tank contents plus precipitation from a 24-hour, 100-year storm event. • Full emergency response capabilities will be available at the site, including an emergency alarm system and a comprehensive gas detection and fire suppression system and on-site trained personnel that would provide 100% coverage to the plant. • Firefighting would also be supported by Cowlitz County Fire District 5. • The facility would be required to prepare and maintain a SPCCP. • A flare system would be provided as part of the safety systems to dispose of released flammable gases and vapors. • Emergency response team would be trained and certified in compliance with OSHA, WISHA, PSM, and NFPA requirements and stationed on site. The facility would include an on-site firehouse and fire brigade. • The production and handling of methanol would be designed, operated, maintained, and monitored under the principles of PSM. The requirements for PSM in Washington are found at WAC 296-67 Process Safety Management of Highly Hazardous Chemicals. **Additional Mitigation** • No significant impacts have been identified; no additional mitigation measures are warranted or proposed.	**Construction:** • Risk that hazardous material spills into adjacent surface waters or onto the nearshore portion of the project site could contaminate Columbia River water and/or underlying groundwater. • Temporary, localized increases in particulate matter. • Diesel emissions from heavy and small equipment could temporarily impact ambient air quality. • Slight and short duration odors within the area of the odor source. **Operational:** • Risk that methanol spills could occur in the Columbia River during loading of methanol onto export vessels. • Vessel incidents resulting in accidental spills and releases of methanol could occur from the proposed project along the Columbia River to its mouth and into the open ocean.	**Construction:** • The contractor(s) would follow all required state and federal safety to ensure worker safety and would develop a SPCCP to protect human health and the environment from accidental spills and releases of toxic substances. • BMPs would be used to minimize odors. **Operational:** • The facility would have full response capabilities to respond to emergencies at the marine terminal. The MFSA and Cowlitz County would have primary responsibility if an event involves a ship, but would be supported by NWIW. • The facility would be required to prepare and maintain a SPCCP. • The proposed project would be designed and constructed with comprehensive safeguards to prevent accidental spills, releases and leaks, detect releases, and contain and minimize the impacts of spills and releases should they occur. • Infrastructure would include shutoff valves on product lines and stormwater systems to minimize impacts in the event of a spill. • The proposed methanol transfer facilities would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. • The emergency response team would be trained and certified in compliance with OSHA, WISHA, PSM, and NFPA requirements and stationed on site. • The handling of methanol would be designed, operated, maintained, and monitored under the principles of PSM. The requirements for PSM in Washington are found at WAC 296-67 Process Safety Management of Highly Hazardous Chemicals. **Additional Mitigation** • No significant impacts have been identified; no additional mitigation measures are warranted or proposed.

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
Land Use and Shoreline Use, Housing, and Employment	**Construction:** • Construction activities would be temporary and would not alter surrounding land uses or otherwise affect land use patterns. • Construction labor would use the existing construction labor pool and laborers would not represent a significant increase in population or impact the housing. **Operational:** • More active and intensive industrial land use would be introduced to the project site but the use is consistent with existing zoning and the Port's development plans. • Roadway access to the informal recreation area near the site would be improved. • 192 workers would work for the proposed operation and would likely already live in the area, and would not affect population and housing characteristics.	**Mitigation:** • No significant impacts have been identified; no mitigation measures are warranted or proposed.	**Impacts associated with the Marine Terminals 1 and 2 Alternatives are the same as the impacts described for the Technologies Alternatives.**	**Mitigation associated with the Marine Terminals Alternatives is the same as the Technologies Alternatives.**
Aesthetics and Visual Resources	**Construction:** • Construction activities on the project site would be visible to residents, workers, commuters, recreationalists, and boat operators, but these activities would be temporary and consistent with the general industrial context of the adjacent area. • Construction of the proposed project would result in a low level of temporary adverse effect to aesthetics and visual quality. **Operational:** • Views from Urban/Industrial areas are dominated by existing industrial facilities, operations, and activities. Large-scale buildings, heavy utility transmission lines, industrial plumes, and ancillary facilities and equipment define the existing visual character of this view. • Views for travelers on southbound I-5 would be altered by introducing new industrial features and water vapor plumes. • Site operational activities would occur 24 hours per day, which would be similar to those of adjacent industrial areas. • The proposed project would result in new nighttime lighting and would expand the extent of artificially lit industrial activities along the river.	**Construction:** • Construction activities would have minor impacts to aesthetics and visual resources. No mitigation is proposed **Operational:** • Nighttime lighting will be designed to minimize glare and confine the lighting to the project site to minimize nighttime visual impacts. **Mitigation:** • No additional mitigation is proposed.	**Impacts associated with the Marine Terminals 1 and 2 Alternatives are the same as the impacts described for the Technologies Alternatives.**	**Mitigation associated with the Marine Terminals Alternatives is the same as the Technologies Alternatives.**

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
Historic and Cultural Resources	**Construction:** • The potential exists for an inadvertent discovery of historical and/or cultural resources during construction. **Operational:** • The potential to discover historical and/or cultural resources during operations is very low because of the absence of eligible or listed resources in the area of potential effects and the absence of ground-disturbing activities during operation.	**Construction:** • An Inadvertent Discovery Plan in advance of construction would detail protocols to be followed in the event that cultural resources or human remains are encountered during project construction activities. This measure would avoid potential adverse impacts to unanticipated cultural resources on the project site. **Operational:** • The Inadvertent Discovery Plan would be used for any ground-disturbing activities during operations maintenance. **Mitigation:** • No mitigation is proposed.	**Impacts associated with the Marine Terminals 1 and 2 Alternatives are the same as the impacts described for the Technologies Alternatives.**	**The Marine Terminals Alternatives would have the same mitigation requirements as described for the Technology Alternatives.**
Transportation	**Construction:** • All study intersections are forecast to meet the WSDOT standard of LOS C or better while all other intersections are forecast to operate at levels that meet the target threshold of LOS E or better during the weekday PM peak hour with peak season construction traffic. **Operational:** • All study intersections are forecast to meet the WSDOT standard of LOS C or better, while all other intersections are forecast to operate at levels, which meet the target threshold of LOS E or better during the weekday PM peak hour with the proposed project in place. • The addition of 36 to 72 vessels per year is within the historic range of Columbia River vessel traffic.	**Mitigation:** • No mitigation is proposed.	**Impacts associated with the Marine Terminals 1 and 2 Alternatives are the same as the impacts described for the Technologies Alternatives.**	**The Marine Terminals Alternative would have the same mitigation requirements as described for the Technology Alternatives.**

Resources	Proposed Project Alternatives			
	Combined Reformer/Ultra-Low Emissions Technology Alternatives		Marine Terminal 1 and Marine Terminal 2 Alternatives	
	Potential Impacts	Mitigation	Potential Impacts	Mitigation
Public Services and Utilities	**Construction:** • There could be a demand for fire, emergency, and police services during construction activities. • Project construction is anticipated to require $1.8 billion in capital investment; $625 million of that is expected to be spent in the local region. • Construction is expected to produce substantial additional indirect spending by other businesses and government and induce spending by individuals for a total economic impact in the region of over $1 billion. • The state, Cowlitz County, and taxing jurisdictions within the County would be positively impacted through payment of B&O and sales taxes. Combined sales, use, and B&O taxes are estimated at $57.7 million during construction. **Operational:** • New demands could be placed on fire and emergency services during operation. • Operation of the project is expected to generate direct, indirect, and induce spending in the local region of approximately $1.4 billion per year. • Combined sales, use, property, leasehold, hazardous substances, and B&O taxes paid during operations are estimated to average approximately $36 million per year.	**Construction:** • Increased demands for public services would be offset by substantial additional tax revenue that the project will generate and by measures included in the operation and design of the proposed project, including the Port security plan, restricted on-site access, perimeter fencing, manned security gates, security cameras, on-site firehouse, workers trained in emergency response and firefighting, and communications with the Cowlitz County Sheriff and Fire departments. **Operational:** • The demand for fire, emergency, and police services would be minimized by design alarm and safety features and on-site emergency response equipment and trained personnel and offset by tax revenue. **Mitigation:** • No mitigation is proposed.	**Construction:** • Impacts associated with the Marine Terminals Alternatives are the same as described for the Technology Alternatives. **Operational:** • Impacts associated with the Marine Terminals Alternatives are the same as described for the Technology Alternatives.	**Construction:** • Mitigation associated with the Marine Terminals Alternatives are the same as described for the Technology Alternatives.
Noise	**Construction:** • Construction noise would be short term and temporary and primarily occur during daytime hours. **Operational:** • The noise assessment identified the potential for project-related sound levels for the CR Alternative that would not comply with Oregon's noise limits.	**Construction:** • Construction would primarily occur during the daytime hours. • Construction equipment will employ properly sized and maintained mufflers, engine intake silencers, and engine enclosures, and turning off idle equipment. **Operational:** • Noise mitigation measures would be employed for the CR Alternative cooling water pumps and methanol loading pumps. Options for mitigation include locating pumps where noise will be blocked or installing sound walls or enclosures to block noise.	**Impacts associated with the Marine Terminals Alternatives are the same as described for the Technology Alternatives.**	**The Marine Terminals Alternatives would have the same mitigation requirements as described for the Technology Alternatives.**

Table 1-2. Related Project Impact and Mitigation Summary

Resource	Related Actions	
	Kalama Lateral Pipeline **Note: This proposed project was assessed in Kalama Lateral Project FERC EA (FERC 2015)**	**Electrical Service**
Earth	**Impacts:** There is a low potential for geologic impact to the pipeline. Potential hazards identified include erosion, shallow groundwater, flood inundation, liquefaction, and lahars. **Mitigation:** Avoidance in route selection (e.g., landslide areas), standard-of-practice engineering design, BMPs, and targeted erosion protection measures.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.
Air Quality and Greenhouse Gases	**Impacts:** Construction of the proposed pipeline-related action would involve excavation and horizontal drilling activities that could result in temporary, localized increases in particulate concentrations due to emissions from construction-related sources. There are no permanent sources of operational emissions for the proposed pipeline with the exception of the possibility for minor fugitive methane emissions. **Mitigation:** No mitigation is proposed.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.
Water Resources	**Impacts:** The construction may result in minor, short-term impacts on water resources for construction activities adjacent to stream channels and wetlands. Operation of the proposed pipeline would permanently affect less than 1 acre of wetland by converting it from a Palustrine Scrub Shrub wetland to a Palustrine Scrub Shrub/Palustrine Emergent wetland and would not result in significant impacts. **Mitigation:** No mitigation is proposed.	**Impacts:** Proposed electrical improvements would cross over a narrow slough that drains to the Kalama River. Construction adjacent to this slough could affect water quality in the slough temporarily due to soil and/or vegetation disturbance. Impacts would be temporary, localized, and minimized by the use of typical construction BMPs. No work would be conducted below the OHWM of the slough. Work on the east side of I-5 could result in direct wetland impacts. Impacts to this area would be associated with utility pole footprints and, as such, would have limited effect on wetlands. **Mitigation:** BMPs would be used.
Plants and Animals	**Impacts:** The Kalama Lateral Project may result in minor, short-term impacts on plant and animal resources. These impacts could occur because the activities are located within or adjacent to stream channels, forested habitats, and wetlands. The potential impacts could include loss of vegetation through construction and operation, mortality of wildlife species from construction machinery and vehicles, temporary and permanent impacts to native wildlife habitats, and temporary disturbance of wildlife during construction. These impacts are not expected to result in significant adverse effects. **Mitigation:** No mitigation is proposed.	**Impacts:** The electrical improvements may result in minor, short-term impacts on plant and animal resources and could occur because activities may occur within or adjacent to habitat and wetlands. The potential impacts could include temporary and permanent impacts to native wildlife habitats and temporary disturbance of wildlife during construction. These impacts are not expected to result in significant adverse effects. **Mitigation:** Mitigation would include avoiding or minimizing disturbance of wildlife and habitat, erosion control, site restoration, habitat enhancement; timing of activities, and/or other BMPs would be used.

Resource	Related Actions	
	Kalama Lateral Pipeline **Note: This proposed project was assessed in Kalama Lateral Project FERC EA (FERC 2015)**	**Electrical Service**
Energy	**Impacts:** Construction of the proposed pipeline, building materials, and fuel would use energy, which would primarily be diesel and gasoline fuel use, and is expected to be negligible compared to the approximately 87 million barrels of distillate fuel and motor gasoline consumed in 2012 in Washington. Operation of the proposed pipeline and associated aboveground facilities would require very little energy. Therefore, the proposed pipeline-related action would not result in significant adverse impacts to regional energy or local natural resources. **Mitigation:** No mitigation is proposed.	**Impacts:** The proposed electrical improvements would not result in significant adverse impacts to regional energy or local natural resources. **Mitigation:** No mitigation is proposed.
Environmental Health and Safety	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.
Land Use and Shoreline Use, Housing, and Employment	**Impacts:** The Kalama Lateral Project would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the construction area. The related action would convert approximately 12.4 acres of forest land to maintained right-of-way for the life of the proposed pipeline. Overall, it is not anticipated to have adverse impacts on land use or public policy. **Mitigation:** No mitigation is proposed.	**Impacts:** The proposed electrical service improvements would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the area during construction. The proposed project includes a new overhead crossing of I-5, the BNSF railroad, and N. Hendrickson Drive within the city of Kalama. Overall, it is not anticipated to have significant adverse impacts on land use or public policy. **Mitigation:** No mitigation is proposed.
Aesthetics and Visual Resources	**Impacts:** Construction of the proposed pipeline, particularly the removal of trees from the route, would result in temporary and permanent effects on visual resources. However, the existing topography would be recontoured to as near preconstruction condition as practical and the disturbed soils would be revegetated. Visual impacts from the construction and operation of aboveground facilities would be minimal and temporary. The construction and operation of the proposed pipeline would not result in significant adverse impacts to aesthetics and visual resources. **Mitigation:** No mitigation is proposed.	**Impacts:** The potential transmission line and substation improvement-related action would have a low level of effect on visual resources. **Mitigation:** No mitigation is proposed.
Historic and Cultural	**Impacts:** The area near the proposed pipeline was found to contain three cultural resources: the Old Pacific Highway, the Northern Pacific Railroad, and the Mount Pleasant Cemetery. The historic-period Old Pacific Highway and the historic-period Northern Pacific Railroad are not recommended to be eligible for listing in the WHR or NRHP. The historic-period Mount Pleasant Cemetery has not been formally evaluated for eligibility by DAHP. Impacts to these resources are avoided by route selection and boring under the highway and railroad. **Mitigation:** No mitigation is proposed.	**Impacts:** There are no recorded cultural resources within the area for the proposed electrical service improvements-related action that are listed in or determined eligible for listing in the NRHP, the WHR, or the Cowlitz County cultural resource inventory. **Mitigation:** No mitigation is proposed.

Resource	Related Actions	
	Kalama Lateral Pipeline **Note: This proposed project was assessed in Kalama Lateral Project FERC EA (FERC 2015)**	**Electrical Service**
Transportation	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.
Public Services and Utilities	**Impacts:** The proposed pipeline would not generate substantial new demands for water or sewer services. The pipeline involves some risk to the public due to the potential for accidental release of natural gas. The greatest risk is a fire or explosion following a major pipeline rupture. The proposed pipeline would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. Operation of the proposed pipeline would not place new demands on water and sewer systems or fire and emergency services. The proposed pipeline would not result in significant adverse impacts to public services and utilities. **Mitigation:** No mitigation is proposed.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.
Noise	**Impacts:** The pipeline project is expected to generate normal construction noise and minor operational noises. The noise levels are not expected to exceed local or state noise criteria during operation. Construction noise is generally exempt. **Mitigation:** No mitigation is proposed.	**Impacts:** The proposed electrical improvements are expected to generate normal construction noise and minor operational noises. The noise levels are not expected to exceed local or state noise criteria during operation. Construction noise is generally exempt. **Mitigation:** No mitigation is proposed.
Socioeconomic	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.	**Impacts:** The related action would not result in adverse impacts. **Mitigation:** No mitigation is proposed.

1.5 Controversial Issues

During the scoping process, a number of comments were received regarding the project. These concerns centered mostly on public safety and environmental impacts related to vessel transportation and work within the Columbia River. Vessel transport concerns have also focused on impacts from vessel wakes and spills. Concerns were expressed regarding the impact of dredging and the new marine terminal on the Columbia River, including impacts to shallow water habitat. Concerns were also raised about the potential for the project to affect water quality, human health, public services, recreational resources, natural resources, tribal resources, cultural resources, visual resources, and GHG emissions. Additionally, commenters emphasized that the environmental review consider the cumulative impacts of implementing other proposals that may result in an increase of vessel traffic on the river.

1.6 Anticipated Permits and Approvals

The proposed project would require federal, state, and local permits and authorizations, as well as completion of the SEPA review process. **Table 1-3** is a preliminary list of the permits that are anticipated to be needed for the project. Additional permits and/or approvals may be identified as the environmental review process and project design continues.

Table 1-3. Permits and Authorizations Required for the Proposed Project

Permit/Authorization	Agency
Federal	
Rivers & Harbors Act Section 10/Clean Water Act Section 404	USACE
Endangered Species Act Section 7 Consultation	National Oceanic and Atmospheric Administration (NOAA) Fisheries/U.S. Fish and Wildlife Service
Marine Mammal Protection Act	NOAA Fisheries
NEPA	USACE, NOAA Fisheries
Private Aids to Navigation Permit	U.S. Coast Guard
Section 106 of the National Historic Preservation Act	USACE
State	
Hydraulic Project Approval	Washington State Department of Fish and Wildlife
Shoreline Conditional Use Permit	Ecology
401 Water Quality Certification	Ecology
Prevention of Significant Deterioration (Air) Permit	SWCCA/Ecology
National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Ecology
NPDES Industrial Wastewater Discharge Permit	Ecology
SEPA	Port and County

Permit/Authorization	Agency
Local	
Shoreline Substantial Development and Conditional Use Permit	County
Critical Areas	County
Floodplain Permit	County
Engineering and Grading	County
Building, Mechanical, Fire, etc.	County

1.7 DEIS Comment Process

One of the primary purposes of preparing an EIS is to provide the public and agencies with information that they can use to make comments on the proposed project. After the DEIS is published, copies of the document are available for public review and comment, and a public hearing is held. The hearing provides an opportunity for citizens to orally present comments on the proposed project. Comments can also be submitted in writing at the hearing. The comment period starts on the day the DEIS is published, March 3, 2016, and ends at 5:00 p.m. on April 18, 2016.

The public hearing for the DEIS will be held on March 22, from 6:00 p.m. to 9:00 p.m. at the Kalama High School Gymnasium, 548 China Garden Road, Kalama, WA 98625.

To submit comments on the DEIS, visit http://KalamaMfgFacilitySEPA.COM.

Written comments and e-mail can be sent to:

KMMEF EIS
c/o SEPA Responsible Official
Port of Kalama
110 West Marine Drive
Kalama, WA 98625

SEPA@KalamaMfgFacilitySEPA.COM

1.7.1 Public Coordination

The SEPA EIS process begins with scoping of the DEIS. The co-lead agencies asked members of the public, agencies, and tribes to comment on what should be analyzed in the DEIS during the scoping period between November 7, 2014 and December 8, 2014. The co-lead agencies established the scope of the DEIS based on state and local SEPA guidance and comments received during the scoping period.

1.7.2 Next Steps

Comments received on the DEIS during the comment period (March 3 through April 18, 2016 at 5:00 p.m.) will be compiled and reviewed and a final EIS (FEIS) will be prepared. The co-lead agencies anticipate that the FEIS will be published in the summer of 2016. Substantive comments received on the DEIS will be included and responses provided in the FEIS. The FEIS will be used by the local and state agencies in making permit decisions for the proposed action. State and local permits for construction and operation of the project may be issued no sooner than seven days following publication of the FEIS.

Chapter 2 Proposed Project and Alternatives

2.1 Introduction

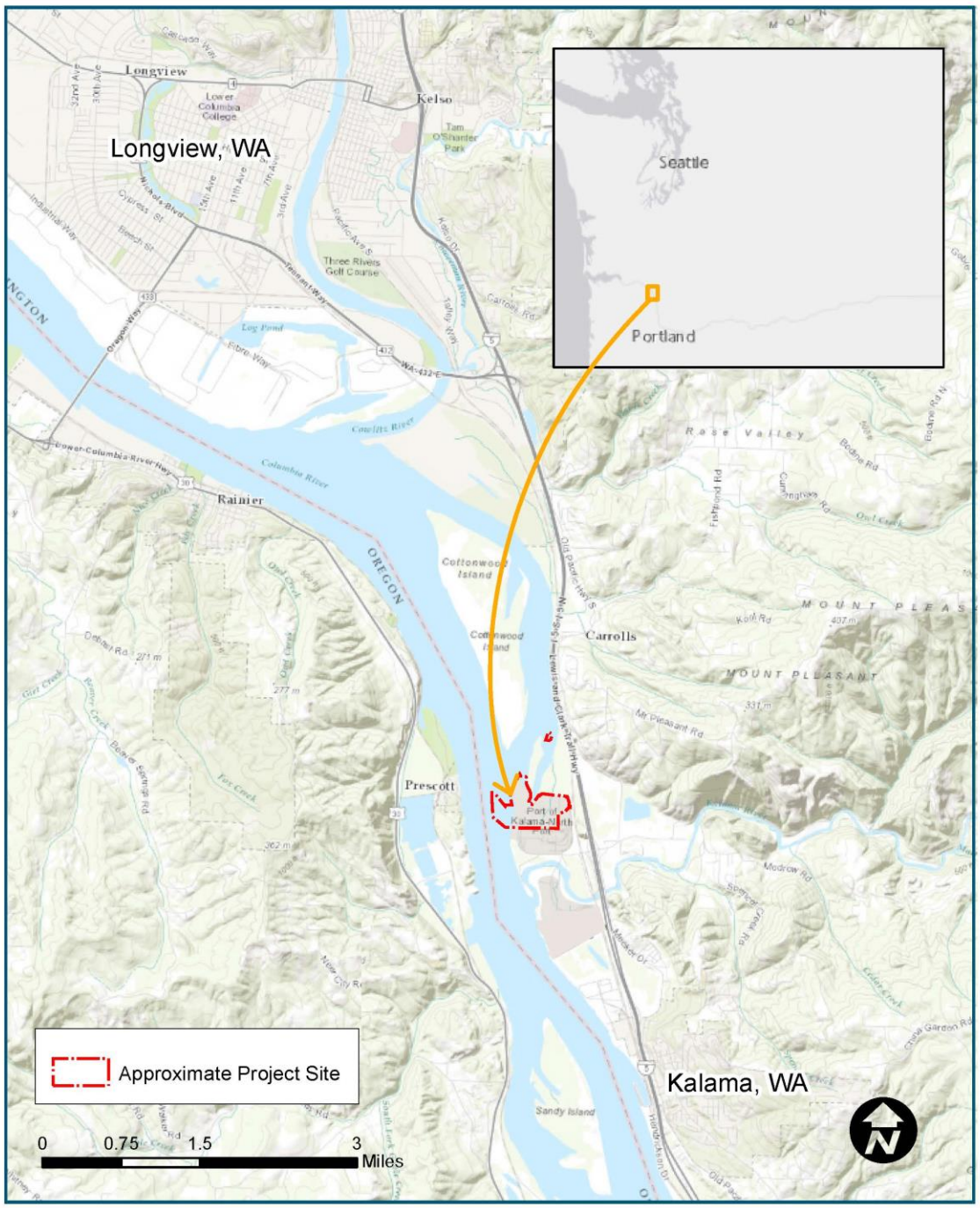
Northwest Innovation Works, LLC – Kalama (NWIW) and the Port of Kalama (Port) are planning to construct the Kalama Manufacturing and Marine Export Facility (KMMEF) (the proposed project), which would consist of a methanol manufacturing facility and a new marine terminal on approximately 100 acres on the Columbia River at the Port's North Port site (the project site). The project site is shown on **Figure 2-1**. In related action, Northwest Pipeline LLC (Northwest) is proposing to construct and operate the Kalama Lateral Project (the proposed pipeline), a 3.1-mile natural gas pipeline to the proposed project, and Cowlitz County Public Utility District No. 1 (Cowlitz County PUD) is proposing to upgrade electrical service to provide power to the proposed project.

The proposed methanol manufacturing plant would convert natural gas to methanol, which would be stored on site and transported via marine vessel to global markets, primarily in Asia. The methanol is expected to be used for the production of olefins, which are the primary components in the production of consumer products, such as medical devices, glasses, contact lenses, recreational equipment, clothing, cell phones, furniture, and many other products.

The proposed marine terminal would accommodate the oceangoing vessels that would transport methanol to destination ports. It would also be designed to accommodate other vessel types and, when not in use for loading methanol, would be made available for general use by the Port, for other cargo operations, as a lay berth where vessels could moor while waiting to use other Port berths, and for topside vessel maintenance.

The proposed project is subject to environmental review under the State Environmental Policy Act (SEPA). The Port and Cowlitz County are serving as co-lead agencies for the SEPA environmental review. Federal approvals would be necessary for permits for in-water work and would be subject to environmental review under the National Environmental Policy Act (NEPA). The proposed pipeline (a related action) is undergoing separate review through the Federal Energy Regulatory Commission (FERC), and a NEPA Environmental Assessment was issued in July 2015. The proposed project would also require permits, authorizations, approvals, or other government actions from Cowlitz County, the Washington State Department of Ecology (Ecology), the Southwest Clean Air Agency, the Washington State Department of Fish and Wildlife (WDFW), and other agencies as summarized in section 2.8. This document is a SEPA draft environmental impact statement (DEIS) intended to meet the environmental review needs of the Port, Cowlitz County, and other state and local agencies with jurisdiction over the proposed project. Analyses in this document are also expected to be used to support NEPA review of applicable federal actions.

This chapter describes the alternatives for the proposed project assessed in this EIS. As described below, these alternatives include two methanol production technology alternatives and two alternative designs for the marine terminal. A No-Action Alternative is also assessed as required by SEPA. The purpose and need for the proposed project are also discussed in this chapter. An Off-Site Alternative that was initially considered but not pursued, and the reasons for its elimination is also discussed in this chapter. Basic information about methanol and methanol production is also provided for context.



Project Location Map
Figure 2-1

KALAMA SEPA
Manufacturing & Marine Export Facility

2.2 Project Site

The proposed project would be located at the Port's North Port site at 222 West Kalama River Road in unincorporated Cowlitz County, Washington (**Figure 2-1**). Existing Port facilities are located along the Columbia River between approximately River Mile (RM) 72 and RM 77. The North Port site is located at approximately RM 72 along the east bank of the Columbia River. The BNSF Railway and Interstate 5 (I-5) lie immediately to the east.

The proposed project site is located in Sections 31 and 36, Township 7 North, Range 2 West Willamette Meridian. The project site consists of portions of tax parcels 63302, 63304, 63305, 60822, 60831, 63301, and WH2500003, including areas of pile removal activities that are proposed for mitigation as part of the proposed project. A portion of the project site consists of state-owned lands that are subject to a Port Management Agreement between the Port and the Washington State Department of Natural Resources. **Figure 2-2** shows the project site boundary.

The project site is bounded by the Columbia River to the west; by Tradewinds Road, the Air Liquide industrial facility, and the Port's industrial wastewater treatment plant to the east; by Port property primarily used for open space, recreation, and wetland mitigation to the north; and by the existing Steelscape manufacturing facility to the south.

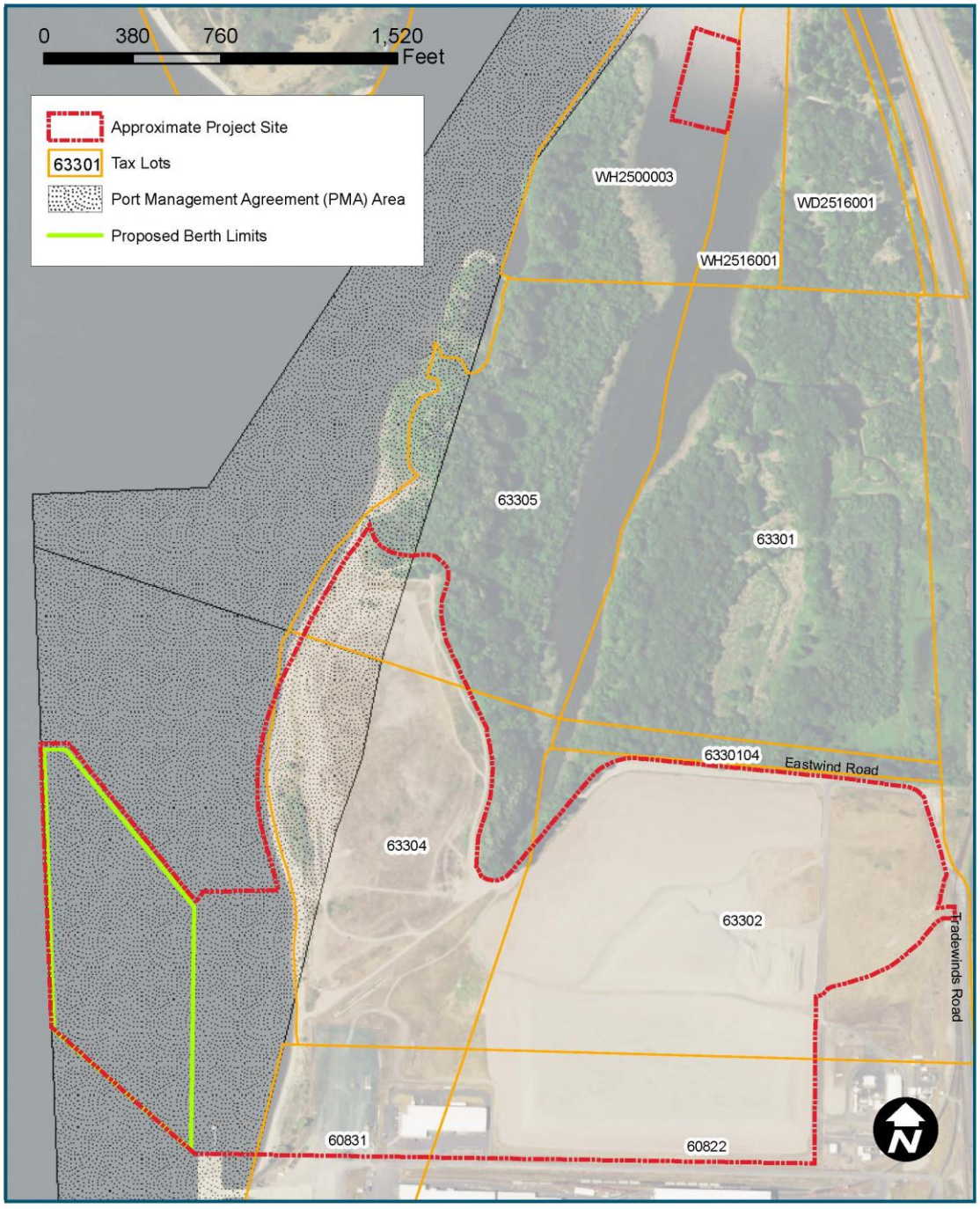
The Port is the owner of the project site and has leased approximately 90 acres of the 100-acre site to NWIW for construction and operation of the proposed facility. The Port would construct the proposed marine terminal to accommodate the shipping of methanol. The Port would also improve existing access roads, construct a new access road, and develop water supply, recreation areas, and other elements to support the proposed project in the remaining 10 acres of the project site. The marine terminal would be designed to accommodate other vessel types and, when not in use for loading methanol, would be made available for general use by the Port, for other cargo operations, as a lay berth where vessels could moor while waiting to use other Port berths, and for topside vessel maintenance.

2.2.1 Existing Project Site Uses

The Port has owned the project site since 1979. The site was filled to its current elevation in 1980 using material dredged from the Columbia River. The last dredge material placement activity on the project site occurred in 1995. The project site was part of the U.S. Army Corps of Engineers (USACE) network of dredge material placement sites but was removed from the network in 2015.[1] Dredge placement activities are also permitted on the site through an active shoreline conditional use permit from Cowlitz County and Ecology related to a previously proposed aggregate facility on the project site.

An existing building is located on the southwest portion of the project site. This approximately 38,000-square-foot building is currently used as a warehouse and office space for Steelscape and includes parking, loading, and landscaped areas. This building and adjacent areas would be reused as part of the proposed project. The remainder of the project site is undeveloped and sparsely vegetated. Site topography is generally flat and consists primarily of sandy dredged material.

[1] The Port of Kalama officially withdrew the Northport Dredge Disposal site on October 6, 2014 from the Columbia River Channel Improvements project. A confirmation letter from the USACE was received on November 24, 2015.



Project Site Parcel Map
Figure 2-2

KALAMA SEPA
Manufacturing & Marine Export Facility

2.2.2 Previous Proposals for the Project Site

The Port has been actively pursuing development of the project site. Four projects were previously proposed for the site, but were cancelled because of economic considerations. The projects are summarized below. Permits or environmental reviews completed for the projects before they were cancelled are also noted.

- North Port Dock Extension: The Port received permits in 2005 to construct a 1,000-foot extension to the existing North Port dock along with additional access trestles and upland support facilities. The dock extension was not constructed.
- Aggregate Facility: The northwest portion of the project site was approved for the construction of an aggregate handling facility and concrete batch plant in 2009. All permits were issued except the USACE Section 10 authorization (for in-water work). The project was canceled by the project proponent.
- Pacific Mountain Energy Center: An integrated gasification combined cycle power generation facility that would use fuel-flexible gasification technology and processes to produce approximately 680 megawatts of electrical power was proposed on the project site in 2005. A DEIS was published by the Washington State Energy Facility Site Evaluation Council in 2007. The applicant canceled the project in 2009.
- Kalama Energy Center: This project proposed a 346-megawatt gas-fired power plant on portions of the project site. The project was canceled by the applicant in 2013. A National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit (No. WA0040576) was received in August 2012 prior to the project being canceled.

2.3 Project Proponent

NWIW and the Port propose to design, construct, and operate the proposed project. Collectively, NWIW and the Port are referred to as the project proponent. A brief overview of each of these entities is provided below.

2.3.1 Northwest Innovation Works, LLC – Kalama

NWIW is a multinational partnership formed for the purpose of developing cleaner sources for methanol production to meet global demands. The parent company of NWIW is CECC (Shanghai Bi Ke Clean Energy Technology Co., Ltd.), a technology commercialization and project development firm in the gas, synthesis gas, chemicals, and fuels industries.

2.3.2 Port of Kalama

The Port oversees a variety of industrial uses on property along the Columbia River in the city of Kalama and unincorporated Cowlitz County, including the project site. Organized in 1920 by a vote of the people as authorized under the Washington State Port District Act of 1911, the Port is operated according to the provisions of Title 53 of the Revised Code of Washington (RCW) Chapter 53.04. Port districts are specifically authorized by RCW 53.04 to acquire, construct, maintain, operate, and develop harbor improvements, rail or motor vehicle transfer and terminal facilities, water transfer and terminal facilities, air transfer and terminal facilities, or any combination of such transfer and terminal facilities, and other commercial transportation, transfer, handling, storage, and terminal facilities, and industrial improvements.

The Port is governed by a three-member Port commission and administered by an executive director. Currently, the Port employs 16 full-time and several part-time employees. The Port

receives revenue from leases of various Port properties, buildings, and marine terminals; services associated with the grain terminal and breakbulk docks; and the Kalama marina. Thirty-one industries employing approximately 867 people are located at the Port.

The Port's mission is "to induce capital investment in an environmentally responsible manner to create jobs and to enhance public recreational opportunities."

2.4 Project Objectives

NWIW and the Port are pursuing the proposed project with the stated goal of reducing greenhouse gas (GHG) emissions globally by producing methanol from natural gas rather than coal. Global demand for methanol for use in production of olefins is high. Economic forecasts predict an increase in worldwide demand for methanol from 60 million tonnes in 2013 to 109 million tonnes in 2023 (IHS 2014). Increased demand for methanol in Asia is being met primarily by the construction of facilities in China that manufacture methanol from coal, which emits very high levels of GHG and generates toxic byproducts and wastes (Yang et al. 2012). Producing methanol from natural gas produces substantially lower levels of GHG emissions and fewer chemical byproducts. This DEIS evaluates two technology options for producing methanol from natural gas (discussed below), one of which is a new technology that produces even lower GHG and other emissions than conventional technologies for producing methanol from natural gas. NWIW has expressed its desire to use the new lower emitting technology consistent with its goal of global reduction of GHG emissions.

The project would provide economic benefit to the region, create jobs, and improve access to recreational resources, and thus meets the Port's mission to "induce capital investment in an environmentally responsible manner to create jobs and to enhance public recreational opportunities."

2.5 Characteristics of Methanol and Basics of Methanol Production

Methanol, also known as methyl alcohol or wood alcohol, is the simplest of all alcohols with the chemical formula CH_3OH. It is biodegradable and noncarcinogenic. Methanol can be used as a fuel, but is more commonly used as an essential ingredient in chemical and manufacturing processes for products, including paint, particle board, plastics, carpets, pharmaceuticals, laminated lumber, and windshield wiper fluid.

Methanol is primarily produced from either coal or natural gas. Production of methanol from natural gas has fewer environmental impacts than production from coal with respect to air pollutants and GHG emissions. The proposed project would produce methanol from natural gas feedstock that would be supplied via pipeline (see section 2.7, Related Actions). The proposed project would not involve the production or handling of ethanol, which is a renewable fuel produced from plant-based feedstocks.

Making pure methanol from natural gas is an established technology: natural gas is combined with steam and heat to produce a "synthesis gas" of carbon monoxide, carbon dioxide, and hydrogen. A catalyst is then used to create a chemical reaction and the resulting liquid is distilled to yield 99.9 percent pure methanol and 0.1 percent water (see **Figure 2-3**).

The process for producing methanol from natural gas has three key steps:

1. Natural gas reforming – the process of converting natural gas to synthesis gas (a mixture of hydrogen and carbon oxides; also referred to as syngas);

Basic Methanol Production Process
Figure 2-3

2. Methanol synthesis – the process of converting syngas to methanol; and
3. Methanol distillation – the process of purifying the methanol product to the required purity.

2.5.1 Natural Gas Reforming

Natural gas reforming is the process of making synthesis gas from natural gas.

Natural gas contains a low level of sulphur compounds, which would be removed to make the natural gas feedstock suitable for use in methanol production. Sulphur is collected before the reforming process in the form of zinc sulfide and disposed off site in accordance with applicable federal, state, and local regulations. Natural gas with the sulphur removed is referred to as treated natural gas.

The treated natural gas is compressed, then saturated with process water, and mixed with steam to increase water content. The treated water-rich natural gas is converted in the reformers into a mixture of carbon oxides and hydrogen, which is referred to as "synthesis gas" or "syngas" and contains the reactants for the formation of methanol. The process involves a partial natural gas reforming with steam as a primary step, and a complete reforming with oxygen in an autothermal reformer (ATR) as a secondary step. Combining the two reforming processes creates the optimum synthesis gas composition for methanol synthesis.

The synthesis gas is cooled in a series of heat exchangers that recover waste heat that is returned to the system to provide energy to feed the gas and methanol distillation process.

2.5.2 Methanol Synthesis

The reformed synthesis gas then enters the two converters where crude methanol is created. Not all of the synthesis gas can be converted to methanol in the first pass, so the outlet gas from the converters contains a mixture of methanol and unreacted synthesis gas.

The hot gas mixture leaving the converters flows through a series of coolers to allow methanol product to condense, and to recover and reuse waste process heat to improve energy efficiency. Condensed crude methanol is sent to the methanol distillation unit, and the noncondensed gas mixture is compressed and recycled back to the converters to enhance methanol production.

2.5.3 Methanol Distillation

Crude methanol from the synthesis process is sent to the distillation unit where it is distilled to the required purity. Water and several other hydrocarbon byproducts are synthesized at the same time as methanol. These byproducts are separated from the methanol through a separation vessel and a series of three distillation columns.

The refined methanol is then directed to the on-site storage tanks, the light hydrocarbon byproducts are recovered and used as fuel for the boilers, and the heavy byproducts (mainly water) are recycled to the reforming step for use in saturating the natural gas feedstock with process water.

2.6 Alternatives Analysis

The proposed project involves the construction and operation of a methanol manufacturing facility and marine terminal on the project site. The alternatives evaluated in this EIS include "action" alternatives, in which the proposed methanol manufacturing facility and marine

terminal would be developed and a No-Action Alternative, in which the proposed project would not be developed.

The on-site action alternatives include two methanol production technology alternatives (collectively referred to as the Technology Alternatives), and two marine terminal design alternatives (collectively referred to as the Marine Terminal Alternatives). An Off-Site Alternative for the methanol manufacturing facility was also evaluated during the initial alternatives analysis but is not carried forward for the detailed EIS analysis because that alternative did not satisfy SEPA requirements for a reasonable alternative, explained in more detail in section 2.6.3 below.

The alternatives include:

- Technology Alternatives:
  - Combined Reformer (CR) Alternative – The proposed methanol manufacturing facility would use combined reforming technology, which employs a combination of a steam-methane reformer (SMR) and an ATR to produce methanol.
  - Ultra-Low Emissions (ULE) Alternative – The proposed methanol manufacturing facility would use ULE reforming technology, which employs a gas-heated reformer (GHR) and an ATR to produce methanol.
- Marine Terminal Alternatives:
  - Marine Terminal Alternative 1 – The proposed marine terminal would be a separate structure located approximately 380 feet north of the existing North Port dock.
  - Marine Terminal Alternative 2 – The proposed marine terminal would be a 1,000-foot northward extension to the existing dock, similar to the previously-permitted proposed extension of the existing North Port dock (see section 2.2.2).
- Off-Site Alternative: The proposed methanol manufacturing facility would be constructed on another Port-owned site. This alternative was determined to be not reasonable because of its potential to result in greater environmental impacts than the alternatives on the project site. The Off-Site Alternative was not carried forward with the detailed alternatives analysis in the EIS process (see section 2.6.3 below).
- No-Action Alternative

2.6.1 Technology Alternatives

2.6.1.1 Description of the CR Alternative and the ULE Alternative

The primary differences between the Technology Alternatives are energy efficiency and energy source and the technology used for the natural gas reforming step in the methanol production process. The other primary steps in the production process remain the same in both Technology Alternatives. Both technologies are viable for use in the proposed project.

Combined reforming (CR Alternative) is widely used in the methanol industry to perform the primary reforming of natural gas with steam. With combined reforming technology, the energy required by the reforming reaction is provided mainly by burning natural gas. Natural gas as fuel combusts through the firing burners, provides heat to allow natural gas steam reforming in the tubes of the SMR, and the flue gas is emitted to the atmosphere. The waste heat carried by hot flue gas is recovered through a series of heat exchangers to generate steam, and the steam is

sent to turbines to drive rotating process equipment (such as pumps and compressors). The combined reforming technology results in lower CO_2 and GHG emissions than coal-based methanol production, which relies on coal gasification to produce synthesis gas from coal feedstock.

ULE reforming is a proven technology commonly used for reforming other chemicals from natural gas and has been used at a smaller scale for the production of methanol. If the ULE Alternative is selected, the proposed project would be the first large-scale application of ULE technology in the world. ULE technology is designed to use process heat directly to provide energy for the reforming reaction. With ULE technology, hot synthesis gas from the secondary reformer (referred to as the autothermal reformer) flows through the shell side of the primary reformer (referred to as the GHR). With the ULE reforming technology, rotating process equipment are driven by electricity instead of steam turbines.

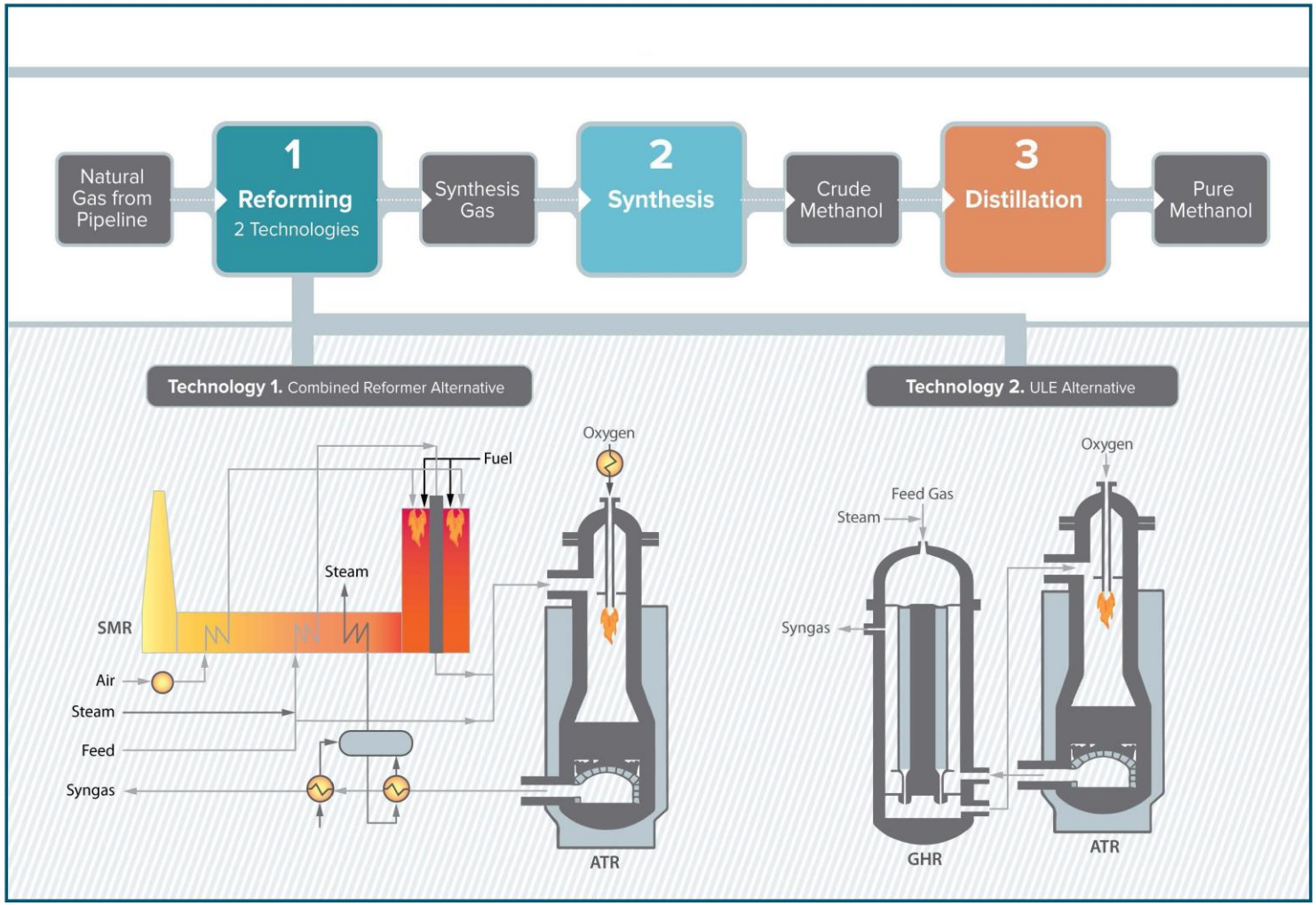
Both the Technology Alternatives would require substantial amounts of electricity and natural gas to power their processes. The CR Alternative requires more energy input and relies more heavily on natural gas for that energy. The ULE Alternative uses natural gas to power boilers, but the reforming process is powered by process heat from the autothermal reformer. However, the ULE Alternative requires substantially more electricity because electricity is used to power compressors and pumps. Cowlitz County PUD does not currently have adequate transmission capacity to supply all the electricity needs of the ULE Alternative. Therefore, the ULE Alternative requires an on-site, natural gas-fired power generator to provide a portion of the power. The ULE Alternative would have lower GHG emissions than the CR Alternative as discussed in Chapter 4, Air Quality and Greenhouse Gas Emissions.

Figure 2-4 illustrates the differences between the CR and ULE alternatives within the overall methanol production process. **Figures 2-5 and 2-6** show the site plans for each alternative.

2.6.1.2 Components Unique to the CR Alternative

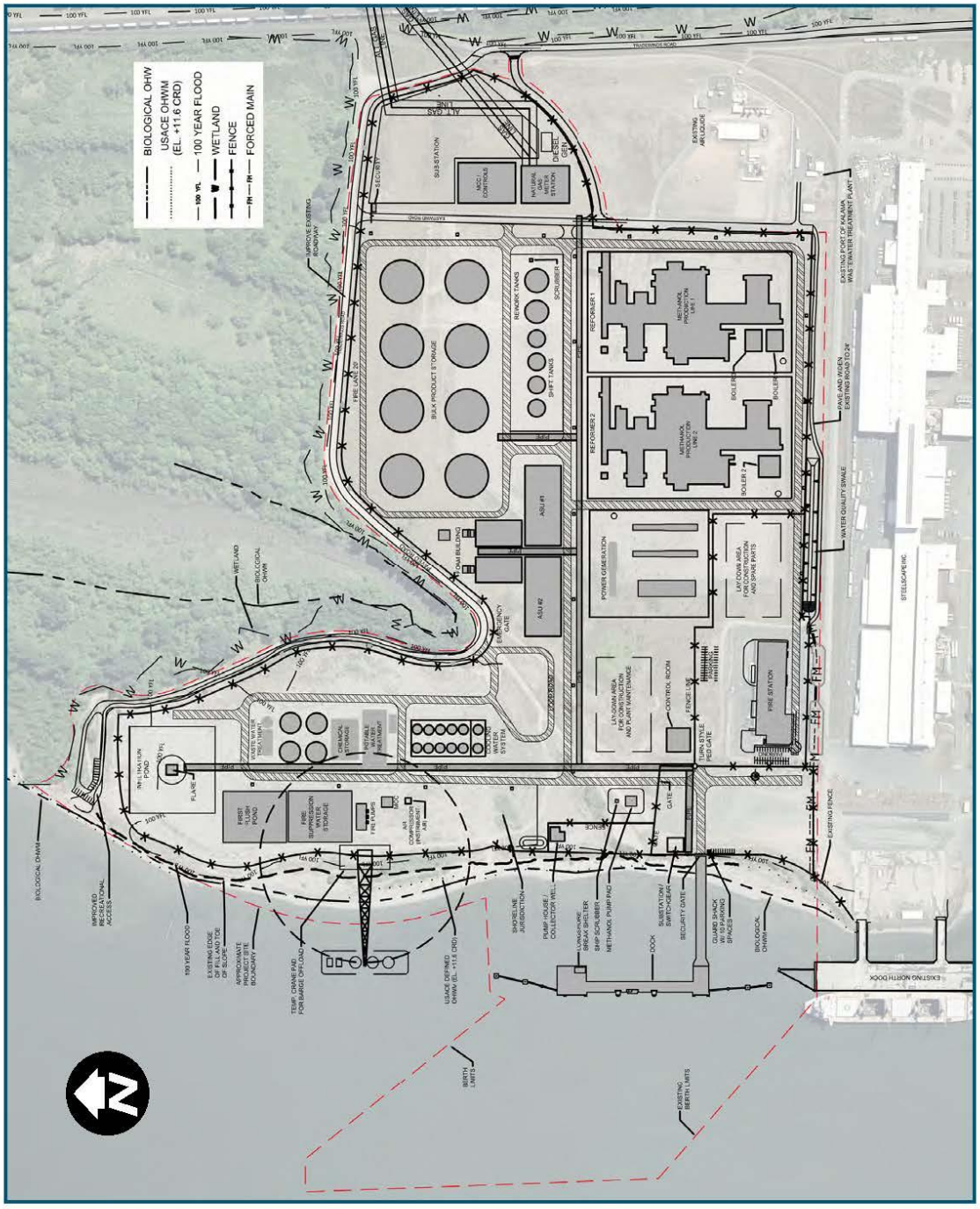
Methanol Production Lines

With the CR Alternative, the primary reformer (an SMR) would be similar in height to the GHR used in the ULE Alternative, but it would have a larger footprint and would have the appearance of complex piping under a high roof. The production lines would occupy approximately 18 acres of the project site with the CR Alternative. **Figure 2-7** shows an elevation of a methanol production line under the CR Alternative.



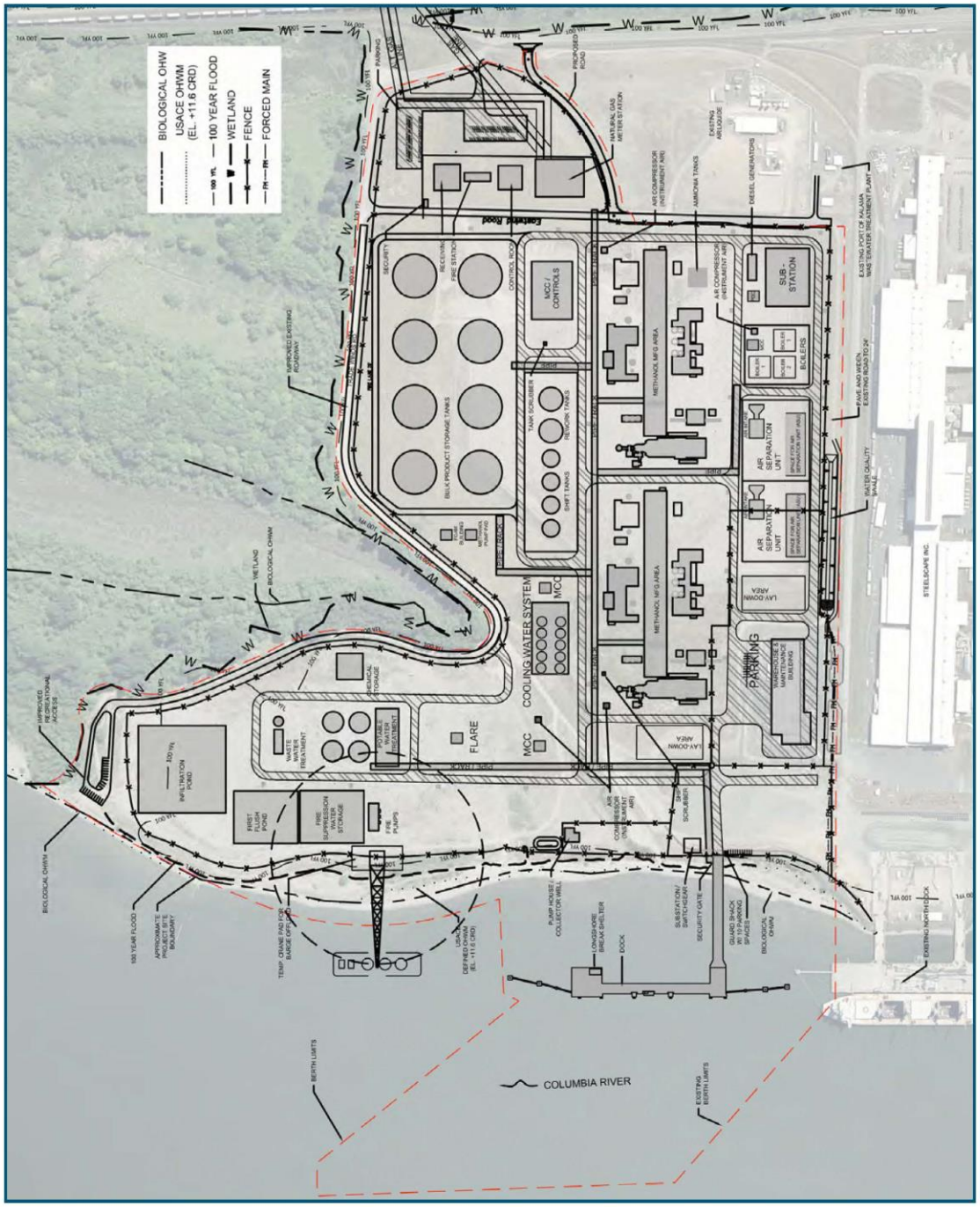
Methanol Production Process - Technology Alternatives
Figure 2-4

KALAMA SEPA
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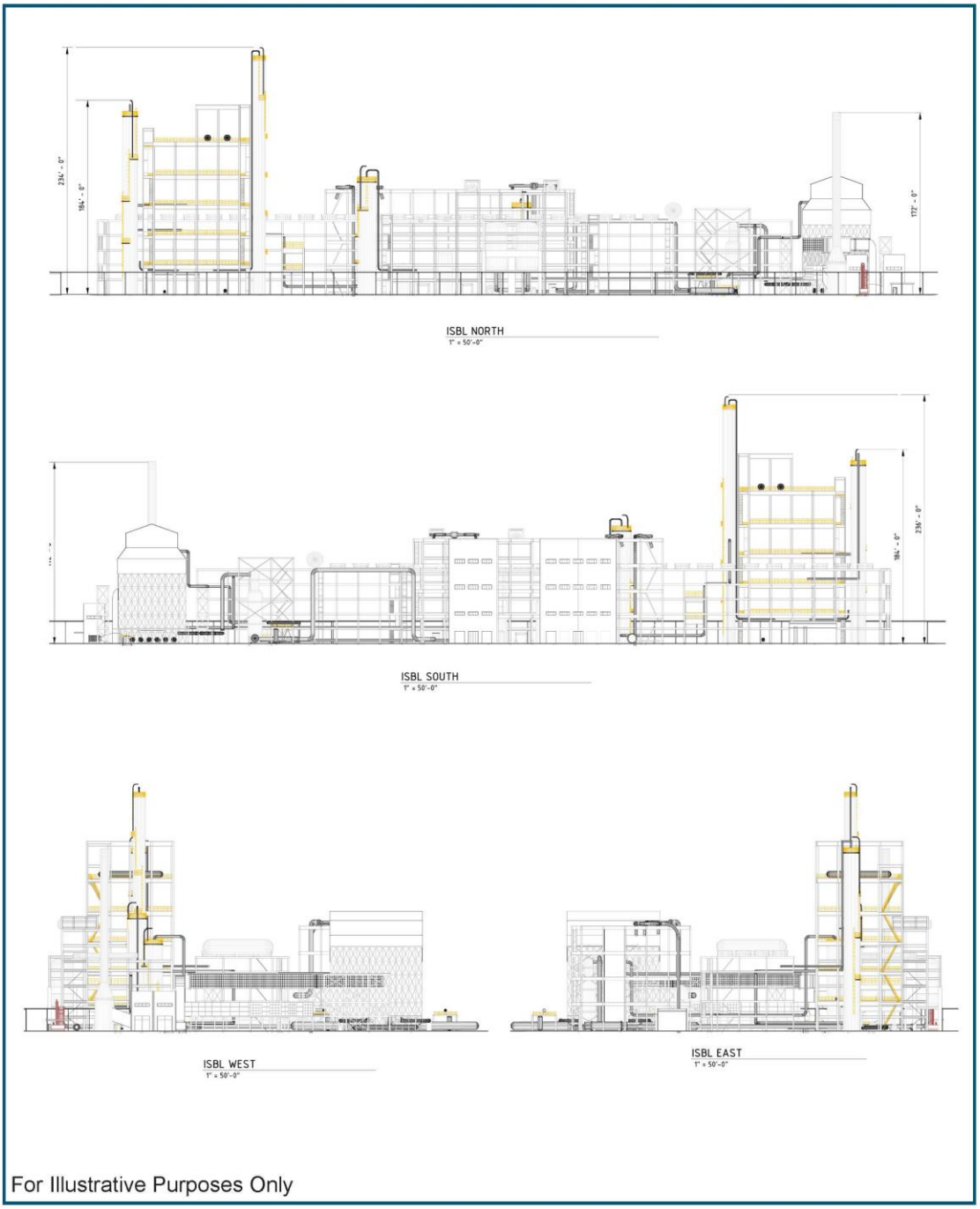
ULE Alternative Site Plan
Figure 2-5

KALAMA SEPA
Manufacturing & Marine Export Facility



Combined Reformer Alternative Site Plan
Figure 2-6

KALAMA SEPA
Manufacturing & Marine Export Facility



CR Alternative - Methanol Production Line Elevation
Figure 2-7

KALAMA SEPA
Manufacturing & Marine Export Facility

2.6.1.3 Components Unique to the ULE Alternative

Power Generation Facility

The ULE Alternative would meet its electric power demands using a combination of grid electric power and on-site power generation. As discussed below, it is expected that new power lines would be run on existing poles to the project site and a new substation would be constructed within the project site. The ULE Alternative would have greater demand for electric power than the CR Alternative (200 megawatts compared to 30 megawatts), so the proposed project with the ULE Alternative would need to supplement the grid electric power.

The ULE Alternative would supplement grid electric power with an on-site 125-megawatt power generation facility. The power generation facility would consist of two natural gas-fired combustion turbines and one steam turbine. Natural gas mixed with air would combust in the gas turbine to generate electricity, and the exhaust gas from each combustion turbine would be used to generate high pressure steam to produce power through a steam turbine. The exhaust stacks would be the tallest element of the power generation facility and would be approximately 90 feet tall. If in the future, Cowlitz County PUD constructs transmission capacity adequate to supply all of the power needs for the ULE Alternative, the on-site power generation facility may not be necessary.

Waste heat from the power generation facility would be managed through cooling towers. Under the ULE Alternative, one cooling tower with two cells would be installed for the power generation facility. This tower would be located adjacent to the cooling towers installed for the methanol production process as discussed below.

Methanol Production Lines

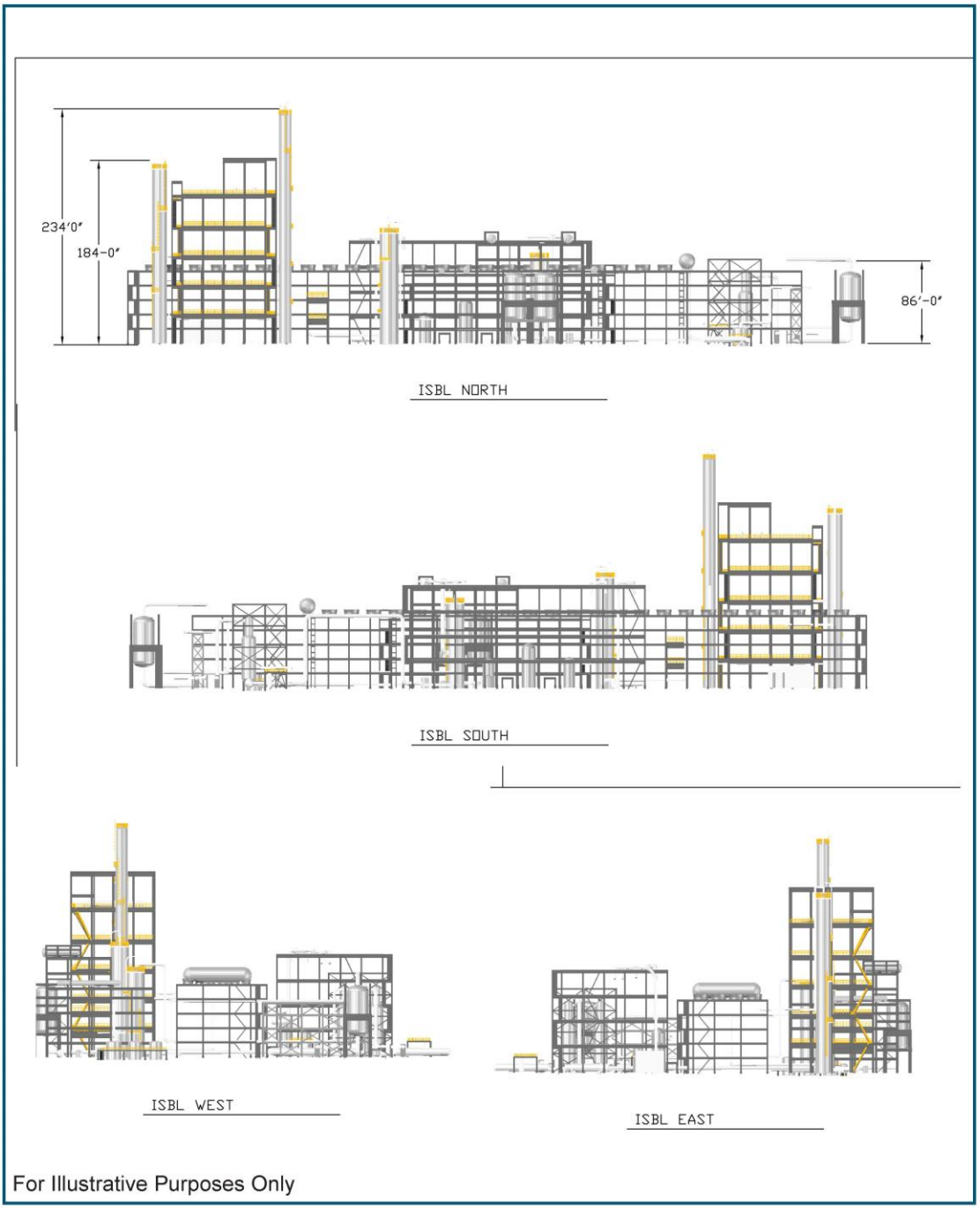
The proposed project with either of the Technology Alternatives would include two methanol production lines. The size, layout, and appearance of the methanol production lines would vary slightly for the CR Alternative and the ULE Alternative. The GHR used in the ULE Alternative would be of similar height to the SMR, but has a smaller footprint and would look like a large vessel or tank. The production lines would occupy approximately 14 acres of the project site with the ULE Alternative. **Figure 2-8** shows an elevation of a methanol production line under the ULE Alternative.

2.6.1.4 Components Common to both Technology Alternatives

The proposed project, with either of the Technology Alternatives, would result in the development of a methanol manufacturing facility that would produce up to 10,000 tonnes[2] of methanol per day when operating at full capacity. The anticipated yearly production at full capacity with both production lines would be approximately 3.6 million tonnes. The methanol would be stored on site for transfer to shipping vessels at the marine terminal.

With either Technology Alternatives, the proposed methanol manufacturing facility would consist of the following major components.

[2] One tonne (approximately 2,204 pounds) is equivalent to approximately 333 U.S. gallons.



ULE Alternative - Methanol Production Line Elevation
Figure 2-8

KALAMA SEPA
Manufacturing & Marine Export Facility

- Methanol production components:
  - Two methanol production lines
  - Interconnecting facilities, including piping, product pipelines, electrical, and control systems
  - Eight finished-product storage tanks within a containment area and additional tanks (rework tanks and shift tanks) for storing raw methanol during the manufacturing process
  - Cooling towers for industrial process water cooling
  - Steam boilers
  - Two air separation units (ASUs) to provide oxygen for the secondary reforming (autothermal reforming) process
  - Flare system for the disposal of flammable gases during startup, shutdown, and malfunctions
- Fire suppression infrastructure and risk management system
- Water supply and treatment components:
  - Process water supply wells, treatment system, storage tanks, and distribution network
  - Industrial process water treatment and disposal system
  - Stormwater treatment, infiltration pond, and disposal system
- Support buildings and accessory facilities:
  - Security gate houses, laboratory, control rooms, warehouses, and other buildings and enclosures
  - Laydown areas for construction activities, plant maintenance, and spare part storage
  - Electrical substation
  - Natural gas meter station and transfer equipment
  - Emergency generators
- Site access ways and public recreation access

Methanol Production Components

Methanol Production Lines

The proposed project with either of the Technology Alternatives would include two methanol production lines. A methanol production line is a series of equipment that handles each step of the methanol production process. Each methanol production line would produce 5,000 tonnes per day of AA-grade methanol from natural gas feedstock. These production lines would consist of reforming, methanol synthesis and distillation elements. The size, layout, and appearance of the methanol production lines, particularly the reformer, would vary slightly for the CR Alternative and the ULE Alternative; those differences are discussed above. Both alternatives would include similar distillation towers, which would be approximately 235 feet tall.

Air Separation Units

Two ASUs (one for each production line) would be constructed to produce oxygen for use in the reforming process and nitrogen for use in the plant process, and to inert equipment during repair and maintenance activities (e.g., to provide inert nitrogen gas for the product storage tanks). The ASUs would use a low-temperature process to separate various gases from the air. Air from the atmosphere would be drawn into the plant, purified, and then separated into its various elements. The ASUs would occupy approximately 225,000 square feet each and would consist of an air intake and filter, compressors, washing towers, sieves, distillation element, and tanks. The ASUs would be approximately 60 feet tall.

Methanol Storage Tanks

Storage tanks would be required for methanol storage during various steps in the production process. All storage tanks would be erected in the field. Both of the Technology Alternatives would require two rework tanks, four shift tanks, and eight bulk product storage tanks. The rework tanks would hold raw methanol during the production process and would be approximately 82 feet in diameter and 58 feet in height holding up to 2,275,000 gallons. Shift tanks would hold refined methanol for testing prior to discharge to the storage tanks. Shift tanks would be approximately 60 feet in diameter and 50 feet in height holding approximately 1,000,000 gallons. The tanks would have fixed external roofs with internal floating roofs.

After final production steps are completed, methanol would be pumped to one of eight bulk product storage tanks prior to be being loaded onto vessels. The bulk product storage tanks would be approximately 105 feet in height and 145 feet in diameter, with a maximum storage capacity of 9,400,000 gallons (approximately 26,000 tonnes). The total storage capacity on site would be 200,000 tonnes when accounting for operation limits on the tank capacity. The bulk product storage tanks would have an external fixed roof and internal floating roof and would be capped with inert nitrogen gas (a "nitrogen blanket") to keep the oxygen level in the individual tanks to a level below that required for combustion. A piping system would convey methanol from the bulk product storage tanks to the loading arms at the proposed marine terminal.

The bulk product storage tanks would be encompassed by a containment berm or wall approximately 7 feet in height. The containment area would be designed with a capacity at least equal to 110 percent of the volume of the largest tank plus precipitation from a 24-hour, 100-year storm event, and would be lined with an impervious membrane to prevent any spills from leaving the containment area via the ground. Stormwater (and/or spills) collected in the containment area would gravity-drain to the berm area sump. The water would be tested and directed to the stormwater system if found to meet stormwater discharge criteria. The sump water would be disposed off site at an appropriate commercial disposal facility in the event of a spill, or if found to exceed the stormwater discharge criteria.

Flare System

A flare system would be used for safe disposal of combustible gases during process upset[3] or an emergency shutdown situation, and during the normal start-up and shutdown of the production process with either of the Technology Alternatives. The flare would be approximately 245 feet in height. The flare would be enclosed and a visible flame would not be present except during the events described above.

[3] Process upset is an unplanned outage of the manufacturing process caused by an operational disruption or failure in the course of its performance.

Cooling Towers

Waste heat from the methanol production process would be managed through cooling towers. The cooling towers would also provide cooling water to various heat exchangers used in the methanol production process. Two cooling towers consisting of five cells each would be installed for the methanol manufacturing facility (one for each production line).

The cooling towers would have mechanical draft (fans located on the air outlet of the cooling towers) and countercurrent flow (in which air enters at the bottom and exits at the top, and warm cooling water enters at the top and exits at the bottom). The cooling towers for the methanol manufacturing facility would be approximately 290 feet long, 110 feet wide, and 40 feet tall.

Steam Boilers

The proposed methanol manufacturing facility would include steam boilers fired by natural gas from the pipeline and purged gas from the methanol synthesis unit. The boilers would produce steam for use in the methanol production process.

Fire Suppression Infrastructure and Risk Management System

The proposed project's operations and risk management system would meet or exceed local, state, and federal codes and regulations in order to minimize the risk of fire, leak, personal injury, or other health and safety impacts. The project proponent would develop a written emergency response plan, which would be reviewed and approved by local and state agencies before operations begin. The proposed project would include full emergency response capabilities to respond to all incidents within the methanol manufacturing facility or on the proposed marine terminal.

The project proponent would develop close relationships with Cowlitz County Fire District No. 5 and would conduct regular emergency response drills at the project site with them and the Port. The project proponent has consulted with Cowlitz County Fire District No. 5, and the fire district has agreed that the emergency response staff at the methanol manufacturing facility would manage the response to an incident at the facility with the fire district providing support. Emergency response training and certification for the proposed project's staff would be in compliance with Occupational Safety and Health Administration, Process Safety Management, and the National Fire Protection Association (NFPA) requirements.

The proposed project will include a fire station to house the on-site fire brigade to respond to emergencies at the facility, as well as an emergency response vehicle. The on-site fire brigade is made up of staff trained in proper firefighting procedures. The proposed project will also include an emergency alarm system with alarm boxes located throughout the facility.

In addition to the on-site fire brigade, the proposed project will include a comprehensive fire suppression system with the following features:

- **Fixed Foam System (foam used for fire suppression).** Foam is used to cool the fire and to coat the fuel, preventing its contact with oxygen and resulting in suppression of the combustion. The fixed foam system will include a foam storage tank, located outside the methanol storage tank containment dike, with an estimated 3,300 gallons of foam stored.
- **Portable Foam Generators.** A portable foam generator will be stored inside the fire station and have the capacity to discharge 60 gallons per minute of foam. Sufficient foam

concentrate will be kept on hand to operate the foam generator for 60 minutes (3,600 gallons). Forty-five 5-gallon buckets of foam (225 gallons) will also be housed in the fire station.

- **Fire Water System.** The proposed project's fire water supply will be stored in the fire water pond located at the northwest end of the plant, with an estimated capacity of 5 million gallons. The proposed project will be designed to have 100 percent coverage of fire water, with fire hydrants and monitors throughout the facility.
- **Deluge System.** Deluge systems are piping configurations with open spray nozzles designed for self-draining of the piping network to ensure the piping remains dry when not flowing water. The deluge system will serve two purposes during a fire. First, it would reduce the temperature in the fire area, potentially below the ignition temperature required for the burning material. Second, the deluge system would keep vessels and structure supports water sprayed. By keeping a structure cool, its strength would be maintained to prevent collapse during a fire situation. By keeping vessels cool, it would prevent possible metal fatigue and overpressure when exposed to flame.
- **Fire Extinguishers.** Hand-held portable extinguishers will be located throughout the facility in accordance with NFPA 10 and 29 CFR 1915.507.

Site Access

The proposed project, under either Technology Alternatives, would develop and improve roadways around the project site to provide access to the proposed methanol manufacturing facility, improve recreational access for the public, and provide emergency access to the site. Access to the proposed methanol manufacturing facility would be provided from Tradewinds Road in the northeast portion of the project site. Emergency access to the facility would be provided at three locations along the site perimeter.

The proposed project would include three primary road improvements: (1) improving Tradewinds Road along the north side of the project site; (2) creating a new roadway connecting Eastwind Road to Tradewinds Road; and (3) improving an existing gravel roadway along the south side of the project site.

The proposed project would improve recreational access to the Columbia River and the areas north of the project site by improving Tradewinds Road and creating a new parking area near the Columbia River. Access to this parking area would be provided by Tradewinds Road along the north boundary of the project site. Tradewinds Road would be improved by the Port by extending the paving 3,400 feet from the current intersection with Eastwind Road. The improved road would be 24 feet wide and consist of two 12-foot travel lanes and be approximately 3,400 feet long.

Tradewinds Road connects with Kalama River Road, which is a County-owned roadway with a 35-mile-per-hour (mph) speed limit. It crosses over the BNSF rail corridor and connects to I-5 approximately a quarter-mile east of the project site. I-5 is Washington's main north-south highway and extends from Canada to Mexico. At this location, I-5 consists of three travel lanes in each direction with a posted speed limit of 70 mph.

Eastwind Road is located within the footprint of the proposed project and that portion of the road would be abandoned. The Port would construct a connection from Eastwind Road to Tradewinds Road south of the proposed project to maintain access to the existing Air Liquide facility and the Port's wastewater treatment plant. The new road would be approximately 720 feet long and 24 feet wide with two 12-foot travel lanes.

Access along the southern boundary of the project site would be provided by a westbound extension of Eastwind Road. This road would extend from the existing southern terminus of Eastwind Road west to the existing warehouse (to be converted to the proposed project's fire station) by improving an existing gravel road. The road would be approximately 1,400 feet long and 24 feet wide with two 12-foot travel lanes.

All three new and/or improved roadways would be designed consistent with the Cowlitz County Rural Low Volume Access standard. Construction of the roadways would require subgrade excavation and surface compaction, base and top course placement and compaction, and asphalt surfacing. The improvements to Tradewinds Road and the connection from Eastwind Road to Tradewinds Road would also require cuts and fills. Stormwater on the roadways improved outside of the project site boundary would flow to roadside ditches and shallow containment to infiltrate. Stormwater generated from the roads within the project would be directed to the proposed project's stormwater system.

Figure 2-9 illustrates the site access and roadway improvements with the proposed project. Public transit does not serve the project site.

Recreational Access

The Port currently allows informal recreation access to portions of the North Port site that are not fenced for security purposes. Recreation use is focused on the sandy beach along the Columbia River and informal trail systems located north of the project site. The Port intends to allow continued access to these areas, consistent with project and federal security requirements, and would develop a formal parking area at the end of Tradewinds Road at the Columbia River as part of the proposed project. The area would provide parking for approximately 21 vehicles and allow recreational users to park and access the beach, river, and trails.

Support Buildings and Accessory Facilities

The proposed methanol manufacturing facility with either Technology Alternatives would include several support buildings and accessory facilities. These buildings and facilities would include a control building and laboratory, motor control center units, security gate house, electrical substation, a natural gas meter station and transfer equipment, and an emergency diesel generator. The project proponent would have office space off site in the Port or elsewhere for administrative offices associated with the proposed methanol manufacturing facility.

The control building and motor control center units would house control centers for facility operations. The laboratory would be used to test the finished methanol product for purity. The control center and laboratory would be housed together in a building that would be approximately 6,400 square feet and 15 feet tall. The motor control center units control building would be approximately 14,000 square feet and up to 40 feet tall.

A small security gate house would be located at the entrance to the proposed methanol manufacturing facility. Warehouse and maintenance buildings would be constructed to house maintenance equipment and vehicles.

A natural gas meter station and transfer equipment would be constructed to receive natural gas from the pipeline and stabilize the flow rate and pressure of the gas. The proposed methanol manufacturing facility would also include a diesel-fired emergency generator for use during power outages.



Proposed Site Access & Roadway Improvements
Figure 2-9

KALAMA SEPA
Manufacturing & Marine Export Facility

A new electrical substation would be constructed by Cowlitz PUD within the project site along with electric service lines to the various buildings and project elements. Service lines would generally be located on cable trays and raceways within the proposed project.

Water Supply and Treatment

Process and Domestic Water Supply and Treatment

The proposed project with either Technology Alternatives would require water for process uses and domestic uses (e.g., drinking, sanitation, showers, etc.). Process water would be provided by a collector well (Ranney well) to be constructed by the Port near the Columbia River shoreline. The well would be constructed under Groundwater Permit No. G2-30283 issued by Ecology. The groundwater permit allows the use of up to 10,640 acre-feet and 6,600 gallons per minute of water for various uses, including industrial activities.[4] It is estimated that the proposed project would use approximately 3,610 gallons per minute for a total of approximately 5.2 million gallons per day of process water.

The process water supply system would consist of a 22-foot collector well approximately 100 feet deep and a 2,200-square-foot pump station facility. The pump station would be equipped with three 4.5-million-gallon-per-day pumps to provide a capacity of 9 million gallons per day (one pump would remain in standby). The pump station would be concrete masonry or similar type of construction on a mat foundation. A redundant process water supply would be provided by three backup wells operated by the Port.

The pump station would convey raw water to the water treatment supply tanks via pipeline. The pipeline would be provided with a blow-off valve for flushing that would be discharged to an infiltration basin near the point of discharge. The infiltration basin could also be used to manage overflow and drain the water supply tank. Stormwater from the pump station facility would be captured and routed to an infiltration basin immediately north of the new pump station. This infiltration basin would also receive blow off from the pump station during pump start-up as required.

Raw water delivered to the methanol manufacturing facility would be treated prior to use in methanol production. The initial stage of raw water treatment would be precipitation softening using a cold-lime softener (CLS). Precipitation softening processes are used to reduce raw water hardness, alkalinity, silica, and other constituents, including iron and manganese. Water from the CLS would be used for cooling tower make-up water and a portion would be routed to a combined reverse osmosis and electrodeionization (RO-EDI) system.

The RO-EDI system would produce high-purity feed water necessary for the auxiliary boilers, power generation plant, and methanol production process. The reverse osmosis portion of the treatment would allow flow through a semi-permeable membrane producing a dilute solution and a concentrated solution. The flow would be reversed forcing water through the membrane producing filtered water and a concentrated brine. The RO membranes typically remove 95 percent of dissolved salts and all suspended particulates. Waste material from the RO membranes would be nontoxic and would be disposed of in accordance with local, state, and federal regulations. The high-quality filtered water would then be polished using the EDI system. The EDI system would use ion exchange membranes, ion exchange resin, and direct current electricity to produce ultrapure water.

[4] An acre-foot contains approximately 325,851 gallons of water.

Potable water for domestic uses (e.g., drinking water, sanitation, showers, and other general uses) would be supplied from a connection to the City of Kalama water system. Alternatively, the proposed project may receive potable water from the Port's water supply system rather than the City of Kalama. Water treatment would be provided on site if potable water is supplied by the Port.

Wastewater Treatment and Disposal

Sources of wastewater from the proposed project would include domestic sewage wastewater and process wastewater. Domestic wastewater would be generated from the restrooms. Process wastewater would be concentrated and discharged only from the cooling towers. Other waste streams on site would be treated and reused on site or discharged to the cooling tower for make-up water.[5] The proposed project, with either Technology Alternatives, would require an individual industrial NPDES permit. The NPDES permit application and engineering report are provided in **Appendix A**.

Domestic wastewater from the proposed project would be discharged to the existing Port wastewater treatment plant. The treatment plant discharges through a common outfall shared with the Steelscape facility to the Columbia River.

Process wastewater would be generated from various industrial units on the site. The primary discharges of wastewater on the site would be related to cooling and condensate loads. Additional discharges would be generated from the brine/waste stream of the RO-EDI unit and the methanol production process. All wastewater streams would be reused on site prior to discharge. The only direct discharge location from the proposed methanol manufacturing facility would be from the blowdown[6] of the cooling towers. The cooling towers would discharge wastewater to the firewater pond for temporary storage and to maintain sufficient fire water. Discharges from the firewater pond would be treated for temperature through a heat exchanger to a maximum discharge temperature of 68 degrees Fahrenheit (20 degrees Celsius) prior to discharge to the outfall.

The methanol production process would produce a process wastewater stream of approximately 35 gallons per minute that would be recycled and reused on site. This process wastewater stream would be treated with a membrane bioreactor (MBR). The MBR would be an aerobic biological treatment with ultrafiltration. The process would use an ultrafiltration membrane downstream of an aeration basin. An aerobic biological treatment system was selected specifically to treat any trace amounts of methanol in the waste stream, organics, and suspended solids. Discharges from the MBR would be directed to the RO-EDI system for reuse on site.

Wastewater generated by auxiliary boilers and/or the on-site power generation (in the case of the ULE Alternative) would consist of condensate that would be discharged to the RO-EDI system and/or the cooling towers for reuse. The cooling towers would reuse the water for a specified number of cycles prior to discharge of the blowdown. Blowdown from the cooling

[5] Make-up water refers to the additional water supply that is necessary to compensate for water lost as evaporation, condensate, or other causes during the cooling process.

[6] Blowdown refers to the loss of water due to high concentrations of dissolved solids (such as calcium, magnesium, chloride, and silica). When water evaporates, the dissolved solids are left behind and over time the concentration of dissolved solids increases, which can result in scale and corrosion affecting the process. To maintain the correct concentration, water with high-dissolved solids is removed from the system and replaced with water from the supply system.

towers is anticipated to be less than 400 gallons per day and would be discharged directly to the fire pond.

Stormwater Treatment

With either of the Technology Alternatives, stormwater from the proposed methanol manufacturing facility would be segregated into two streams depending upon the anticipated pollutant loadings. These two streams would be (1) potentially contaminated stormwater and (2) non-contaminated stormwater. Non-contaminated stormwater would be from areas of the project site that are physically separated from the methanol production line areas from on-site paved areas (i.e., access roads, parking lots, and building rooftops) and would be directed to infiltration facilities for discharge into the ground. Potentially contaminated stormwater would be from the methanol production line areas of the facility, as well as the methanol storage tank areas. Stormwater from these areas may contain pollutants and, therefore, would be directed to a first flush pond for treatment. The first flush pond would discharge treated stormwater to the infiltration facility.

Stormwater from the first flush pond may be reused on site as raw water for methanol production. Stormwater from the first flush pond would be treated through a coalescing plate oil-water separator and a granulated activated carbon filter prior to discharge into the CLS for reuse. The ponds and infiltration facility would be sized to manage stormwater on site consistent with Cowlitz County and state standards. The ponds would be sized to infiltrate the 100-year, 24-hour rainfall event.

Detailed spill prevention, control, and countermeasures, including isolation valves and monitoring requirements, would be implemented across the site in accordance with 40 CFR 112.

Stormwater generated from site access roadways outside of the methanol manufacturing facility would be directed to roadside ditches and shallow containment to infiltrate.

Ground Improvements

The proposed project with either Technology Alternatives would incorporate seismic design criteria in accordance with applicable building codes and standards to account and compensate for anticipated earthquake effects. At this point in the design process, a range of design measures are being considered that would address the seismic hazards of the project site and meet the code performance requirements. These measures may include a ground improvement program that could be implemented to improve the existing subsurface soils and reduce the risk of ground movement during an earthquake. Ground improvement measures may include vibro-replacement (stone columns), soil mixing and jet grouting, and/or driven piles. Ongoing design and analysis would determine the final configuration and specific locations of the ground improvements to be installed, and the improvement techniques may be refined as the design progresses.

Employment

With either of the Technology Alternatives, the proposed methanol manufacturing facility would employ approximately 192 full-time employees, including administrative and management, production, maintenance, logistics, and technical staff. Workers would also be needed to work on the dock with vessel and export operations. The labor necessary for these tasks would vary based on vessel size and type.

2.6.1.5 Methanol Manufacturing Facility Construction Overview

The proposed project would be developed in one or two phases. The construction duration would be approximately 26 to 48 months depending on whether it is built in one or two phases. Construction is expected to begin in late 2016 and be completed as early as mid-2018 and as late as mid-2020.

The analyses of construction in this EIS assume that the proposed project would be constructed in one phase lasting approximately 26 months. This represents a reasonable worst-case assumption for analysis purposes because it would result in the most intense construction activity with the greatest amount of daily worker and truck traffic.

Construction of the proposed manufacturing facility and marine terminal would introduce construction workers and truck trips to the project site. **Table 2-1** shows the average number of daily construction workers based on a 26-month construction duration. As shown in **Table 2-1**, the number of workers would vary throughout the construction period depending on the activities being undertaken. The average number of workers would be about 550 per day throughout the construction period. During the peak construction activities, there would be an average of approximately 1,032 workers per day. This schedule includes workers associated with the marine terminal construction activities.

Table 2-1. Average Number of Daily Construction Workers by Month

Month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Workers	87	152	192	287	277	377	427	627	727	827	827	1,027	1,032	1,032
Month	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**Avg**	**Peak**
Workers	915	818	818	718	678	622	472	377	402	200	150	100	**545**	**1,032**

Note: This schedule conservatively assumes that in-water construction activities associated with the marine terminal would overlap with peak construction activities for the proposed methanol manufacturing facility.

Temporary support facilities would be installed on the project site as needed during construction. These facilities would include construction trailers for office space, food and catering facilities, a first aid station, portable restrooms, laydown areas, and site security.

It is expected that construction employees would park off site at nearby locations and would be bused to the project site. Three locations have been identified for potential parking lots for construction workers. These areas are lots adjacent to the existing Air Liquide facility, adjacent to the Steelscape facility, and at 2301 Hendrickson Drive (**Figure 2-10**). All three are west of I-5. During the peak construction period (three to four months), up to approximately 1,000 workers would park in the lot(s) and continue to the project site via shuttle buses.

It is expected that some components of the proposed project (e.g., boilers, ASUs, water treatment, substation, and motor control centers) would be assembled off site and transported to the project site via barge. These modules may be offloaded from the existing North Port dock, across temporary falsework for the new dock trestle, or alternatively, may be offloaded directly from the barges using a temporary crane. A temporary concrete crane pad would be constructed on an upland portion of the site for offloading materials/equipment from barges.



Potential Temporary Construction Parking Areas
Figure 2-10

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Modules would be delivered to the site in self-anchoring barges, which would anchor offshore using spuds or similar temporary anchors. Barges would not be allowed to ground out on the beach. Barges would typically only be anchored in place for approximately one to two days, as material is being unloaded. Once offloaded, the equipment/modules will be moved into place and erected on the site. The temporary concrete pad would be demolished and removed prior to project completion.

Construction of the proposed methanol manufacturing facility would commence with mobilization, site preparation, and civil works activities. Site preparation would consist of clearing and grubbing the site, grading, and setting up the temporary construction facilities discussed above. The majority of the project site would be located at approximately Elevation 23 feet Columbia River Datum (CRD). The northwest portion of the project site may be elevated by as much as 10 feet higher than the rest of the site (i.e., to 33 feet CRD) using existing dredged materials on site or new material generated during dredging for the proposed project. Civil works would follow site preparation and would involve installation of ground improvements and utilities. Utility work at project outset would include firewater, drain lines, the underground duct bank, and other underground utilities. These utilities would be prioritized along with the other civil work. Following completion of the utility work, site paving would begin.

Construction of the methanol production lines would be modularized to the maximum extent practicable, with as much of the construction activity occurring off site as feasible. It is expected that certain components (e.g., boilers, ASUs, water treatment, substation, and motor control centers) would be assembled off site and transported to the project site via the Columbia River as discussed above. Certain components, such as the cooling towers, bulk product storage tanks, and support buildings, may be constructed on the project site. The flare would be ordered as a package and erected on site by a mechanical contractor.

2.6.2 Marine Terminal Alternatives

The Marine Terminal Alternatives analyzed in this EIS include Marine Terminal Alternative 1, in which the proposed marine terminal would be separate from the existing North Port dock, and Marine Terminal Alternative 2, in which the existing North Port dock would be extended.

With either Marine Terminal Alternative, the proposed marine terminal would be located on the western portion of the project site at approximately RM 72 and would consist of a dock and a single berth to accommodate the oceangoing vessels that would transport methanol to destination ports. The marine terminal under both Marine Terminal Alternatives would include a dock, a berth, loading equipment, utilities, and a stormwater system. These components are designed to support the necessary product transfer equipment and safely moor the vessels that may call on the proposed project. The berth would be designed to accommodate other vessel types and, when not in use for loading methanol, for other cargo operations, as a lay berth where vessels could moor while waiting to use other Port berths, and for topside vessel maintenance activities.

The primary difference between the two Marine Terminal Alternatives would be the design of the dock and trestles, and the resulting number of piles and area of overwater coverage.

2.6.2.1 Components Unique to Marine Terminal Alternative 1

Dock

The dock would generally be 530 feet long and 36 feet wide and would be designed to accommodate vessels ranging in size from 45,000 deadweight tonnage (DWT) to 127,000 DWT, and would include Handymax to Suezmax vessels measuring from 600 to 900 feet in length and 106 to 152 feet in width. The dock would consist of a transition platform, trestle, and turning platform. From the access trestle, the berth face of the dock would extend approximately 530 feet downstream, and would consist of an approximately 100- by 54-foot transition platform, a 370- by 36-foot berth trestle, and a 104- by 112-foot turning platform. **Figure 2-11** shows a plan view of Marine Terminal Alternative 1.

The dock would be supported by precast 24-inch octagonal concrete piles supporting cast-in-place concrete pile caps and precast, prestressed haunched concrete deck panels. The dock would total approximately 44,943 square feet and include 320 concrete piles and 16 steel pipe piles. The bottom of the superstructure (deck, pile caps, etc.) would be located above the ordinary high water mark (OHWM).

Two 15- by 15-foot breasting dolphins would be constructed near the center of the dock. Each breasting dolphin would consist of seven 24-inch precast, prestressed concrete battered piles supporting a cast-in-place concrete pile cap with mooring bollards.[7]

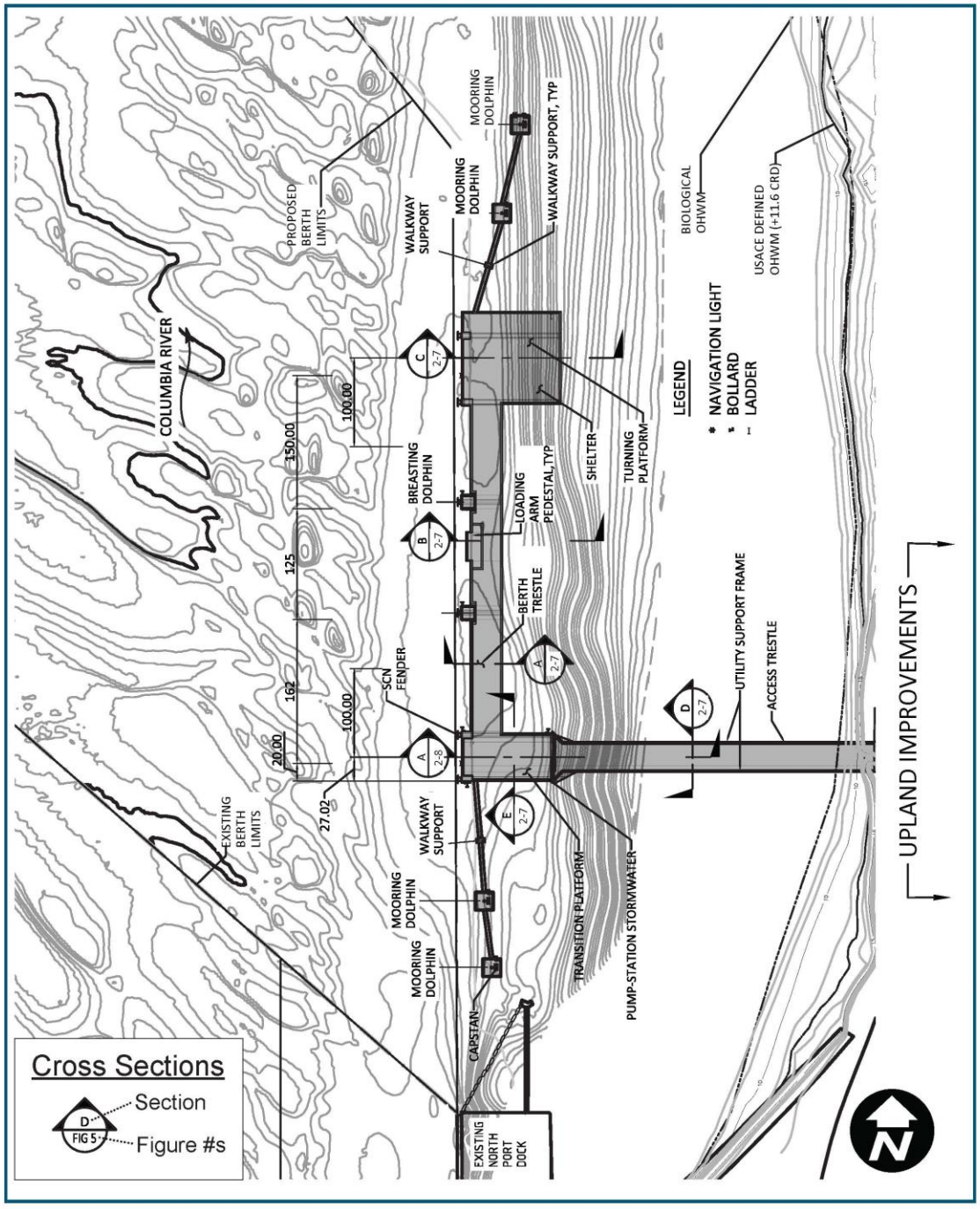
Four 15- by 15-foot concrete mooring dolphins would be constructed (two upstream and two downstream of the platforms) for securing vessel bow and/or stern lines. Each mooring dolphin would consist of twelve 24-inch-diameter, precast, 24-inch-octagonal-diameter concrete piles supporting a cast-in-place concrete pile cap. The dolphins would be equipped with mooring bollards and electric capstans. Access to the mooring dolphins would be provided from the platform by trussed walkways with open grating surfaces. The walkways would be 3 feet wide with a combined length of 375 feet supported by four 18-inch-diameter steel pipe piles.

To provide for safe mooring and to prevent damage to the dock and vessel during the berthing and loading process, six fender units would be provided. Each unit would consist of 9- by 9-foot ultra-high molecular weight polyethylene face panels with a super cone fender unit and two 12-inch-diameter steel pipe fender piles. Below the panels, the fender piles would have 18-inch-diameter high-density polyethylene sleeves. Fender units would be placed on the dock face, two upstream and two downstream, and on the two breasting dolphins.

A single access trestle 34 feet wide and approximately 365 feet long would be constructed to provide vehicle, equipment, and emergency access to the dock from the shoreline.

A small building would be constructed on a corner of the turning platform. The building would function as a shelter from the weather and a small lunch area for the dockworkers and as a place to store tools and supplies. Electricity and communication services would be provided to the shelter but no water or sewer services would be provided.

[7] The "battered" piles are installed at an angle to vertical as opposed to plumb piles, which are installed vertically.



Marine Terminal Alternative 1 Plan
Figure 2-11

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A second small building would be constructed at the center of the dock, adjacent to the loading arms. The building would be used as an operations shack for the loading arms. Electricity and communications services would be provided to the operations building; no water or sewer services would be provided.

Figures 2-12 and **2-13** show section views of the proposed dock and trestle.

2.6.2.2 Components Unique to Marine Terminal Alternative 2

Dock

The new dock under this alternative would have the same design as the North Port dock extension permitted by USACE and other permitting agencies in 2005. The marine terminal under this alternative, as with the proposed project, would be used for loading methanol onto oceangoing vessels and general use by the Port for other cargo operations, as a lay berth where vessels could moor while waiting to use other Port berths, and for cleaning holds and other vessel maintenance activities.

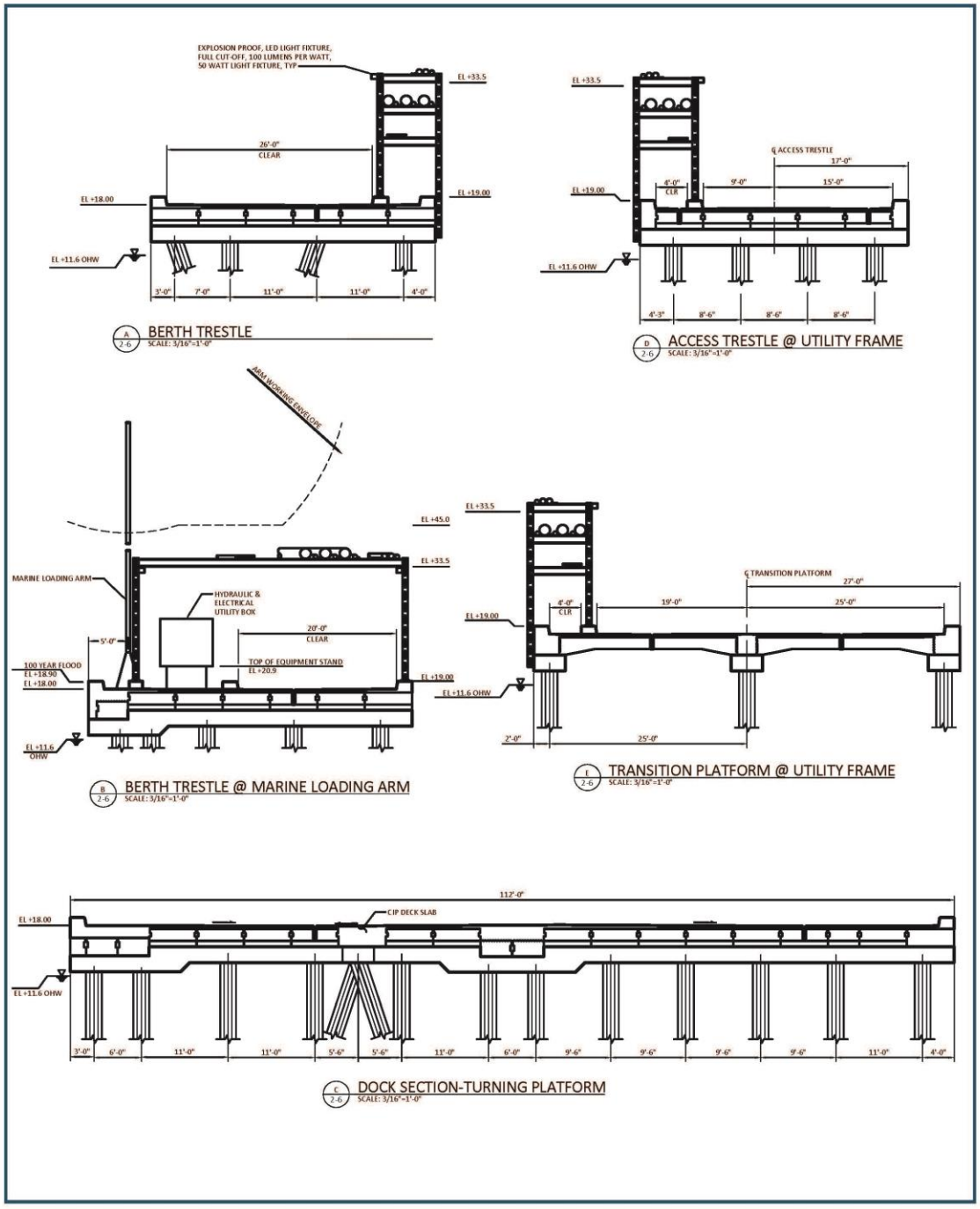
The proposed dock would be a 100-foot-wide by 1,000-foot-long pile-supported structure extending from the north end of the existing North Port dock and oriented parallel to the shoreline. The proposed dock would be supported by approximately 450 24-inch-diameter octagonal precast concrete piles. The shoreward face would be 335 feet from the OHWM at a water depth of -25 feet CRD, and the waterward face at 435 feet from the OHWM at a water depth of -40 feet CRD. The offshore face of the pier would be protected from berthing vessels by 40 24-inch-diameter concrete fender piles. The dock surface would be concrete on top of precast concrete deck panels similar to Marine Terminal Alternative 1. **Figure 2-14** shows a plan view of Marine Terminal Alternative 2.

The marine terminal under this alternative would be accessed by two 34-foot-wide access trestles supported by approximately 138 24-inch-diameter octagonal precast concrete piles. The trestles would be aligned perpendicular to shore and ground/mudline and the elevation varies from approximately +23 feet to -24 feet CRD on the north trestle and between +23 feet and -36 feet CRD on the south trestle. The trestles would be configured to eliminate abutments and shoreline armoring where they land on the riverbank. Instead, the abutments would be located upland, above the OHWM (CRD). **Figure 2-15** shows a section view of Marine Terminal Alternative 2.

One dolphin containing nine 24-inch-diameter steel piles would be relocated from the north end of the existing dock to the north end of the proposed dock at approximately -36 feet CRD. The dolphin would be installed approximately 195 feet north of the trestle and would be connected to the dock by a 190-foot-long by 2.5-foot-wide catwalk. The catwalk would be supported by four 16-inch-diameter steel piles, two of which would be relocated from the existing North Port dock to the proposed dock.

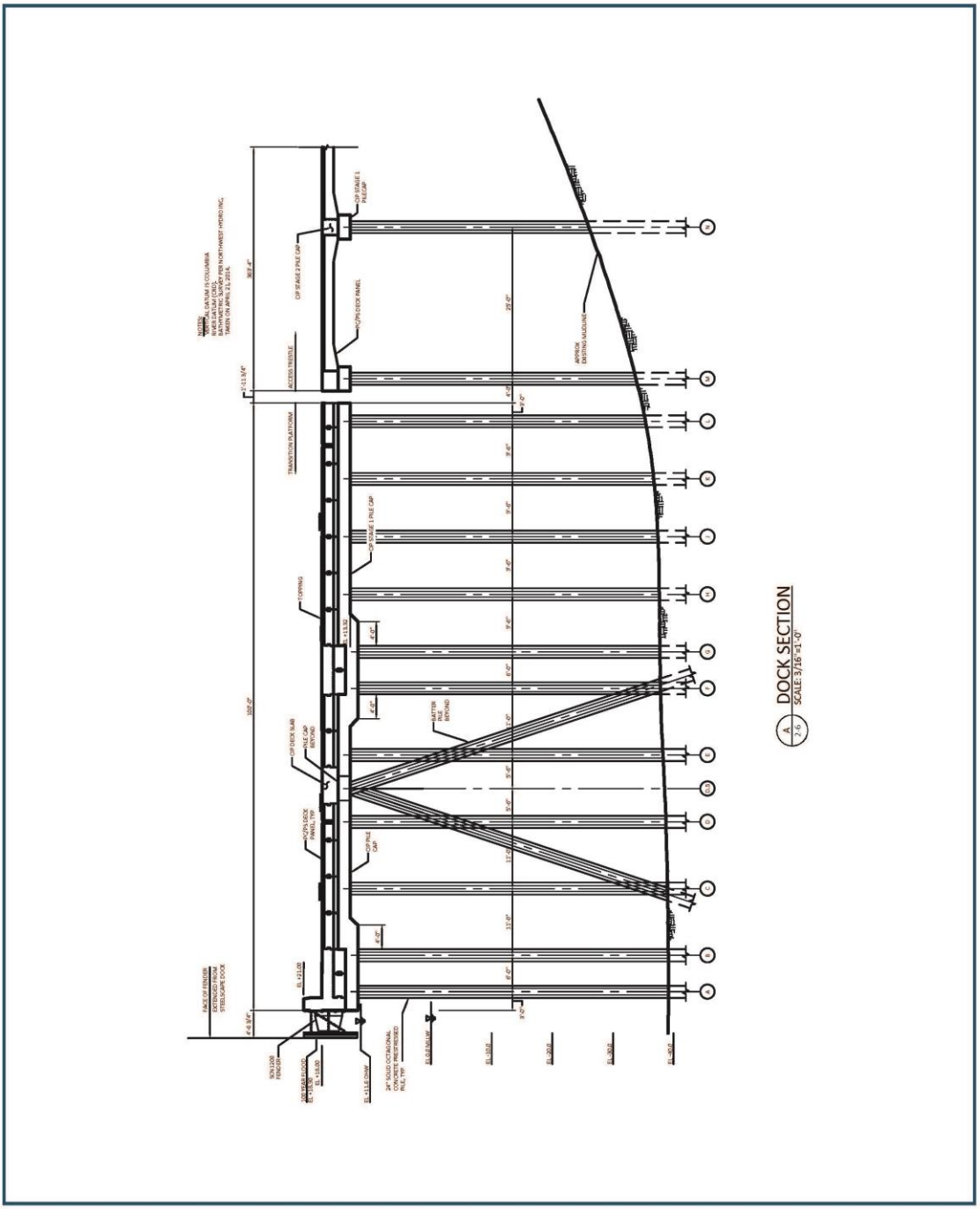
2.6.2.3 Components Common to both Marine Terminal Alternatives

Marine Terminal Alternatives 1 and 2 would require similar dredging, stormwater treatment, utilities, and methanol loading equipment. They would also serve similar marine vessels.



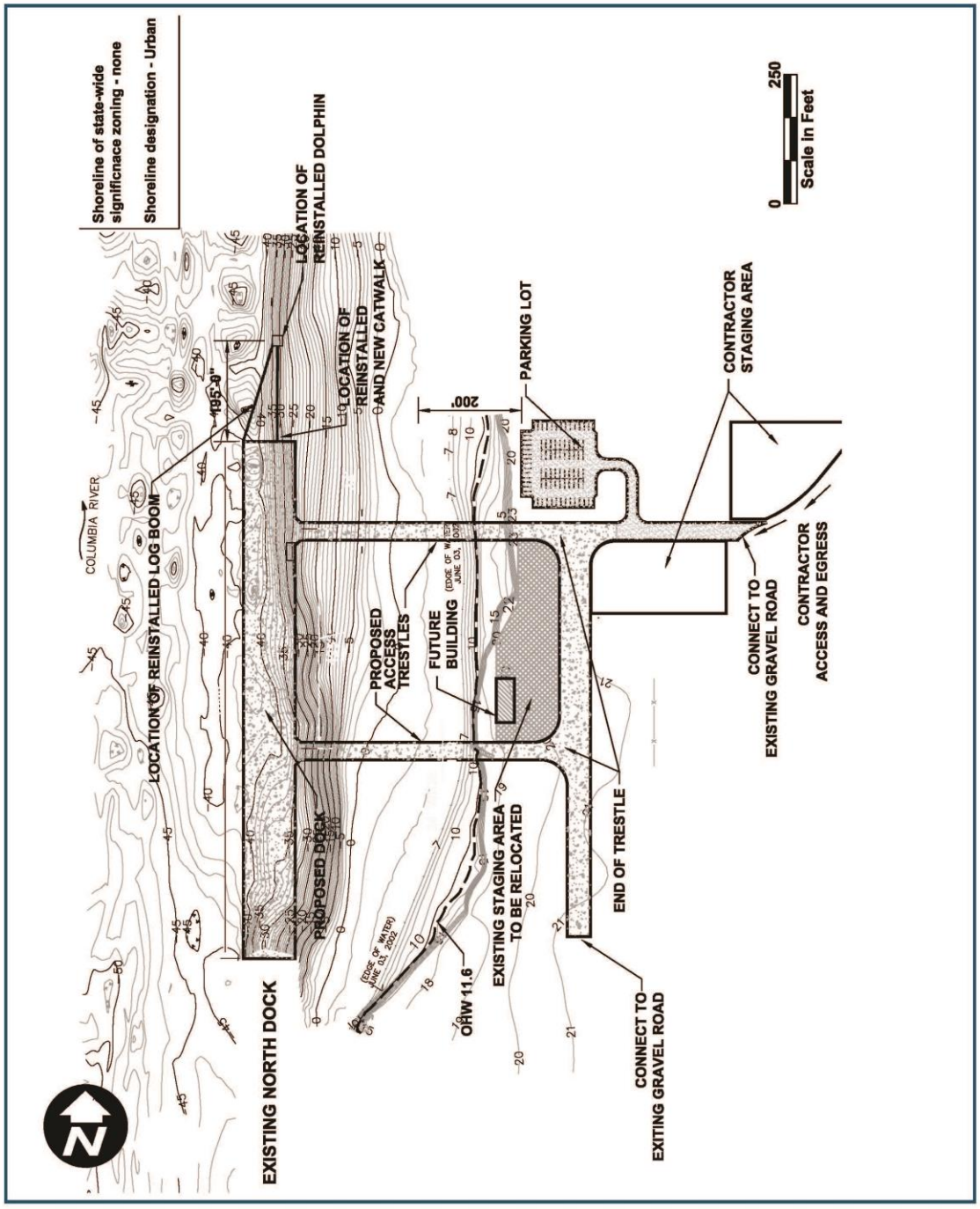
Marine Terminal Alternative 1 Section
Figure 2-12

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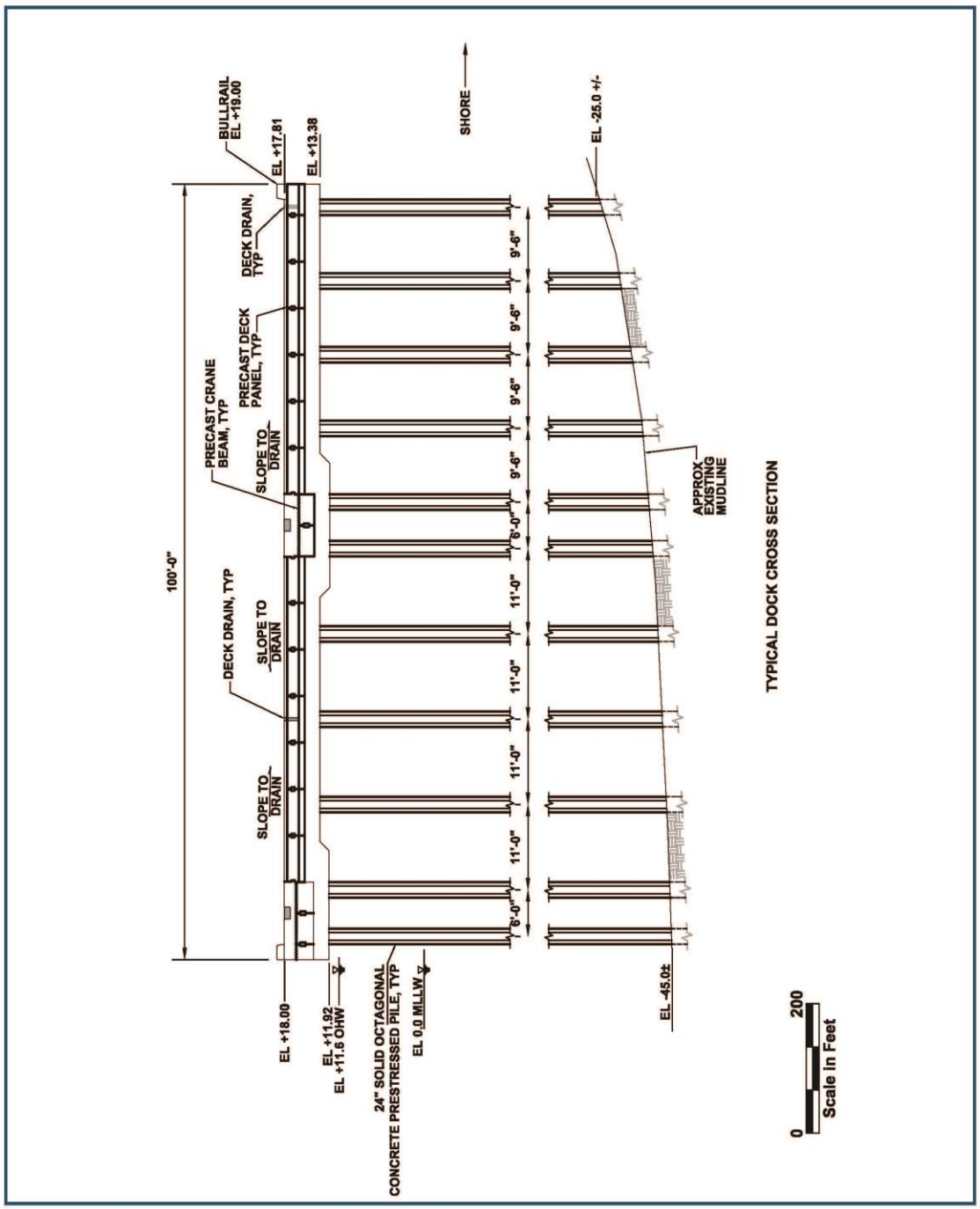
Marine Terminal Alternative 1 Trestle Section
Figure 2-13

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Marine Terminal Alternative 2 Plan
Figure 2-14

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Marine Terminal Alternative 2 Section
Figure 2-15

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Berth Dredging

The existing berth serving the Port's North Port terminal would be extended northward to the new berth and deepened to -48 feet CRD with a 2-foot overdredge allowance consistent with the existing berth. The berth would extend at an angle from the edge of the Columbia River navigation channel to the berthing line at the face of the proposed dock. The footprint of the expanded berth would be approximately 18 acres, of which approximately 16 acres would require dredging to achieve the required berth depth. **Figure 2-16** shows the area to be dredged. Existing water depths in the proposed berth area currently vary from -39 feet CRD to -50 feet CRD. The total anticipated dredging volume would be approximately 126,000 cubic yards.

Chemical characterization was performed to evaluate appropriate placement of the material dredged for the new berth (BergerABAM 2015) in accordance with guidance from the USACE Portland Sediment Evaluation Team and its interim final guidelines, *Regional Sediment Evaluation Framework* (USACE et al. September 2009), for the Lower Columbia River Management Area. The characterization results indicate that the proposed dredged material would be suitable for placement at any of the existing Port in-water or upland placement sites or on the upland portion of the project site for use during construction.

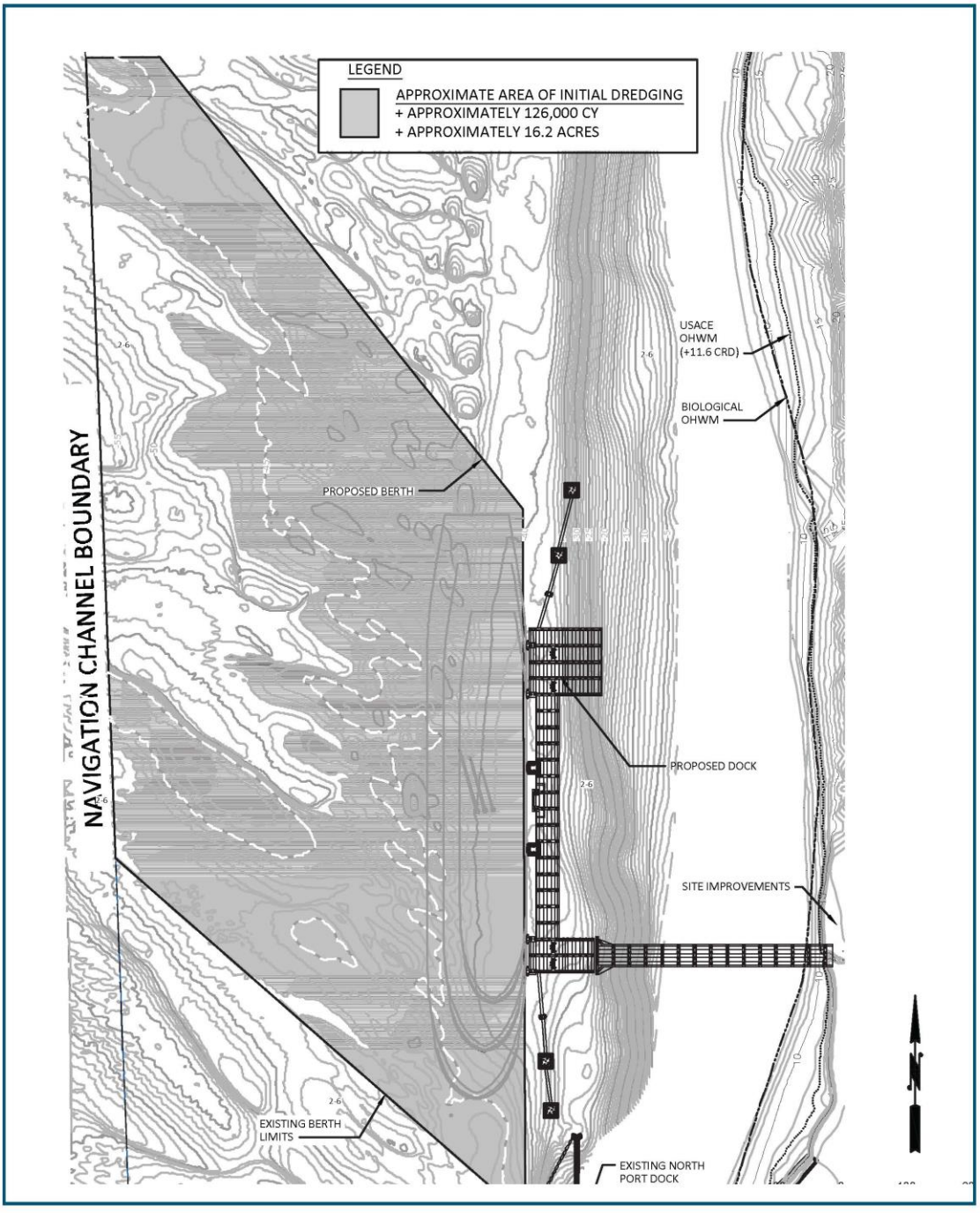
The existing authorized in-water placement locations include: (1) flow lane placement to restore sediment at a deep scour hole associated with a pile dike at RM 77.48 located on the Oregon side of the river; (2) flow lane placement to restore sediment at a deep scour hole associated with a pile dike at RM 75.63 located on the Washington side of the river; (3) beach nourishment at the Port's shoreline park (Louis Rasmussen Park) at RM 76; and (4) the Ross Island Sand and Gravel disposal site in Portland, Oregon. The anticipated upland placement sites include the South Port site located north of the CHS/TEMCO grain terminal at approximately RM 77 and the project site. Additional in-water and upland sites may be identified and permitted for dredge material placement for general Port maintenance dredging needs in the future.

Maintenance dredging would likely be required over time to maintain the berth to the permitted depth. This activity would occur in the same manner as used for the establishment of the berth. The volumes and frequency of maintenance dredging events would vary based on the needs of the facility and the rate of shoaling. It is estimated that an average of 27,000 cubic yards of sediment could be deposited in the berth area yearly. Maintenance dredging would be permitted separately as part of the Port's maintenance dredging program.

Loading Equipment

Methanol would be transferred from the bulk product storage tanks to the dock for loading onto vessels by three 16-inch pipelines. In addition, there would be three 6-inch vapor return lines and three 2-inch inert gas (nitrogen) lines running from the methanol manufacturing facility to the loading equipment on the dock. All of the pipelines, as well as mechanical, electrical, and plumbing utilities, would be elevated above the dock surface on a steel frame pipe rack.

Three complete loading systems on three arms will be installed to transfer methanol from the pipelines to the vessel manifold. Each has a liquid loading line, a vapor return line, and an inert gas line. Small vessels require only one or two arms to load.



Marine Terminal Alternative 1 Dredging Plan
Figure 2-16

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Loading rates would vary from approximately 203,000 to 523,000 gallons (610 to 1,571 tonnes) per hour per line depending on the vessel size. The loading arms would be hydraulically articulated, equipped with an emergency release system, and configured to maintain clearance for emergency vehicles on the trestle behind.

Vessels would arrive with inert gas in the product tanks to keep the oxygen level in the individual tanks to a level below that required for combustion. The gas would be displaced from the tank as it is loaded with the methanol. The inert gas would be collected by three 6-inch-diameter pipes located on the loading arms and directed back to the plant via the vapor return pipes where it would be redirected to the production process.

Utilities

Domestic water service would be provided to the proposed dock and to the new fire hydrants serving it. New hydrants fed by 6-inch-diameter lines would be located at the dock and where the trestle connects to the land as required by the fire code. These hydrants would be fed using a 6-inch-diameter fire main. A 1-1/2-inch water service for domestic water service would be provided on the dock. A 3-inch domestic waterline would be constructed to the outside face of the dock. This water supply would serve two 2-inch-diameter provisioning connections, as well as approximately two washdown water spigots on the dock. All exposed water piping hung from the dock structure would be heat-traced to prevent freezing. Pipe supported on hangers would be equipped with flexible couplings at expansion joints.

Alcohol-resistant normal aqueous film-forming foam concentrate would be used for firefighting. The foam line would be mounted on the utility support frames and directed to fire monitors on the dock surface.

A new electrical substation would serve the new dock and provide shore power for berthed vessels. Dock lighting will be provided by fixtures mounted on 40-foot steel poles. Lighting levels would be designed to 5 foot-candles per the Washington Administrative Code (WAC) requirements. Private aids to navigation lighting would also be installed on the dock.

Stormwater Treatment

Stormwater runoff generated on the proposed dock and trestle would be collected and conveyed to a pumping station located at the platform to access trestle transition. The pump station would be fitted with a primary pump that would be capable of accommodating stormwater flows that would be subject to treatment requirements per the Stormwater Management Manual for Western Washington. A second pump at the pump station would pump flows in excess of the flow rate. All pumped flows would be conveyed upland in a single pipe to a flow separation structure.

Stormwater flow subject to treatment requirements would discharge to an oil/water separator prior to discharge to a water quality swale, designed in accordance with Ecology criteria. After passing through the swale, the runoff would be directed to a newly constructed infiltration ditch located upland. This infiltration ditch would also accommodate stormwater flows from the existing North Port dock and yard area, as well as the new collector well pump house and surrounding area. Stormwater from these areas are currently directed to an infiltration ditch that would be eliminated by the methanol plant. The proposed infiltration ditch would be approximately 495 feet long with a bottom width of 12 feet and depth of 5 feet. Flows at the flow separation structure that exceed the flows requiring treatment would discharge to a bypass line for direct discharge to the infiltration area.

Any accidental spills from pipelines on the dock (for both alternatives) would be captured on the dock surface and collected by the stormwater system. Valving would be installed on the storm conveyance pipes so that the spill could be diverted to a separate pumping system that would convey the contaminated water back to the proposed methanol manufacturing facility for treatment and reuse.

Marine Vessels

The marine terminal would be designed to load methanol onto oceangoing vessels that can handle methanol as a cargo. Vessels would arrive at the terminal from the Pacific Ocean via the Columbia River navigation channel. As noted above, the dock would be designed to accommodate vessels ranging in size from 45,000 DWT to 127,000 DWT, which would include vessels measuring from approximately 600 feet to 900 feet in length and 106 feet to 152 feet in width.

The typical speed of the types of vessels that would serve the proposed project is 15 knots in the ocean and 10 knots in the Columbia River. Vessels would be piloted across the Columbia River bar and up the river to the terminal as required by state and federal regulations. Assist tugs would help vessels arriving at and leaving the berth. Based on the typical vessel size and production of the plant, an estimated 3 to 6 ships per month or 36 to 72 ships per year would use the berth for loading and unloading methanol. Additional ships may use the berth for other cargo operations, as a lay berth, and for topside vessel maintenance activities.

2.6.2.4 Mitigation Activities under the Marine Terminal Alternatives

Compensatory mitigation would be proposed to offset the reduction in habitat function of the water column due to shading and the loss of benthic habitats from pile installation under both Marine Terminal Alternatives. It is expected that each alternative would include three compensatory mitigation activities: (1) pile removal in the area shown on **Figure 2-17**; (2) engineered log jams (ELJ); and (3) riparian habitat restoration and wetland buffer enhancement. Potential aquatic habitat mitigation activities are discussed in more detail in Chapter 6, Plants and Animals.

The proposed project with either Marine Terminal Alternative would also include best management practices (BMPs) to minimize the extent of any impacts to marine mammals or the aquatic environment due to dredging, overwater work, and pile installation.

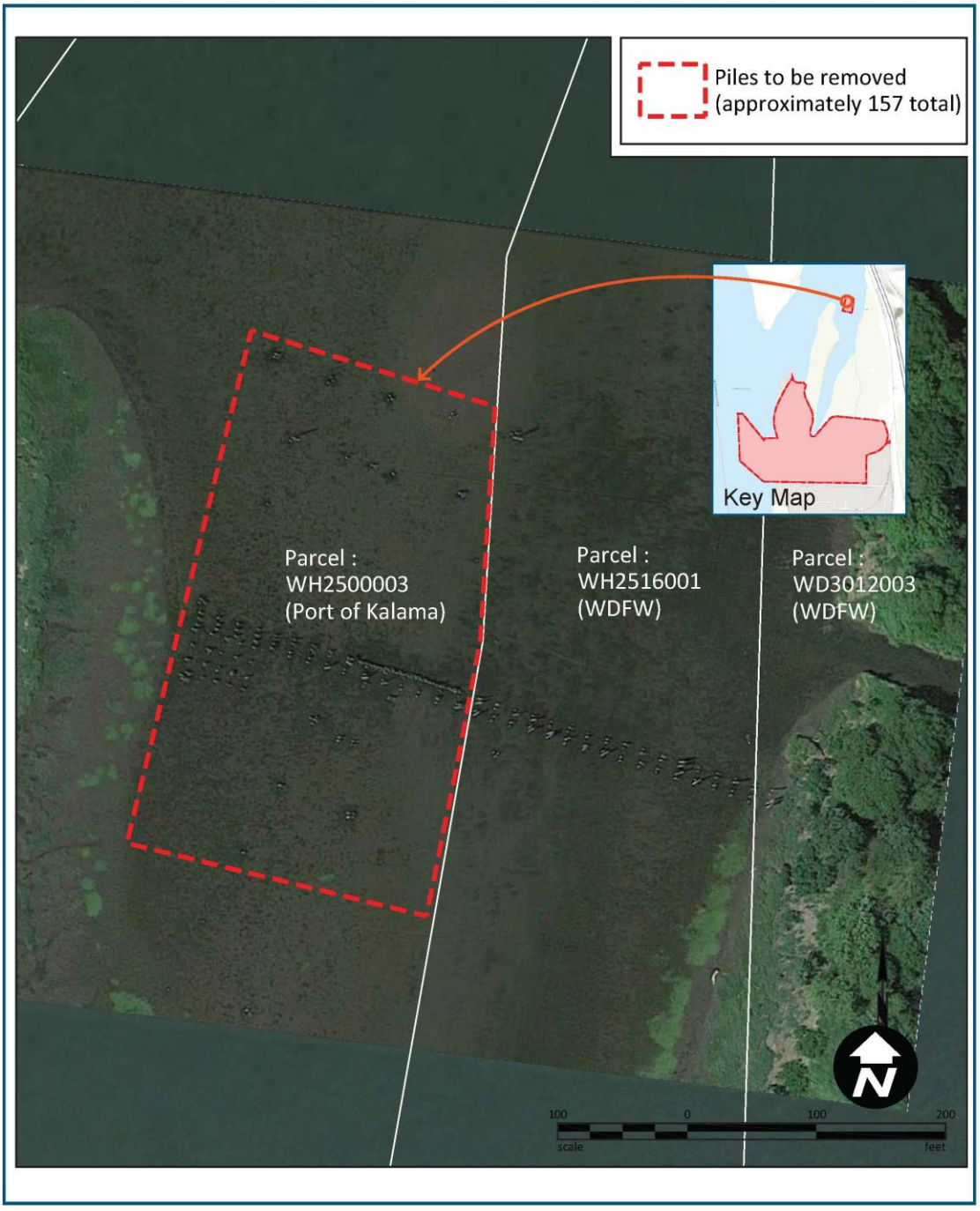
2.6.2.5 Marine Terminal Alternatives Construction Procedures

Mobilization

Most of the construction activities would be water based and mobilization would generally consist of moving barge-mounted equipment to the site with tug boats. Two to four barges would typically be used at the site at any given time.

Pile Installation

Concrete and steel piles would be installed using vibratory and/or impact hammers (depending upon pile type, as described below), most likely operated from a barge. Piles would typically be transported to the site and stored at the site on a work barge. The contractor's water-based equipment would include a barge-mounted crane with pile-driving equipment and a materials barge with piles. At times, a second barge-mounted crane may be on site with an additional materials barge.



Pile Removal
Figure 2-17

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Concrete piles would be installed with an impact hammer. It is anticipated that steel piles would be driven with a vibratory hammer, and that it would not be necessary to impact drive or impact proof any of the steel piles. If it does become necessary to impact-drive steel piles, a bubble curtain or similarly effective noise attenuation device would be employed to reduce the potential for effects from temporarily elevated underwater noise levels. Temporary piles may be required during the pile driving and overwater construction process. Temporary piles are typically steel pipe or H-piles and are driven with a vibratory hammers. These are placed and removed as necessary during the pile driving and overwater construction process.

All pile installation would be conducted during the in-water work window that is approved for this project via project permitting. The typical in-water work window at the site is September through January but may vary for specific activities.

It is anticipated that pile driving would be completed over approximately 80 to 120 days during the 2016-2017 and/or 2017-2018 in-water work windows. Ordinarily, work would be conducted during standard daylight working hours, roughly 8 to 10 hours a day.

Overwater Construction

Overwater construction includes those activities that are waterward of the OHWM, but that are conducted above the OHWM elevation or the actual water surface at the time of construction, such as construction of pile caps, decking, fenders, and other associated overwater structures. These overwater structures would include a combination of cast-in-place and precast concrete structures, grated steel walkways, and associated structures, such as rails, fenders, bollards, etc. Overwater activities and activities conducted in the dry below OHWM would be conducted according to the BMPs established for the project, which would minimize potential impacts to water quality, such as spills or release of construction debris into the waters at the site. These activities would not be limited to the in-water work window.

Surface features, such as loading arms, pipe racks, fenders, and bollards, would be manufactured off site, arrive at the site by land or water, and be installed with a crane.

Timing

Proposed in-water work will be conducted only during the in-water work window that is ultimately approved for this project. The currently published in-water work window for this reach of the Columbia River is 1 November to 28 February. However, regulatory agencies, including the USACE, WDFW, U.S. Fish and Wildlife Service (USFWS), and the National Oceanic and Atmospheric Administration (NOAA) Fisheries, have recently suggested making modifications to the window to take into account the best available science and to address newly listed species. The following work windows are proposed for this project, as explained further below:

- Pile installation will be conducted between 1 September and 28 February
- Dredging will be conducted between 1 August and 31 December
- ELJ installation will be conducted between 1 August and 31 December
- Pile removal may be conducted year-round
- Work conducted below the OHWM, but outside the wetted perimeter of the river (in the dry), may be conducted year-round

These work windows are necessary to accommodate the construction schedule, while simultaneously being cognizant of avoiding biologically sensitive time periods for given activities. One of the driving considerations is the need to conduct all or most berth dredging prior to pile installation. The proposed dredging window is designed to begin early enough in the season to allow pile-driving activities to begin on schedule, while avoiding the bulk of the peak juvenile salmonid outmigration in the spring/summer, and the peak run timing for Pacific eulachon in the late winter/early spring. An early pile installation window will minimize the need for pile installation to be extended into the late winter/early spring time frame. The project proposes to use impact driven concrete structural piles (rather than steel), which are not known to result in injurious levels of underwater noise. For this reason, an early start to the pile installation window will not result in adverse effects to any fish or other aquatic species. ELJ installation could be conducted during late summer, fall, or early winter, to accommodate the range of times when Columbia River water levels could be low, to allow for improved access to the shoreline, and to minimize disturbance to the aquatic environment. Pile removal activities, and work conducted below the OHWM, but outside the wetted perimeter of the river (i.e., in the dry), are not expected to result in significant impacts to aquatic species or resources and, as such, these activities could be conducted year-round.

Construction crews and methods will be influenced by weather, timing, and available equipment, as well as this time frame.

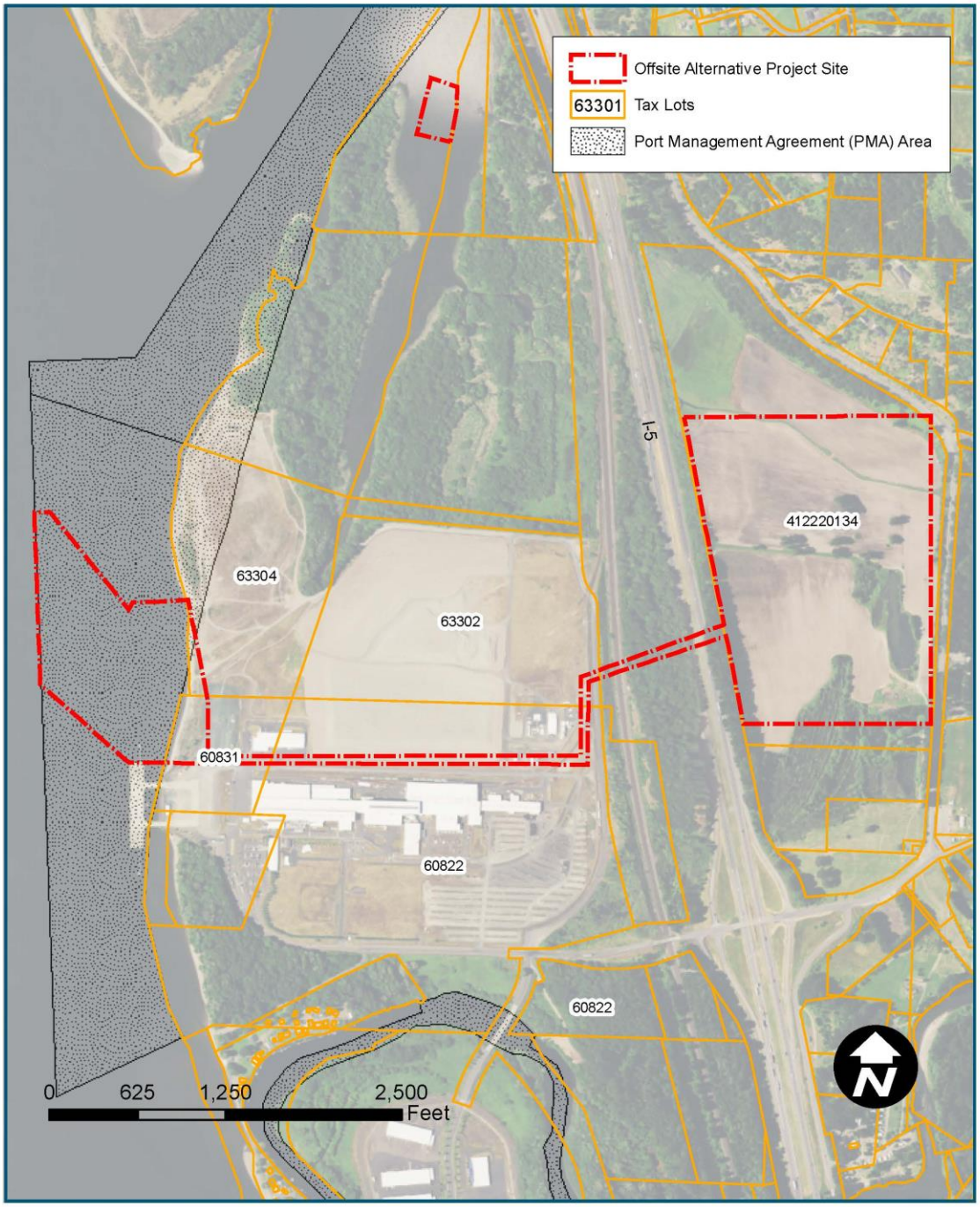
2.6.3 Off-Site Alternative

The Off-Site Alternative would develop the proposed methanol production facilities at the Port's East Port site located east of I-5 as shown in **Figure 2-18**. The Off-Site Alternative project site would be approximately 90 acres in size and would consist of a portion of tax parcel 412220134 in the city of Kalama. This portion of the Off-Site Alternative project site is currently used for interim agricultural uses. The Off-Site Alternative project site would also include the same area for the marine terminal and pile removal as the proposed project and would include portions of tax parcels 60831 and 60822 for new pipelines to convey methanol from the methanol manufacturing facility to the marine terminal and raw water from the collector well and pump house to the methanol manufacturing facility.

This alternative would include the same methanol manufacturing facility components as the proposed project, except they would be located on the East Port site. The Off-Site Alternative, like the proposed project, would produce up to 10,000 tonnes of methanol per day when operating at full capacity. The methanol would be stored on site for shipment to global markets by oceangoing vessel from a newly constructed marine terminal to be operated by the Port. The same marine terminal and collector well would be developed with the Off-Site Alternative as with the proposed project.

Approximately 0.9 mile of pipeline would be required to convey methanol from the Off-Site Alternative project site to the marine terminal in the Columbia River. It would also require pipelines of similar length to raw water from the proposed collector well to the Off-Site Alternative project site.

The pipeline and utilities would cross beneath I-5 and would be installed using horizontal directional drilling methodology.



Off-Site Alternative Parcel Map
Figure 2-18

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2.6.3.1 Analysis of the Off-Site Alternative

The analysis below indicates that the Off-Site Alternative is not a reasonable alternative because the environmental impacts associated with developing the project at the off-site location would be greater than developing the project at the proposed site. This conclusion is based primarily on:

- potential impacts to existing wetlands and/or other habitat;
- visual, noise, and safety issues due to proximity to residences;
- distance from the marine terminal; and
- inconsistency with existing comprehensive plan and zoning designation.

These factors are described in more detail below.

Wetlands and Other Habitat

The Off-Site Alternative site includes wetlands, riparian, and agricultural land habitat types. The National Wetlands Inventory (NWI) identifies several wetland polygons that encompass the majority of the project site for the Off-Site Alternative. Wetland types include palustrine emergent (PEMC, PEMA) and palustrine unconsolidated bottom, excavated wetlands (PUBHx) (USFWS 2015). The palustrine unconsolidated bottom wetlands correspond to excavated open ponds associated with prior gravel mining activities that occurred on the site.

NWI mapping at the Off-Site Alternative site was conducted in 1981 and is the product of "photo-interpretation of high-altitude aerial photography, supported by preliminary field reconnaissance and aided by the use of collateral information (County Soil Surveys, USGS quadrangles, etc.)" (USFWS 1982). The NWI data is reflective of the conditions visible from aerial photography conducted during the specific year and season when the mapping was conducted are not precise delineations. In addition, the Off-Site Alternative project site has been leased for agricultural use for corn, hay, and cattle grazing. Nonetheless, wetlands are present on the Off-Site Alternative project site, although the actual extent of such wetlands may not be as extensive as indicated by the NWI.

Development of the Off-Site Alternative would directly impact wetlands and other habitat at the site. In contrast, the development of the proposed project on the North Port site would not directly impact wetlands.

Noise

The Off-Site Alternative would involve the same equipment as the proposed project but would be located east of I-5. The Off-Site Alternative would be farther from residences in Prescott, Oregon (over 6,000 feet away), and from the Sportsmans Club (over 3,000 feet away, which is treated as a residential use for the purposes of the noise analysis) than the proposed project, but would be much nearer to residences to the east and southeast than the proposed project. The residences that would be nearest to the Off-Site Alternative project site are on the hillside to the northeast, approximately 600 feet from the site boundary, and residences approximately 1,250 feet to the southeast. There are approximately 8 residences to the southeast and 20 residences on the hillside to the northeast, including those along Old Pacific Highway.

Operational noise with the Off-Site Alternative would likely exceed the nighttime noise limits set forth in the WAC 173-60 at six residential receptors southeast and northeast of the Off-Site

Alternative project site (receptors SE1, SE2, NE1, NE2, NE3, and NE4, see Chapter 14, Noise, for a map of receptor locations). In addition, operational noise could result in substantial, clearly discernible increases (i.e., 10 dBA or more) over existing levels at two locations (receptors NE3 and NE4). Mitigation measures to address these impacts could include the use of equipment enclosures, quieter specified equipment, stack/exhaust/inlet silencers, and changes to operating parameters (i.e., reduced nighttime operation). It is uncertain at this time if noise mitigation that is both feasible and cost-effective could be identified that could reduce the noise from the Off-Site Alternative project site to levels that would not result in significant adverse noise impacts. Therefore, unlike the proposed project, operation of the Off-Site Alternative would result in potential unavoidable significant adverse noise impacts.

Visual Resources

The Off-Site Alternative would displace interim agricultural uses, open space, and mature trees with heavy industrial facilities on the East Port site. Certain viewers from residential areas on the hillside to the northeast of the site would have direct views of the Off-Site Alternative in the visual foreground to middle ground. This alternative would result in more noticeable and prominent effects on views from residential areas than the proposed project, which would be located more distant from these residential areas.

The Off-Site Alternative would also be highly visible in views from Kress Lake, unlike the proposed project. This alternative would be a prominent feature in views for recreational users of Kress Lake and would alter the site's existing visual context of interim agricultural land, open space, and mature trees. This change would adversely affect views from Kress Lake. The proposed project site would only be visible from Kress Lake during winter, when trees are bare.

Design Considerations – Distance to the Marine Terminal

The Off-Site Alternative would require approximately 0.9 mile of pipeline to convey methanol from the Off-Site Alternative project site to the marine terminal in the Columbia River. It would also require pipelines of similar length to convey raw water from the proposed collector well to the Off-Site Alternative project site. These pipelines would require crossing under I-5 and would result in a greater amount of land disturbance than would be necessary under the proposed project. They would also require greater energy use for the increased pumping loads, greater maintenance and potential for spills due to their longer length, and increased operational costs related to energy and the additional maintenance.

Land and Shoreline Use – Consistency with Comprehensive Plan and Zoning Designation

The Off-Site Alternative project site is located in the city of Kalama and has a zoning and comprehensive plan designation of Mixed Use. Per Kalama Municipal Code 17.25, the mixed-use zone is intended to combine two or more land uses, such as residential, commercial, business, and light industrial uses in close proximity. The Port of Kalama Comprehensive Scheme of Harbor Improvements also anticipates a mixed-use business/light industrial/recreational park on the East Port site. The Off-Site Alternative would introduce a single-use development on a large portion of the broader East Port site, and a methanol manufacturing facility would likely not be considered a light industrial use compatible with the other mix of uses planned for the properties in this area. Therefore, the Off-Site Alternative may be inconsistent with the zoning and comprehensive plan designation of the East Port site and the Port of Kalama Comprehensive Scheme of Harbor Improvements.

2.6.3.2 Off-Site Alternative Summary

The comparison of the proposed project and Off-Site Alternative indicates that impacts to a variety of environmental factors would be greater with the Off-Site Alternative, and the use would not be consistent with current comprehensive plan and zoning designations, as summarized below in **Table 2-2**.

Reasonable alternatives under SEPA are those that feasibly attain or approximate a proposal's objectives and provide a lower environmental cost or decreased level of environmental degradation than the proposal. The Off-Site Alternative would not attain the project objectives with a lower environmental cost. The Off-Site Alternative is, therefore, not included in the more detailed EIS analysis.

Table 2-2. Summary of Off-Site Alternative Compared with the Proposed Project

Technical Area	Proposed Project	Off-Site Alternative
Design Considerations – Distance to Marine Terminal	Adjacent to marine terminal.	Approximately 0.9 mile of pipeline to convey methanol and water from the site to the marine terminal.
Plants and Animals	The proposed project would require approximately 336 new piling, approximately 44,943 square feet of new overwater coverage, and approximately 126,000 cubic yards of dredging within approximately 16 acres of an 18-acre expanded berth. The proposed project would not result in any direct wetland impacts. See Chapter 6, Plants and Animals.	The Off-Site Alternative would result in greater impacts to wetlands and associated plants and animals. Impacts associated with piling, overwater coverage, and dredging would be the same as the proposed project.
Noise	No significant adverse noise impacts. See Chapter 14, Noise.	Potential significant adverse noise impacts.
Water	The proposed project would not result in any direct wetland impacts. See Chapter 5, Water Resources.	The Off-Site Alternative would result in greater impacts to wetlands.
Land and Shoreline Use - Comprehensive Plan and Zoning Designations	Consistent with the comprehensive plan and zoning designation for project site. See Chapter 9, Land Use and Shoreline Use, Housing, and Employment.	Potentially inconsistent with the City of Kalama zoning and comprehensive plan designation of the East Port site, as well as the Port of Kalama Comprehensive Scheme of Harbor Improvements.
Visual Resources	Views would change from surrounding areas but impacts are not considered to be significant and adverse.	Potential for greater impacts to residential viewers and recreational viewers at Kress Lake.

2.6.4 No-Action Alternative

A No-Action Alternative is analyzed in this EIS as required by SEPA regulations. Under the No-Action Alternative, the proposed project would not be constructed on the project site.

Given the project site's highway, rail, and waterfront access and the Port's Comprehensive Scheme for Harbor Improvements, it is expected that the Port would pursue future industrial or marine terminal development of the site absent the proposed project.

Given the demand for methanol in global markets, the proposed project may be constructed on another site within the Pacific Northwest or at other locations in the world and could use natural gas or other feedstock, such as coal.

2.7 Related Actions

2.7.1 Natural Gas Supply – Kalama Lateral Project

The proposed project would use natural gas as the feedstock of the methanol project. Northwest is proposing to construct and operate the Kalama Lateral Project (the proposed pipeline) a 3.1-mile, 24-inch-diameter natural gas pipeline and related facilities to provide natural gas transportation service to the proposed project.

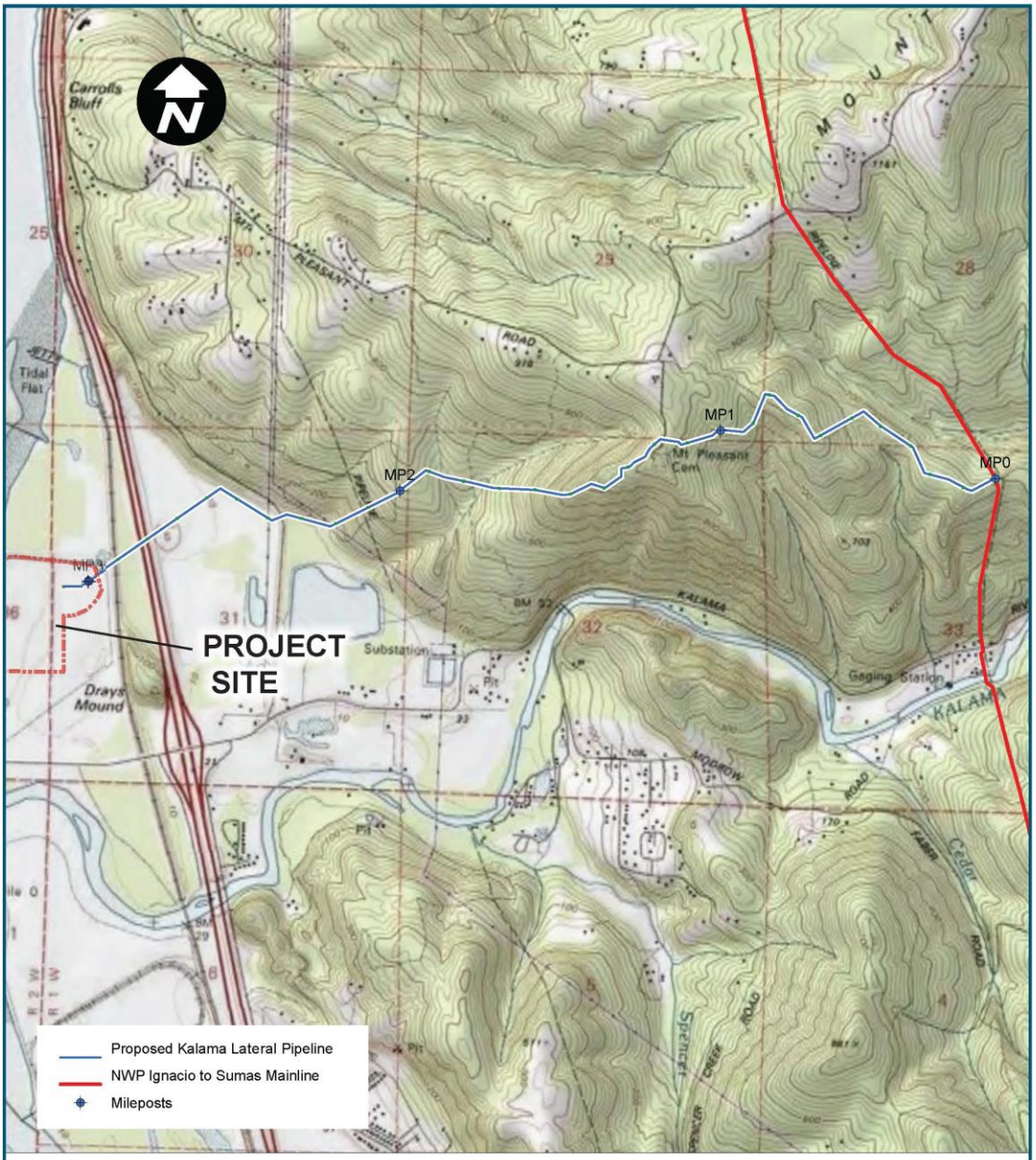
The proposed pipeline is subject to the jurisdiction of the FERC and an application pursuant to Section 7(c) of the Natural Gas Act and Subpart A of Part 157 of FERC's regulations was submitted by Northwest to FERC on October 27, 2014 (Docket No. CP15-8-000). The proposed pipeline is undergoing a separate review process through FERC. However, because the proposed pipeline is being constructed primarily for the proposed project, it is considered a related action and the effects of the construction and operation of the proposed pipeline will be considered in the evaluation of the proposed project.

The proposed pipeline would begin at the interconnection of Northwest's existing Ignacio to Sumas 30-inch mainline at approximately Milepost 1254.1 of the mainline in Section 33, Township 7 North, Range 1 West, and would end within the boundary of the manufacturing facility in Section 31, Township 7 North, Range 1 West, Cowlitz County, Washington (**Figure 2-19**).

The pipeline would be located within a new 50-foot-wide permanent pipeline easement. The pipeline project would require new appurtenances, including a new tap and isolation valve to tie the proposed 24-inch-diameter lateral pipeline into the existing 30-inch-diameter mainline. Additionally, pigging[8] facilities would be installed at the beginning of the lateral pipeline and at the new delivery meter station to be constructed within the boundary of the manufacturing facility. The meter station would include standard appurtenances, piping, and buildings within an approximate 150-foot by 200-foot fenced area. A complete description of the proposed pipeline is available in the FERC environmental assessment for the proposed pipeline.

The proposed pipeline would use the same preferred route as the Kalama Lateral Project. That project was filed previously with FERC in Docket No. CP13-18 (Docket CP13-18). Docket CP13-18 was assigned after the FERC pre-filing process, subsequently filed with the Commission, and later withdrawn prior to the issuance of a Certificate of Public Convenience and Necessity (certificate) when the proponent cancelled the project. Additional information is provided in **Appendix B**.

[8] A "pig" is a device that is inserted into and moves through a pipeline to clean the pipe, inspect it, or for other purposes.



Source: Federal Energy Regulatory Commission, Kalama Lateral Project Environmental Assessment.

Proposed Pipeline Route
Figure 2-19

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The proposed pipeline would be constructed in accordance with U.S. Department of Transportation regulations in 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" and FERC regulations in 18 CFR Part 380.15, "Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities."

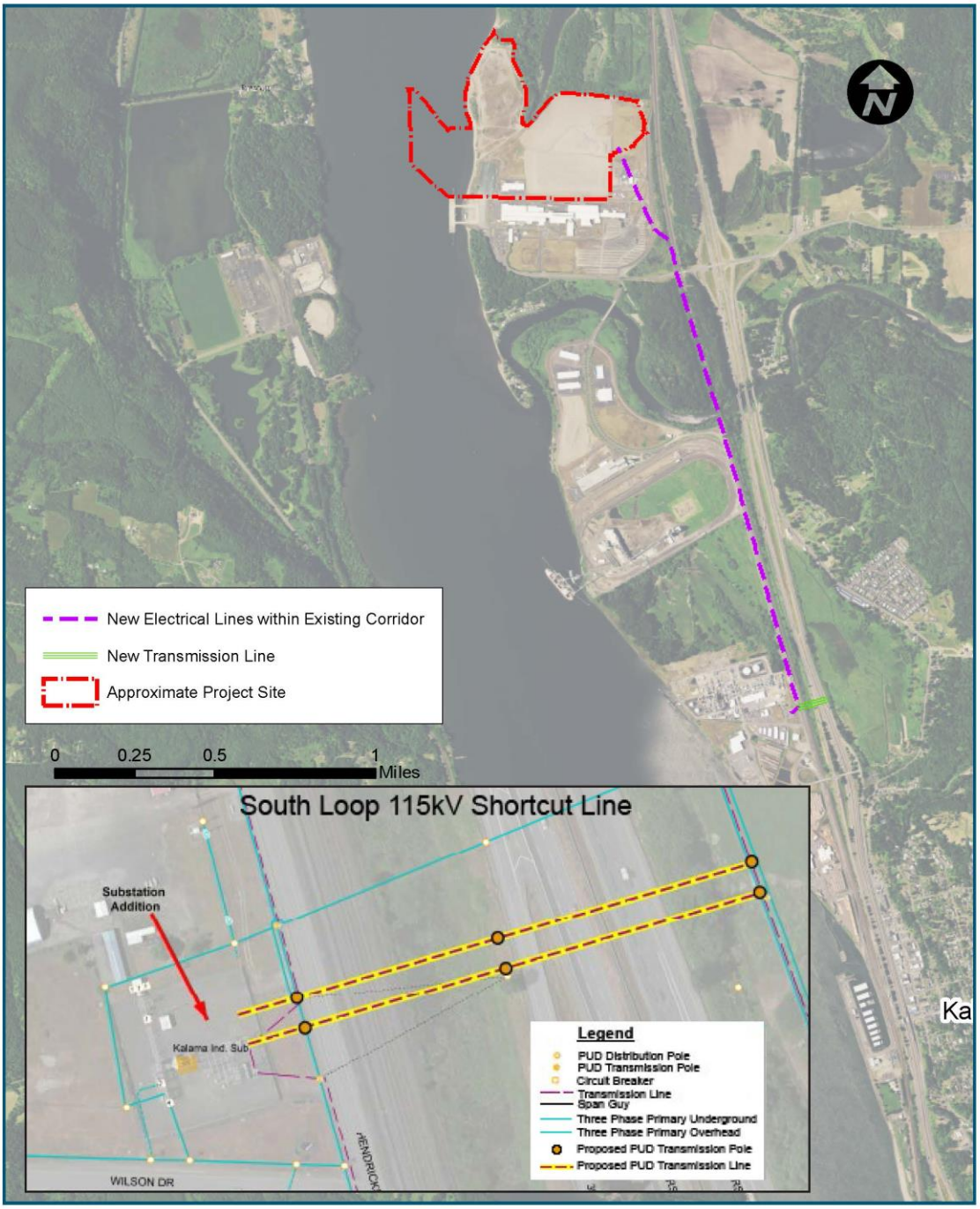
It is anticipated that the pipeline would be constructed in the following sequence: clearing, grading, trenching, trench preparation for the 24-inch-diameter pipeline, pipe stringing, welding, lowering-in, backfilling, regrading, and restoration. The construction activities would occur in sequence along the pipeline route with one crew following the next from clearing until final cleanup. In certain areas, such as residential areas or at water body and road crossings, most of the construction activities would be completed together as one operation.

Additional information on the proposed pipeline construction is provided in **Appendix B**.

2.7.2 Electrical Service

In order to provide electric service to the proposed project under either of the Technology Alternatives, it is expected that Cowlitz PUD would upgrade an existing transmission line from its existing Kalama Industrial Substation (located east of the project site at the northwest corner of N. Hendrickson Drive and Wilson Drive) to the project site by installing new lines on existing towers within an existing transmission line corridor. This line originates at the substation and continues north along N. Hendrickson Drive before crossing the Kalama River and continuing north to the project site. New equipment (e.g., 115-kilovolt [kV] breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility.

Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation located on the west side of I-5 and an existing 115-kV transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, the railroad, and N. Hendrickson Drive and would require installation of new poles. **Figure 2-20** illustrates the location of these improvements with the proposed project.



Proposed Electrical Service
Figure 2-20

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2.8 Anticipated Permit Requirements

2.8.1 Proposed Project

The proposed project would require federal, state, and local permits and authorizations. **Table 2-3** below is a preliminary list of the permits that are anticipated to be required. Additional permits or approvals may be identified as the design and environmental review processes proceed.

Table 2-3. Permits and Authorizations Required for the Proposed Project

Permit/Authorization	Agency
Federal	
Rivers & Harbors Act Section 10/Clean Water Act Section 404	USACE
Endangered Species Act Section 7 Consultation	National Oceanic and Atmospheric Administration (NOAA) Fisheries/USFWS
Marine Mammal Protection Act	NOAA Fisheries
NEPA	USACE, NOAA Fisheries
Private Aids to Navigation Permit	U.S. Coast Guard
Section 106 of the National Historic Preservation Act	USACE
Funding	Various agencies to be determined
State	
Hydraulic Project Approval	WDFW
Shoreline Conditional Use Permit	Ecology
401 Water Quality Certification	Ecology
Prevention of Significant Deterioration (Air) Permit	Southwest Clean Air Agency/Ecology
NPDES Construction Stormwater Permit	Ecology
NPDES Industrial Wastewater Discharge Permit	Ecology
SEPA	Port and County
Local	
Shoreline Substantial Development and Conditional Use Permit	County
Critical Areas	County
Floodplain Permit	County
Engineering and Grading	County
Building, Mechanical, Fire, etc.	County

2.8.2 Related Actions

Table 2-4 lists the anticipated permits, approvals, and consultation required for the construction and operation of the proposed pipeline. **Table 2-5** lists the anticipated permits for the construction and operation of the proposed transmission line improvements.

Table 2-4. Permits and Authorizations Required for the Proposed Pipeline

Agency	Permit/Approval
Federal	
FERC	Certificate of Public Convenience and Necessity
USACE	Permit for the discharge of dredge or fill material into waters of the United States under Section 404 of the Clean Water Act
USFWS	Consultations for impacts on federally listed threatened and endangered species and critical habitat under Section 7 of the Endangered Species Act and the Migratory Bird Treaty Act
NOAA Fisheries	Consultations for impacts on federally listed threatened and endangered species and critical habitat under Section 7 of the Endangered Species Act and the Magnuson-Stevens Act
Advisory Council on Historic Preservation	Consultation under Section 106 of the National Historic Preservation Act if the Project would affect historic properties
State	
Ecology	General Permit for Construction Stormwater Discharge under the National Pollution Discharge Elimination System
WDFW	Hydraulic Project Approval
Washington Department of Natural Resources	Forest Practices Act
Department of Archaeology and Historic Preservation	National Historic Preservation Act – Section 106 Consultation
Washington State Department of Transportation	Road Crossing Permit
Local	
Cowlitz County	Critical Areas Ordinance, Pipeline Ordinance, Grading Ordinance, County Road Crossing Permits

Table 2-5. Permits and Authorizations Required for the Proposed Electrical Service

Agency	Permit/Approval
Other	
BNSF	Wire Line Crossing License
State	
Washington State Department of Transportation	Utility Permit

2.9 Benefits or Disadvantages of Reserving Project Approval for a Later Date

If the Port, County, or other agency with permitting authority were to delay action on the proposed project, the impacts associated with construction and operation of the facility would be delayed along with any potential benefits of the project, such as increased tax revenues and job creation. In addition, if the proposed project were to be delayed, the market for methanol and products created from it could respond by developing additional methanol plants in other locations. These plants may manufacture methanol from coal or through use of a less efficient technology. Delaying the action could allow the Port to pursue other development opportunities on the site that could result in similar, lesser, or more adverse impacts than the project.

2.10 References

IHS Inc. 2014. Newsroom – Driven by China, Global Methanol Demand to Rise Nearly 80 percent by 2023; North America marks return as "Production Powerhouse". http://press.ihs.com/press-release/chemicals/driven-china-global-methanol-demand-rise-nearly-80-percent-2023-north-americ. 29 August 2014.

U.S. Fish and Wildlife Service (USFWS). 2015. National Wetland Inventory online wetland mapper. Accessed February 15, 2015 at http://www.fws.gov/wetlands/data/mapper.HTML.

U.S. Fish and Wildlife Service (USFWS). 1982. National Wetland Inventory. Notes to Users. Lower Columbia River. Vancouver East. Accessed at: http://www.fws.gov/wetlands/Data/HisMapRep/vancouver-e.pdf.

Yang, Chi-Jen, and Robert B. Jackson. 2012. China's Growing Methanol Economy and Its Implications for Energy and the Environment, Energy Policy (Elsevier 2012). http://people.duke.edu/~cy42/Methanol.pdf.

Chapter 3 Earth

3.1 Introduction

This chapter describes the existing setting of the project site and assesses the potential for the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative to result in environmental impacts related to earth and geology. The assessment includes a summary of geologic and geotechnical conditions at the site, as well as information on the geological and seismological settings and a general assessment of potential geologic hazards at the project site. The analysis also describes the geologic setting and potential geologic hazards along the route of the Kalama Lateral Project (the proposed pipeline), which is assessed as a related action to the proposed project.

The potential for construction activities and operations to affect earth and geology is also discussed, along with design measures that the proposed project would include to address potential geologic hazards.

3.2 Methodology

The study area for this assessment is the project site and considers regional geology, as well as local conditions within the project site. Existing maps and technical reports published by the U.S. Geological Survey (USGS), Washington State Department of Natural Resources (DNR), and the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) were reviewed as the basis of the information presented about geology, geologic hazards, topography, and soils. Geotechnical data reports, memos, and maps derived from previous subsurface investigations on the site were reviewed for site-specific information (Geotechnical Resources Inc. 1990, 2003, 2015a, and 2015b; PBS Engineering + Environmental Inc. 2006). The 2015 studies are included in **Appendix C**.

The discussion of the related action relies on the geological and land use assessment provided in the Northwest Pipeline LLC (Northwest) Draft Resource Report No. 6, Geological Resources (Golder 2012), provided to the Federal Energy Regulatory Commission (FERC) in connection with the Northwest Section 7(c) application and the environmental assessment (EA) for the proposed pipeline (see **Appendix B**).[1]

Short-term effects are assessed relative to the activities that would be conducted for construction of the proposed project and the potential project impacts on existing geologic hazards, such as slope stability or soil erosion. The analysis of project activities considers the potential for grading, cuts, and fills during construction to result in adverse effects of soil erosion to stormwater, diminishing surface water quality in the Columbia River, and undermining structures along the shoreline.

Long-term operational effects are assessed based on geologic processes and geologic hazards, such as slope stability, volcanoes, and earthquakes (liquefaction, ground motion, fault rupture, and seismically induced water waves).

[1] This application is FERC Docket CP15-8-000 and is available online at http://www.ferc.gov/docs-filing/elibrary.asp.

The effects assessment evaluates how the proposed project would expose people or site structures to damage, loss, injury, or death resulting from geologic hazards and whether the project contributes to erosion or exacerbates existing geologic hazards.

Building codes, seismicity, and other engineering criteria that dictate design requirements related to geologic hazards are described in detail in **Appendix C**.

3.3 Affected Environment

The project site is located along the east bank of the Columbia River approximately 1,600 feet north of the river's confluence with the Kalama River. The site is bounded on the west by the Columbia River, on the east by a BNSF rail line, and on the south by an existing steel-handling and manufacturing plant (Steelscape). The site is bounded on the north by undeveloped land.

Most of the site has been filled to present grades with sand dredged from the Columbia River. Based on 2010 light detection and ranging (or lidar) data for the project site, most of the ground surface is relatively flat with a nominal elevation of approximately Elevation +21 feet Columbia River Datum (CRD). Stockpiles of dredged material are located in the central portion of the property and the northwest corner of the site. The stockpiles currently extend to elevations ranging from + 30 feet to +40 feet CRD.

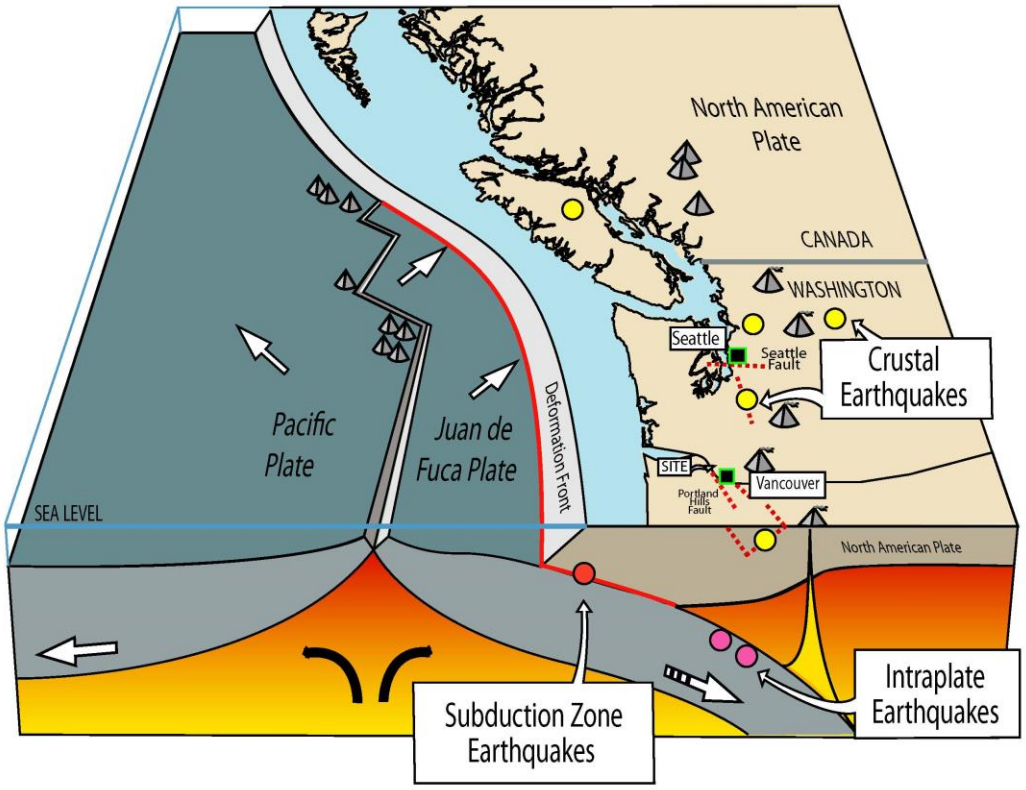
3.3.1 Geologic Setting

The project site is located in the Columbia River Valley where the valley narrows as the river flows from southeast to northwest. This region of the Columbia River floodplain is located on the North American continental tectonic plate near a convergent plate boundary with the Juan de Fuca oceanic tectonic plate. The site lies approximately 45 miles inland from the down-dip edge of the of the Cascadia Subduction Zone (CSZ), an active convergent plate boundary along which remnants of the Farallon Plate (the Gorda, Juan de Fuca, and Explorer plates) are being subducted beneath the western edge of the North American continent. As shown on **Figure 3-1**, the Juan De Fuca Plate is diving beneath the overriding North American Plate. The subducting slab partially melts, resulting in magma rising to the ground surface and erupting as volcanic centers. The convergent tectonic forces have generated northwest-trending fault zones (generalized as red dashed lines on **Figure 3-1**) and crustal blocks resulting in areas of uplifted mountainous terrain and depressed structural basins.

3.3.1.1 Geology

Geologic units in the vicinity of the site include late Eocene to early Oligocene volcanic rocks and Quaternary alluvial deposits. The volcanic rocks consist of thick accumulations of mainly subaerial basalt lava flows of the Goble Volcanics Formation (McCrory and Wilson 2013). The Goble Volcanics form the steep valley walls on either side of the Columbia River in the vicinity of the project site. A rock outcrop of Goble Volcanics (referred to elsewhere as Dray's Mound) can be observed just east of the site between the BNSF rail line and Interstate 5 (I-5).

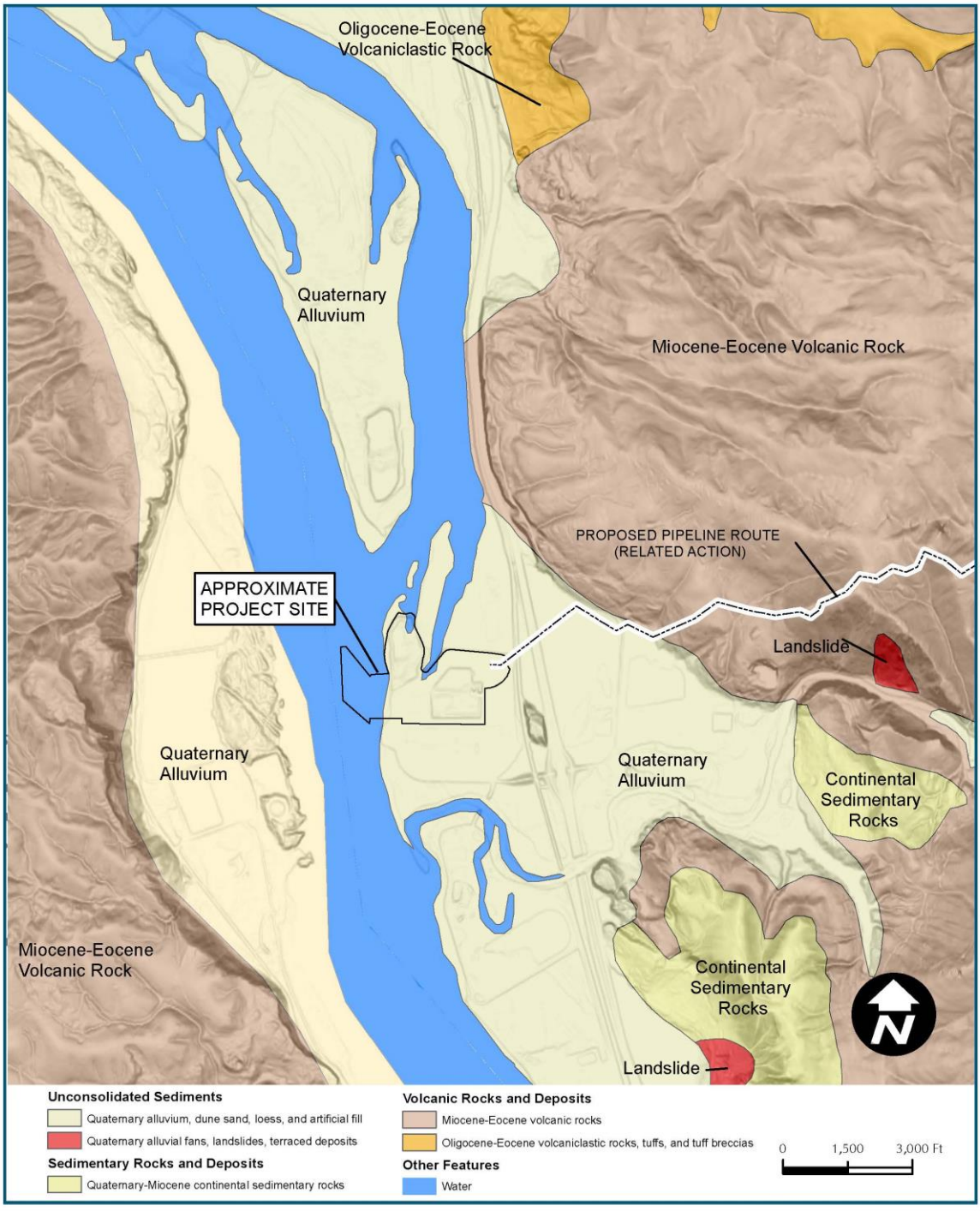
River channel deposits overlay the basalt rock and typically consist of fine- to medium-grained sand with lenses of gravel. Quaternary floodplain alluvial deposits overlay the river channel deposits and typically consist of layers of silt and clayey silt between layers of sand, sandy silt, and silty sand (Walsh et al. 1999). **Figure 3-2** shows geologic units mapped in the vicinity of the site.



MODIFIED FROM USGS CASCADIA EARTHQUAKE SOURCES
(http://geomaps.wr.usgs.gov/pacnw/pacnweq/casceq.html)

Regional Geologic Setting
Figure 3-1

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Geologic Units in the Project Site Vicinity
Figure 3-2

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3.3.2 Subsurface Conditions

Various geotechnical investigations to evaluate the subsurface conditions at or in the vicinity of the site have been completed. Soil conditions near the bank of the Columbia River were evaluated in 1990 and 2003, for design of the existing dock at the adjacent Steelscape site and a later proposed dock expansion (Geotechnical Resources Inc. 1990 and 2003). Subsurface explorations on the project site were completed in 2006 for a proposed power generation facility that was not developed (PBS Engineering + Environmental Inc. 2006).

Soils encountered in the explorations have been grouped into the following categories based on their physical characteristics and engineering properties. Described from the ground surface downward, the soils are as follows:

Fill. Fill mantles the ground surface at the site. The fill consists primarily of dredged sand. The sand is typically gray and fine- to medium-grained, and contains a trace of silt and scattered pumice pebbles or thin layers of coarser-grained sand or gravel. The fill is estimated to be approximately 14 to 20 feet thick. The fill is material dredged from the Columbia River during channel maintenance activities. The site is no longer used for dredged material placement.

Interbedded Sand and Silt. The dredged material is underlain by interbedded alluvial deposits of sand and silt. The sand is typically gray and fine-grained, and contains varying percentages of silt. Scattered fine organic material and small woody debris are also present within the deposit. The silt and sand typically extend to depths of 35 to 45 feet below the ground surface (bgs).

Sand. Sand occurs below the interbedded sand and silt and extends to depths of at least 130 feet bgs. An approximately 10-foot-thick layer of silt within the sand was identified by some of the deeper explorations. The sand is brown to gray, fine- to medium-grained, and may contain some silt and some gravel. Variably distributed organic debris was also encountered in the sand, including woody debris.

3.3.2.1 Groundwater Conditions

A review of well log records maintained by the Washington State Department of Ecology (Ecology) indicates that depth to groundwater in the vicinity of the site has been measured between 12 and 23 feet bgs. Groundwater levels will likely fluctuate in response to river levels, tidal influence, and precipitation. Groundwater may also tend to seasonally perch within portions of the dredged sand fill above the less-permeable alluvial silt soils.

3.3.3 Geologic Hazards

Geologically hazardous areas include areas susceptible to earthquakes, volcanoes, landslides, or erosion. These hazards can potentially impact health and safety, structures, or topographical features as described in the following sections.

3.3.3.1 Earthquake Hazards

The project site is located in a regional tectonic regime that is capable of producing earthquakes of magnitude (M) 9 or greater (Atwater et al. 2005). Available information indicates the following three categories of earthquake: subduction zone, intraplate, and local crustal earthquakes. The characteristics of these earthquake types are presented in **Table 3-1.**

Large subduction zone earthquakes result from the sudden slip between the upper surface of the Juan de Fuca Plate and the lower surface of the North American Plate. Published studies of coastal

subsidence, evidence of past tsunamis, and other geologic data yield a wide range of recurrence intervals, but the most complete records indicate recurrence between 200 and 700 years with an average of approximately 300 years between earthquakes on the CSZ (Adams 1990; Atwater and Hemphill-Haley 1997; Witter 1999; Clague et al. 2000; Kelsey et al. 2002; Kelsey et al. 2005; Goldfinger et al. 2012; and Witter et al. 2003).

Historical evidence of tsunami inundation in Japan suggests that the last subduction zone earthquake in the project area occurred on 26 January 1700 and ruptured along the nearly 1,000-mile length of the CSZ. The magnitude is estimated to have been approximately between M8.7 and M9.2 (Atwater et al. 2005).

Intraplate earthquakes result from the remains of the Juan de Fuca Plate fracturing as it dives beneath the North America Plate and are characterized by moderate to large earthquakes that are deep (25 to 40 miles bgs) and over 120 miles from the deformation front of the subduction zone. Published estimates of the probable maximum size of these events range from M7.0 to M7.5.

Crustal earthquakes occur during the rupture of shallow faults at depths up to approximately 15 miles bgs. Shallow crustal faults have not been identified within 4 miles of the project site. (Phillips 1987; Personius et al. 2003). The magnitude of local shallow crustal earthquakes is anticipated to be approximately M6.5 to M7.1.

Table 3-1. Possible Earthquake Sources

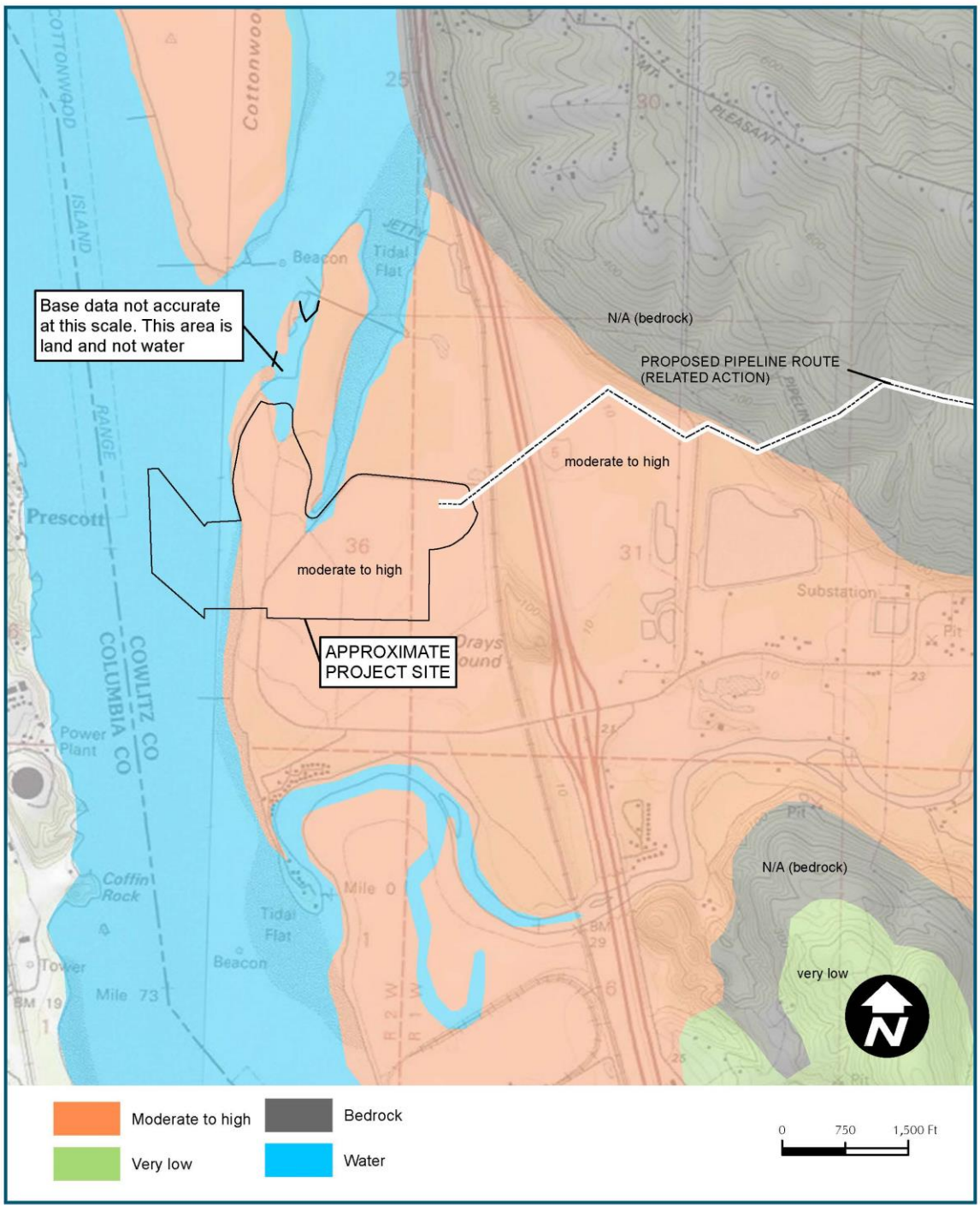
Earthquake Source	USGS Fault No.	Distance from Project Site [a, c] (mile)	Magnitude Max [a] (M)	Length [a] (mile)	Most Recent Deformation [b, c] (years ago)
Cascadia Subduction	781	62-124	9.0	621	300 yr
Intraplate	NA	24-37	7.5	~621	>150 yr
Crustal Fault Portland Hills Fault	877	22	7.1	38	<1.6 m.yr

a Wong et al. 2000.
b Gregor et al. 2002.
c Personius et al. 2003; information is approximate.
m.yr = million years
NA = not applicable

Hazards attributable to earthquakes include liquefaction, lateral spreading, faults and ground rupture, ground motion, and seismic water waves as described below.

Liquefaction. Soil liquefaction can occur when saturated sand or low-plasticity silt is subject to strong ground shaking during an earthquake. The ground shaking can rearrange the soil particles, which leads to a rise in the pore water pressure and loss of soil strength within the susceptible soils and the soils begin to behave as a viscous liquid.

The site has been identified as having soils of moderate to high liquefaction susceptibility, as presented on **Figure 3-3** (Palmer et al. 2004). Geotechnical investigations conducted on and near the site indicate sands and layers of silt and sandy silt that are present below the groundwater surface are susceptible to liquefaction and that could occur to depths of approximately 80 to 100 feet bgs (Geotechnical Resources Inc. 2015b).



Liquefaction Susceptibility
Figure 3-3

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Lateral Spreading. As soil strength is reduced and soil liquefies during an earthquake, there is an increased risk of settlement, lateral spreading, and/or slope instability, especially along waterfront areas. Lateral spreading occurs as blocks of soil move horizontally toward unconfined banks such as a river or stream channel in response to the ground motion of an earthquake and liquefaction in a subsurface layer. Lateral displacement may range from a few inches to several feet depending on soil conditions, the slope and height of the riverbank, and the magnitude and epicenter location of the earthquake. Lateral spreading of 5 to 10 feet could occur along the banks of the Columbia River and estimates of liquefaction-induced settlements range from 18 to 30 inches at the ground surface (Geotechnical Resources Inc. 2015b).

Faults and Ground Rupture. Geologic mapping completed by DNR has not identified evidence of historical or geological surface rupture crossing the site (Phillips 1987, Walsh et al. 1999). The nearest Quaternary crustal fault identified by the USGS is the Portland Hills Fault located approximately 22 miles southwest of the site. The potential for earthquake-induced fault displacement and ground rupture at the site is generally low unless the earthquake occurs on a previously unknown or unmapped fault.

Ground Motion. One of the damaging effects of an earthquake is from strong shaking at the ground surface. Ground motion is the movement of the earth's surface from earthquakes that produce waves generated by a sudden slip on a fault. The waves propagate near the ground surface and result in strong shaking that can damage man-made structures, depending on the construction materials, the type of ground, and foundations. The potential for injury and death from ground motion is typically associated with structural damage.

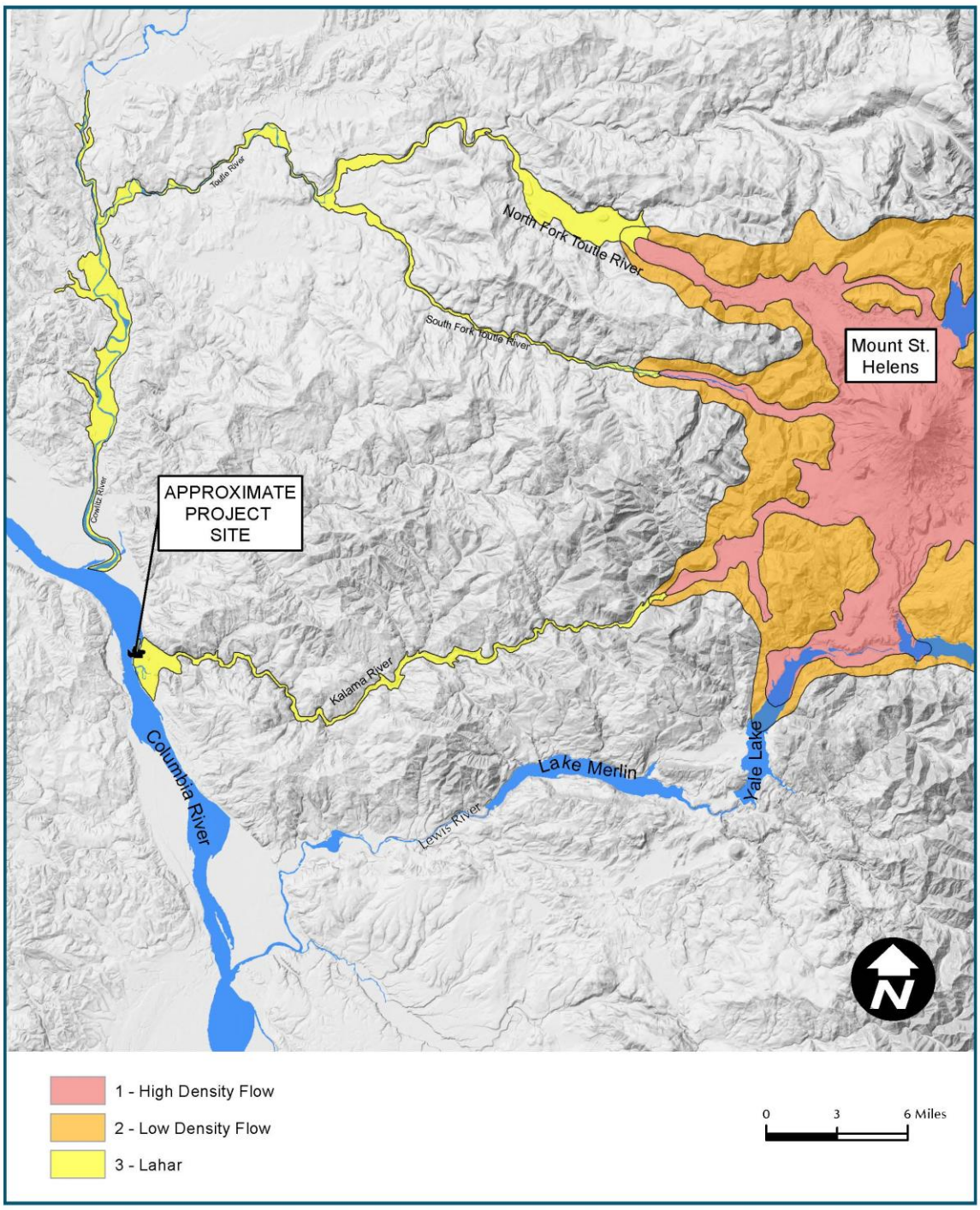
Seismic Water Waves. Tsunamis are large waves generated in oceanic areas by earthquakes. Recent numerical modeling shows that a tsunami would attenuate very quickly once inside the Columbia River and would dissipate around 25 miles from the mouth of the Columbia River (Kalmbacher and Hill 2014). The project site is located more than 25 miles upriver; therefore, tsunamis are not a concern.

Earthquake-generated waves that occur on inland bodies of water, including rivers, are termed seiche. No historical seiches are known in the lower, free-flowing Columbia River. (McGarr and Vorhis 1965). The likelihood that a seiche could affect the project site is low.

3.3.3.2 Volcanic Hazards

The project site is located west of the Cascade Mountains, a belt of volcanoes that extends from northern California to British Columbia that pose various eruptive hazards. Mount St. Helens is the nearest Cascade volcano; it is located 35 miles east of the project site.

Mount St. Helens can produce eruptions of ash (rock, mineral, and volcanic glass fragments smaller than 0.079 inch), lava flows (masses of molten rock), pyroclastic flows (high-density mixtures of hot, dry rock fragments and hot gases that move away from the vent at high speeds), and lahars (rapidly flowing mixtures of water and rock debris) (Wolfe and Pierson 1995). The project site could be subject to ash and lahars following an eruption, but is located far enough away from Mount St. Helens that it would not be subject to pyroclastic flows or lava flows as shown on **Figure 3-4**. The potential for ash fall and lahars at the project site is discussed in more detail below.



Volcanic Flowage Hazard Zones
Figure 3-4

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Ash

The project site could be subject to ash following an eruption. The USGS estimates the annual probability of 4 inches or more of ash being deposited at the project site by an eruption of Mount St. Helens at between 1 and 2 percent. (Wolfe and Pierson 1995). Ash can damage property, structures, and the natural environment.

Lahars

Based on the information and techniques available today, predicting when or where a volcanic eruption or lahar is likely to occur is not possible. The project site is located 42 miles from the summit of Mount St. Helens and was unaffected by the lahars that followed the 1980 eruption of Mount St. Helens. Based on the behavior of lahars in other river drainages after the 1980 eruption, a lahar down the Kalama River could travel to the mouth in approximately 1 hour and 21 minutes (Wolfe and Pierson 1995). The annual probability of a large explosive eruption (the type with the potential to result in a large lahar) is about 0.0015 percent for the past 4,500 years and 0.008 percent for the past 500 years. Based on lahar studies in the Toutle River system, lahars large enough to inundate floodplains of river systems draining Mount St. Helens 30 miles or more from the volcano have a return period of approximately once every 10,000 years (Hoblitt et al. 1987).

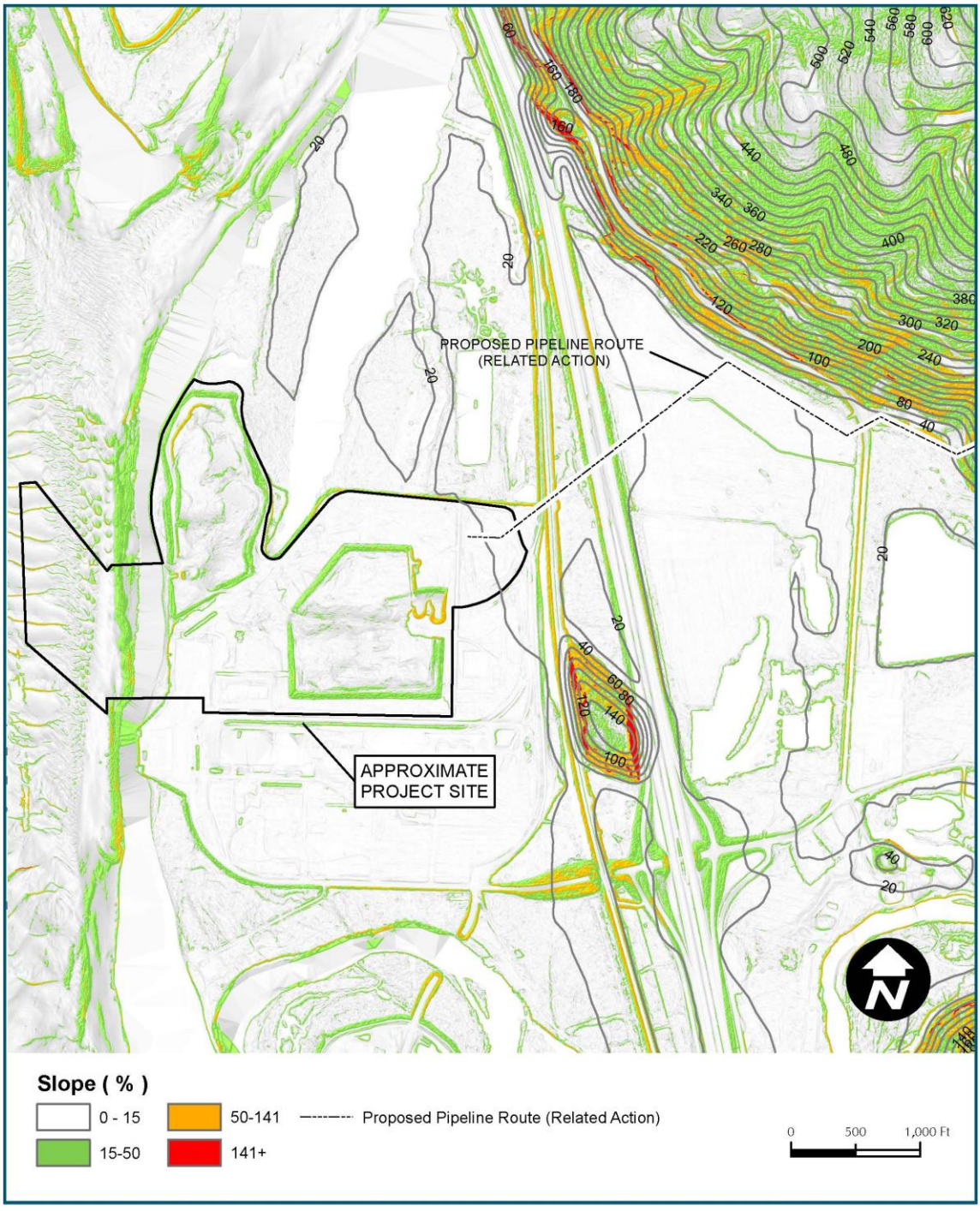
3.3.3.3 Landslide Hazards

Landslides are mass movement of soil down a slope. They can range from small localized failures (sloughing) to massive earth movements that cause extensive damage to the natural and built environments and may cause injury and death to humans and wildlife.

Landslide hazard areas are typically defined as areas with a combination of slope inclination, soil type, geologic structure, and the presence of water, that are susceptible to failure and subsequent downhill movement. Landslide hazard areas are defined by the Cowlitz County critical areas ordinance as areas with slopes inclined equal to or greater than 15 percent, hillsides with geologic contacts with relatively permeable sediment overlying relatively impermeable sediment or bedrock, and areas with springs. Landslide hazard areas also include slopes with gradients steeper than 80 percent or 39 degrees over any distance, or slopes of 33 percent or 18 degrees or steeper where there is a vertical relief of 10 feet.

No landslides have been mapped in the vicinity of the project site (Wegmann 2006). The topography of the site is generally flat other than the sloping river bank on the west side of the project site. With the exception of the banks of the Columbia River and the slope from the project site to lowland areas to the north, the project site is relatively flat. The banks of the river have slope inclinations of up to about 33 percent as shown on **Figure 3-5.** These slopes are not considered landslide hazards based on the criteria provided above.

The dredged material stockpile slopes may meet the landslide hazard criteria in some areas; however, the stockpiles are temporary and are stable at this time. The stockpiles are set back from the river banks on generally flat ground. Failures of the stockpile slopes would likely be localized sloughing and would not likely impact structures or human health and safety.



Slopes
Figure 3-5

KALAMA SEPA
Manufacturing & Marine Export Facility

3.3.3.4 Erosion Hazards

Erosion hazard areas are identified by the NRCS as areas having a "severe" or "very severe" hazard of erosion. Erosion hazard areas are typically present in areas impacted by upland disturbance and/or streambank erosion and areas within a stream's channel migration zone. The degree of erosion is a function of the soil type, slope inclination, presence of surface water, perched or shallow groundwater, area of soil exposed, and rainfall intensity.

The project site is located adjacent to the Columbia River. This portion of the river is subject to wind-generated waves and ship-, barge-, and boat-generated wakes. The sandy dredge fill and alluvial soils exposed along the riverbank near the project site may be subject to erosion from waves, wakes, and flooding of the Columbia River along unprotected portions of the riverbank. However, no indications of severe erosion hazards have been identified at the project site and the sandy site soils are considered less prone to erosion than silt or clay soils.

Based on the sandy surface soils, low slope gradients of upland areas, and planned erosion management practices (discussed in section 3.4.1.1), erosion hazards at the project site are low.

Dredging and construction of the new terminal (other than the access trestle from the shoreline to the loading dock) would occur approximately 360 feet from the shoreline in deep water (existing water depths in the area to be dredged range from -50 feet CRD to -39 feet CRD) and is not expected to cause erosion at the shoreline.

The access trestle connection to the shoreline would cause disturbance of the shoreline slope during construction and pile driving, but is not expected to cause permanent or ongoing shoreline erosion.

Vessels using the facility during methanol loading would be positioned at the berth and removed from the berth by tugs rather than under their own power, further limiting waves and turbulence from the vessel that could cause erosion of the shoreline.

Three parking areas are proposed to facilitate construction worker access to the site. The areas proposed are existing flat and graveled or paved areas. Clearing and site grading volumes would be minor and are not anticipated to impact erosion, topography, or geologic hazards.

3.3.4 Related Actions

The proposed pipeline alignment is located along the western edge of the Cascade Range between the Puget Lowland and the Portland Basin.[2] The Cascade Range consists predominantly of volcanic rocks and deposits chiefly composed of volcanic materials. The western end of the proposed pipeline alignment is underlain by alluvial deposits, while the remainder of the alignment is underlain primarily volcanic deposits. Geological hazards within the proposed pipeline alignment include landslides, erosion, seismic effects, volcanic activity, shallow groundwater, flood inundation, and surface mine encroachment. No existing active or dormant mass wasting (landslide) hazard was identified across the proposed pipeline alignment; the alignment tends to avoid known and potential landslides by being located on ridge tops and slopes

[2] The Puget Lowland is the broad, low-lying region situated between the Cascade Range to the east and the Olympic Mountains and Willapa Hills to the west. The Portland Basin is the northern terminus of the Willamette Lowland of Oregon.

that lack mapped deep-seated landslides. Potential hazards from erosion, shallow groundwater, flood inundation, and liquefaction are located along the last 0.87 mile of the alignment.

In order to provide electric service to the proposed project with the Ultra-Low Emissions Alternative, Cowlitz County Public Utility District No. 1 (Cowlitz PUD) would upgrade an existing transmission line from its existing Kalama Industrial Substation to the project site by installing new lines on existing towers within the existing transmission line corridor. New equipment (e.g., 115-kilovolt [kV] breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility. Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing 115 kV transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, Hendrickson Drive, and the railroad and would require installation of new poles. As discussed in Chapter 2, Proposed Project and Alternatives, the new lines and improvements to the Kalama Industrial Substation would constitute a related action on the part of the Cowlitz PUD.

The substation would require nominal site grading of an already flat area next to the existing substation. The substation upgrade and transmission pole additions would not increase erosion or other geologic hazards.

3.4 Environmental Impacts

Potential environmental impacts related to construction and operation of the proposed project are discussed below. The Technology Alternatives and Marine Terminal Alternatives for the proposed project would be constructed and operated on the same project site and would, therefore, have the same potential for impacts related to earth and geology. The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would be designed to meet state and federal regulations and buildings codes. This section, therefore, assesses the potential impacts of the construction and operation of the proposed project related to earth and geology without distinguishing between the Technology and Marine Terminal Alternatives.

Details regarding the project components are provided in Chapter 2, Proposed Project and Alternatives. With either Technology Alternative, the proposed methanol manufacturing facility would consist of methanol production/reforming facilities, including production lines, utilities, piping, cooling towers, storage tanks, boilers, air separation units, a flare system, fire suppression infrastructure, water supply and treatment components including ponds for treatment and stormwater infiltration, support buildings and accessory facilities, site access ways, and public recreation access.

Approximately 325,000 cubic yards of the stockpiled dredged material will be removed for use by the Port of Kalama (Port) independent of the proposed project and approximately 325,000 cubic yards would be used for grading during site development for the proposed project to achieve desired site grade of approximately +23 CRD. The northwest portion of the project site would likely be graded to higher final elevations (up to +33) to improve infiltration capacity at the stormwater pond to be located on the northwest portion of the site. Except for the infiltration pond, it is expected that approximately 90 to 100 percent of the project site would be impervious surfaces upon project completion (accounting for graveled areas as impervious surfaces, in accordance with the Stormwater Management Manual for Western Washington).

Detailed infiltration analysis will be completed during design. The existing site fill and subsequent filling is primarily sand and is expected to be suitable for infiltration based on the inherent

permeability of sand. Permeability and infiltration capacity will be confirmed during design. Preliminary field infiltration testing performed at the project site confirmed that the soil has infiltration rates ranging from 9 to 99 inches per hour, depending on the location. Preliminary design of the infiltration pond assumed an infiltration rate of 10 inches per hour, assuming the pond would be at least 5 feet above the seasonal high groundwater level.

Foundation design for the various structures and facilities has not been completed, but is expected to include ground improvements for support of structures and to avoid/minimize/mitigate potential impacts from geologic hazards. Various ground improvements would be considered and selected following future detailed geotechnical analysis of site conditions.

Both Marine Terminal Alternatives would include construction of a pile-supported marine methanol loading dock and both require dredging to provide a berth with sufficient draft for the export vessels that would service the site. The dock and dredging would occur in deep water and is not expected to significantly impact shallow water habitat.

As the design of the proposed project proceeds, additional supplemental subsurface investigation and engineering studies will be conducted to address the geotechnical issues specific to the proposed project, and a project-specific geotechnical investigation to inform the final project design will be completed. Potential measures to address the geologic conditions of the project site and the proposed project's design considerations would be implemented to minimize potential impacts and would meet state and federal regulations and buildings codes, as discussed below.

3.4.1.1 Construction Impacts

Soil Erosion. Historical activities have substantially modified the surface soil by filling the project site with dredged material to raise site grades and stockpiling dredged material at the site for future use. As noted above, significant erosion has not been identified on upland areas or along the banks of the Columbia River at the project site. Construction activities would include clearing, excavation, filling, and grading in areas for foundation construction, ponds, utility placement, and ground improvement.

Short-term effects from erosion could occur as soil is exposed to wind and stormwater during construction activities. Final site grades are expected to be nominally +23 CRD over most of the site. Some site grading would be necessary to further level some areas for the construction of structures, buildings, and access roads. As discussed above, the erosion hazard for soil types on the surface of the site is low and additional leveling and stormwater control for the facility would further reduce the erosion hazard. A detailed construction stormwater pollution prevention plan (SWPPP) would be prepared and adhered to during construction as required by construction stormwater permits granted by Ecology. The SWPPP would contain best management practices (BMPs) specific to the proposed project to reduce erosion and sediment delivery to surface waters. Exposed soil would be stabilized by the application of BMPs. Potential BMPs may include sediment basins for receiving stormwater, gravel construction entrance and exits, check dams and sediment traps, gravel filter berms, filtration bags or socks, fiber mats, and/or silt fences.

As discussed in Chapter 2, Proposed Project and Alternatives, it is expected that construction employees would park off site at nearby locations and would be bused to the project site. These three locations would be graveled to minimize potential soil erosion during construction parking activities.

Dredging. The proposed project with either Marine Terminal Alternative would dredge approximately 126,000 cubic yards of material from the Columbia River to create the proposed

berth. Dredging would be accomplished using mechanical (crane-supported clamshell) or hydraulic equipment. Ongoing observation of sediment aboard the barge or at the placement areas would be conducted during dredging and disposal operations.

Dredging and in-water construction activities would be conducted in compliance with Surface Water Quality Standards for Washington (173-201A WAC) or other conditions as specified in the water quality certification and/or other permits required for project construction. BMPs would be employed to minimize sediment loss and turbidity generation during dredging and may include, but are not limited to, smooth closure of the clamshell bucket when at the bottom; no stockpiling of dredged material on the riverbed; maintaining suction head of hydraulic dredge in the river bed to the extent practicable; using a buffer plate or other means to reduce flow energy of the hydraulic dredge at the placement area; and other enhanced BMPs or conditions as specified in the water quality certification.

The dredged material would be placed at a Port-permitted in-water or upland placement site. Dredged material would be placed upland at the project site to provide material for construction or for other uses, or it may be placed at existing authorized in-water and upland placement sites. The existing authorized (NWP-1994-462-1) in-water placement locations include: (1) flow lane placement to restore sediment at a deep scour hole associated with a pile dike at RM 75.63 located on the Washington side of the river; (2) beach nourishment at the Port's shoreline park (Louis Rasmussen Park) at RM 76; and (3) the Ross Island Sand and Gravel disposal site in Portland, Oregon. The available upland placement sites include the South Port site located north of the CHS/TEMCO grain terminal at approximately RM 77 and the project site. Additional in-water and upland sites may be identified and permitted for dredge material placement for general Port maintenance dredging needs in the future.

BMPs would be employed at upland dredged material placement sites as appropriate to control stormwater runoff and erosion. Such BMPs may include: (1) installing silt fences, hay bales, and/or containment berms; (2) managing runoff and elutriate water; and (3) routine inspection of the stockpile areas to verify that BMPs are functioning properly.

Erosion can potentially damage natural or man-made features, but is not likely to impact human health and unlikely to cause injury or death. Potential impacts as a result of soil erosion would be negligible and would be additionally minimized by standard erosion control construction practices.

Topography Modification. Detailed grading plans would be prepared during project design. The proposed project design is not expected to include substantial modifications to the topography of the project site, site excavation into native soils, or the use of imported fill materials, other than using on-site stockpiled dredged material to raise site grades from Elevation +21 CRD to a nominal subgrade elevation of +23 and a finished paved grade of approximately +24 CRD. The northwest portion of the project site may be graded to elevations as high as +33 CRD to increase infiltration capacity at the stormwater pond. Grading and excavation for utilities, ponds, and site preparation would also be necessary; in particular, the infiltration pond, fire water pond, and first flush pond would be below the finished site grade. Site grading and slope setbacks would be designed in accordance with Cowlitz County criteria. Ground improvements would be completed below the ground surface and would not impact topography. Therefore, adverse impacts related to topography modification are not anticipated.

Slope Stability. Landslide deposits were not identified within the project site. As discussed above, the only current existing steep slope areas identified on the project site are along the banks of the Columbia River and along the northern boundary of the project site. Construction of the marine

terminal would remove sediments for a berth and dock. The proposed cut slope for the dredge prism is about 33 percent and would match the existing slope gradient of about 33 percent at the location of the dock and berth. With the exception of the proposed marine terminal, construction activities would be located on flat upland areas and are not likely to increase potential risk of slope failures along the bank of the Columbia River.

Dredging activities for the Marine Terminal Alternative have the potential to create oversteepened bank slopes and reduce slope stability. The project design would include dredge slope and construction sequencing that avoids oversteepening of slopes that would reduce the potential for instability during dredging activities.

Overall, construction of the proposed project would not result in significant adverse impacts to earth and geology.

3.4.1.2 Operational Impacts

Earthquake Impacts

As discussed above, there is a low risk of the site being impacted by earthquake-induced tsunamis or seiches, but earthquakes can injure or cause death of personnel and/or cause damage to site structures from liquefaction-induced settlement, seismic lateral spreading deformations, and strong ground-shaking motions.

The project site has been identified as having moderate liquefaction-susceptible soils (Palmer et al. 2004). Based on the available subsurface data, and on the current code-based ground motions, liquefaction-induced settlements have been estimated to be approximately 18 to 30 inches (Geotechnical Resources Inc. 2015b). Earthquake-induced settlement and lateral spreading due to liquefaction could affect structures at the project and result in related injury or death to personnel. Structures at the site would be designed to minimize potential liquefaction, settlement, and lateral spreading impacts in accordance with current seismic codes.

Lateral spreading would be most likely to affect the project elements located close to the river, such as the marine terminal, pump station, fire suppression water storage and pumps, infiltration pond, flush pond, and Ranney well. The wastewater treatment facility may be affected, although to a lesser degree because it is further from the banks of the Columbia River. Lateral spreading is often addressed by constructing a zone, or buttress of stone columns or soil/cement mixing along the riverbank to prevent liquefaction during an earthquake and subsequent mass soil movement towards the shoreline. Ground improvement alternatives to minimize lateral spreading would be evaluated and selected during project design.

Ground improvements would be designed to meet specified performance criteria and limit seismic deformation to tolerable levels. Although no measures can completely eliminate the risk posed by earthquakes, these measures would reduce structural damage and would be implemented to meet state and federal regulations and buildings codes. Seismic building codes and design are discussed in detail in **Appendix C**.

Alternatively, driven piles could be installed to develop foundation capacity below the depths where liquefaction-induced settlement is a concern. With this measure, structures within the proposed project would be able to resist compressive, uplift, and lateral loads.

Volcanic Impacts

As discussed previously, the project site is susceptible to ash fall and lahars resulting from an eruption of Mount St. Helens.

Major hazards from ash fall include impact of falling fragments; suspension of abrasive fine particles in air and water; and burial of structures, transportation routes, and vegetation. Ash fall could affect operation activities and result in damage to project site and equipment, but is not likely to cause injury or death to on-site personnel. Ash fall material could potentially overload facility structures, clog machinery and filters, cause electrical short circuits and damage electronic equipment, damage surfaces through corrosion, and make roads slippery. Regional communications and transportation systems may also be disrupted.

Lahars may rapidly add water volume, sediment, and debris to the Kalama and Columbia rivers, affecting facility operations and vessel mooring and loading activities, and potentially damaging the marine terminal. Potential impacts to the upland areas of the facility include inundation by lahar from the Kalama River and burial and impact by rock and other debris. Because of the distance of the project site from Mt. St. Helens and the Kalama River and the long return period for significant volcanic events, the risk of a lahar reaching the project site and resulting in damage to the proposed project is low.

Overall, the operation of the proposed project, with either Technology Alternatives and either Marine Terminal Alternatives, would not result in significant adverse impacts to earth and geology.

3.4.1.3 Related Actions

The potential impacts of the Kalama Lateral Project (the proposed pipeline) were assessed in the Draft Resource Report No. 6, "Geological Resources," submitted to FERC by Northwest (Golder 2012) and the FERC EA for the proposed pipeline. The results of the assessment indicate the potential for geologic hazards to impact the pipeline is low. No existing active or dormant mass wasting (landslide) hazard was identified across the proposed pipeline alignment; the alignment tends to avoid known and potential landslides by being located on ridge tops and slopes that lack mapped deep-seated landslides. Potential hazards identified during the assessment included erosion, shallow groundwater, flood inundation, liquefaction, and lahars. The report concludes that known potential hazards can be mitigated through avoidance in route selection (e.g., landslides), standard-of-practice engineering design, BMPs, best construction practices, and targeted erosion protection measures. See the FERC EA in **Appendix B** for more detailed discussion on the proposed pipeline-related action.

Overall, the proposed pipeline-related action would not result in significant adverse impacts related to earth and geology.

The proposed electrical service improvements-related action would result in improvements to the existing Kalama Industrial Substation, new transmission lines on existing towers within the existing transmission line corridor, and a new shortcut transmission line over I-5. The new shortcut line would require six new utility poles in and around the existing highway right-of-way. These activities would not result in fill or grading activities, excavation, or substantial new impervious surfaces and, therefore, would not have the potential to result in significant adverse impacts to earth and geology.

3.4.2 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed. However, it is anticipated that the Port would pursue future industrial or marine terminal development at the project site (absent the proposed project). Therefore, like the proposed project, this alternative could result in effects related to surface soil disturbance and topography modification, and it could

result in development on the project site that would be subject to potential geologic hazards. The potential risks to a different industrial development on the project site in the event of a seismic or volcanic event could be greater or less than that of the proposed project and would depend on the type of alternative development.

3.5 Mitigation Measures

3.5.1 Project Mitigation

The design features and BMPs the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the project and have been considered in assessing the environmental impacts to earth resources and are listed below.

3.5.1.1 Construction

- SWPPP that includes BMPs to reduce erosion and sediment delivery to surface waters (e.g., sediment basins for stormwater, gravel filter berms, fiber mats, silt fences).
- BMPs to minimize sediment loss and turbidity generation during dredging (e.g., no stockpiling of dredge material on the riverbed, use buffer plates to reduce flow energy of the hydraulic dredge during its operation).
- BMPs to control stormwater runoff and erosion at the upland site (e.g., silt fences, hay bales and containment berms, managing runoff, elutriate [strain] water).
- Compliance with Surface Water Quality Standards for Washington (173-201A WAC).
- Conditions specified in the water quality certification.
- Conditions specified in the construction stormwater permits.
- Foundation design with ground improvements for support structures to avoid/minimize impacts from geological hazards.
- Construct gravel parking lots for off-site construction parking to minimize soil erosion.
- Structural design in accordance with current seismic codes.
- Densify soil to improve strength (e.g., vibro-replacement [stone columns], soil mixing or jet grouting [cement injected into soil]).

3.5.2 Operational

3.5.2.1 Design Measures

Potential impacts due to erosion or earthquakes would be addressed with design measures in accordance with existing state and federal regulations, building code standards, and standard construction methods that avoid and minimize these impacts.

Measures to minimize ground movements and/or movements of structures as a result of seismically induced settlement and lateral spreading may include vibro-replacement, soil mixing and jet grouting, and driven piles. Vibro-replacement would reduce the potential of the project site soils for liquefaction, lateral spreading, and seismic settlement during an earthquake. Soil mixing and jet grouting could be used to provide foundation support and limit seismic settlement of structures or to reduce lateral spreading to tolerable levels. Driven piles develop foundation capacity below the depths at which liquefaction-induced settlement is a concern. These measures

would meet building codes that require the project design to account for potential earthquakes, such as the M9.0 CSZ and the M7.0 Portland Hills Fault Zone scenarios.

Overall, seismic design standards have been developed with the best available science and current standard engineering practice to safeguard human health and welfare, as well as property. Adherence to design standards would provide the proposed project and alternatives with design and construction methods that would substantially reduce damage from geologic events. With these measures and standards, the proposed project would not result in significant adverse impacts related to earth and geology that would require additional mitigation.

3.5.3 Related Actions

3.5.3.1 Kalama Lateral Pipeline

The potential impacts of the proposed pipeline were assessed in the FERC EA. Potential hazards identified during the assessment included erosion, shallow groundwater, flood inundation, liquefaction, and lahars. The EA concludes that known potential hazards can be mitigated through the following.

- Avoidance in route selection (e.g., landslides).
- Standard-of-practice engineering design.
- BMPs and targeted erosion protection measures.

See the FERC EA in **Appendix B** for more detailed discussion on the proposed pipeline-related action.

3.5.4 Electrical Service

Electrical service improvements would not have the potential to result in significant adverse impacts to earth and geology; therefore, no mitigation measures are identified.

3.5.5 Additional Mitigation

There are no significant adverse impacts identified for earth resources; therefore, no additional mitigation measures are identified.

3.6 Unavoidable Significant Adverse Impacts

The proposed project would not result in unavoidable significant adverse impacts related to earth and geology.

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Chapter 4 Air Quality and Greenhouse Gas Emissions

4.1 Introduction

This chapter assesses the potential impacts of the proposed project, the No-Action Alternative, and related actions on air quality and greenhouse gas (GHG) emissions. This chapter describes the air quality environment at the project site and discusses general indications of air quality status and attainment status of the project vicinity. It summarizes the methods and findings of the analyses of the potential impacts of construction and operation of the proposed project, including the following: an air quality compliance assessment of facility-focused sources (i.e., stationary sources) completed in support of an application for an air discharge permit from the Southwest Clean Air Agency (SWCAA); an expanded analysis that considered vessel sources not included in the permitting process analysis; and analyses of GHG emissions and potential micro meteorological impacts from the proposed project's cooling towers.

Unless otherwise stated, project-related impacts and mitigation are based on the information contained in the application for the required air permits (Ramboll Environ 2016) as submitted to the Washington State Department of Ecology (Ecology) and SWCAA. Technical information developed as part of the air quality analysis for this environmental impact statement (EIS) is included in the Air Quality Technical Report (see **Appendix D**).

4.1.1 Facility Configurations Considered

The air quality review of the proposed project considered two methanol production technology alternatives (collectively referred to as the Technology Alternatives). These Technology Alternatives were described previously in Chapter 2 and can be summarized as follows:

- Combined Reformer (CR) Alternative - The proposed methanol manufacturing facility would use combined reforming technology, which employs a combination of a steam-methane reformer and an autothermal reformer to produce methanol.
- Ultra-Low Emissions (ULE) Alternative - The proposed methanol manufacturing facility would use ULE reforming technology, which employs a gas-heated reformer and an autothermal reformer to produce methanol.

The project as originally proposed and publicly announced by Northwest Innovation Works, LLC – Kalama (NWIW) was based on the CR Alternative technology. During the preliminary engineering for the facility, NWIW explored other technologies that would mitigate the GHG and other emissions that would result from the CR technology. This exploration led to consideration of the ULE technology. ULE technology has been used to produce other chemicals from natural gas, but is a new technology for methanol production. Johnson Mathey developed the technology at a small methanol plant in Australia through three generations of engineering and implementation. ULE technology has not been applied at any full-scale methanol production facility. NWIW conducted a detailed engineering evaluation and feasibility analysis of the ULE technology in 2015. Based on the favorable conclusions from that analysis, NWIW determined to change the proposed technology for the project from CR to ULE for the purpose of mitigating air quality impacts. Because it substantially reduces air quality impacts and is NWIW's preferred approach to methanol manufacturing for this project, the ULE Alternative configuration has been more completely developed in engineering plans,

and more detailed information on it was available for the air quality dispersion modeling assessment discussed below.

4.2 General Methodology

The air quality impact assessment used standard analytical techniques and tools that included the following components:

- Consideration of existing air quality in the project area using estimates of background concentrations developed using modeling based on statewide air quality monitoring
- Estimates of emissions from project-related sources, including stationary sources that would be part of the project facility (therefore, subject to air quality permitting review), oceangoing tanker vessels that would transport the product, oceangoing general cargo vessels that would use the new dock, and escort tugs that would assist during vessel maneuvering to and from the facility dock
- Air quality dispersion modeling to consider project-related emission sources over time and estimate resulting concentrations of air pollutants in the ambient air
- Comparison of time-averaged pollutant concentrations associated with the proposed project with respective health-protective ambient air quality standards

More specifics regarding the tools and procedures used in these analyses are discussed in section 4.3.3 below and in the Air Quality Technical Report in **Appendix D**.

4.3 Affected Environment

This section describes the air quality regulatory environment and existing air quality conditions in the study area as described in this chapter and as depicted in air quality modeling.

4.3.1 Applicable Air Quality Rules

The air quality regulations that apply to the proposed project, the various methods of analysis used in evaluating potential project-related air quality impacts, and existing air quality conditions are described in the following sections.

4.3.1.1 Ambient Air Quality Standards and Attainment Status

Air quality is generally assessed in terms of whether concentrations of air pollutants are higher or lower than ambient air quality standards set to protect human health and welfare. Ambient air quality standards are set for "criteria" pollutants (e.g., CO, particulate matter [in two size ranges described later], nitrogen dioxide [NO_2], and sulfur dioxide [SO_2]). Three agencies have jurisdiction over the ambient air quality in the proposed project location: the U.S. Environmental Protection Agency (EPA), Ecology, and SWCAA. These agencies establish regulations that govern the concentrations of pollutants in the outdoor air. Applicable local, state, and federal ambient air quality standards are displayed in **Table 4-1**.

Table 4-1. Applicable Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Terms of Compliance [a]	Concentration
Total Suspended Particulate		
Annual Average (µg/m^3)	Geometric mean not to exceed	60 µg/m^3
24-Hour Average (µg/m^3) WA State only; no federal standard	Not to be exceeded more than once per year	150 µg/m^3
Inhalable Particulate Matter (PM_{10})		
Annual Average (µg/m^3)	Arithmetic mean; not to be exceeded	50 µg/m^3 [b]
24-Hour Average (µg/m^3)	The 3-year average of the 98th percentile of the daily concentrations must not exceed	150 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)		
Annual Average (µg/m^3)	The 3-year annual average of daily concentrations must not exceed	12 µg/m^3
24-Hour Average (µg/m^3)	The 3-year average of the 98th percentile of daily concentrations must not exceed	35 µg/m^3
Sulfur Dioxide (SO_2) [(b)]		
Annual Average (ppm)	Annual arithmetic mean of 1-hour averages must not exceed	0.02 ppm [b]
24-Hour Average (ppm)	24-hour average must not exceed	0.10 ppm [b]
1-Hour Average (ppm)	1-hour average must not exceed	0.40 ppm [b]
1-Hour Average (ppm)	The 3-year average of the 99th percentile of daily max 1-hour conc. must not exceed	0.075 ppm
1-Hour Average (ppm)	No more than twice in 7 consecutive days may 1-hour average exceed	0.25 ppm [b]
Carbon Monoxide (CO)		
8-Hour Average (ppm)	The 8-hour average must not exceed more than once per year	9 ppm
1-Hour Average (ppm)	The 1-hour average must not exceed more than once per year	35 ppm
Ozone (O_3)		
8-Hour Average (ppm)	The 3-year average of the 4th highest daily maximum 8-hour average must not exceed	0.075 ppm
8-Hour Average (ppm) Revised effective 12/28/2015 [c]	The 3-year average of the 4th highest daily maximum 8-hour average must not exceed	0.070 ppm
Nitrogen Dioxide (NO_2)		
Annual Average (ppm)	The annual mean of 1-hour averages must not exceed	0.053 ppm
1-Hour Average (ppm)	3-year avg. of 98th percentile of daily max 1 hour averages must not exceed	0.1 ppm
Lead (Pb)		
Rolling 3-month Average	Rolling 3-month average not to exceed	0.15 µg/m^3

Note: µg/m^3 = micrograms per cubic meter; ppm = parts per million

[a] All limits are federal and state air quality standards except as noted. All indicated limits represent "primary" air quality standards intended to protect human health.

[b] Washington State standards; Washington applies more stringent annual and 24-hour limits for SO_2 than in federal rules. There is also a federal 0.5 ppm 3-hour average "secondary" standard for SO_2 to protect welfare.

[c] The newly adopted 8-hour ozone standard became effective 12/28/2015 but will not wholly replace the existing standard until current standard is revoked, probably sometime in 2017.

The ambient air quality standards (**Table 4-1**) have been set at levels that EPA and Ecology have determined will protect human health with a margin of safety, including the health of sensitive individuals, such as the elderly, the chronically ill, and the very young.

Ecology maintains a network of air quality monitoring stations throughout Washington State. Based on monitoring information for criteria air pollutants collected over a period of years, Ecology and EPA designate regions as being "attainment" or "nonattainment" areas for particular pollutants. Attainment status is a measure of whether air quality in an area complies with the federal health-based ambient air quality standards for criteria pollutants. Once a nonattainment area achieves compliance with the national ambient air quality standards (NAAQSs), the area is considered an air quality "maintenance" area in perpetuity or until the NAAQSs that was the basis of the original nonattainment designation is rescinded. The methanol plant would be located in a region currently considered to be in attainment for all criteria pollutants. One aspect of the air quality study described here was to assess whether ambient air quality would continue to comply with the NAAQSs with the proposed project in operation. The findings of this review comprise the basis for determining whether the proposed project would result in any potential significant adverse air quality impacts.

4.3.1.2 Acceptable Source Impact Levels (ASILs) for Air Toxics

In addition to the health-based ambient air quality standards described above, the proposed project has the potential to emit non-criteria air pollutants that are regulated federally by CAA Section 112, and regulated in Washington by Ecology under Chapter 173-460 WAC. Some of these pollutants are deemed hazardous air pollutants under CAA Section 112; others are defined as toxic air pollutants (TAPs) under Chapter 173-460 WAC. Although there are no ambient standards for TAPs, there are risk-based screening level regulations for TAPS that are known or suspected to be toxic or carcinogenic to people. These screening levels, known as Acceptable Source Impact Levels (ASILs), are applied in permitting processes for industrial pollution sources.

All TAPs emitted by proposed project stationary sources (i.e., those fixed sources subject to air permitting review) were considered during the air permitting analysis. The TAPs ASIL screening levels, which do not apply to emissions from mobile sources like vessels, are sometimes nonetheless used as benchmarks for considering concentrations of toxic air contaminants subject to permitting requirements. Such a review was conducted for this assessment.

4.3.1.3 Air Permitting Review

This section briefly summarizes the air quality permitting review required for the proposed project. That review, conducted separately from the SEPA environmental impact review, was necessary to prepare the permit applications described below. Results from the permitting analyses contributed to the environmental impact analyses documented in this section.

The air quality permitting process considered the appropriate levels of permitting for the proposed methanol manufacturing facility based on the maximum potential annual emissions. If such emissions of criteria pollutants[1] exceed 100 tons per year, the proposed methanol manufacturing facility would be considered a major stationary source subject to evaluation under the federal Prevention of Significant Deterioration (PSD) regulations. The PSD program

[1] See Table 4-1 for a list of criteria pollutants.

is designed to prevent the degradation of air quality in locations with very good air quality and in locations complying with applicable ambient standards.

The initial air quality permitting review considered the Combined Reforming (CR) and Ultra-Low Emissions (ULE) configurations of the proposed methanol manufacturing facility. Based on emissions calculations, the CR Alternative configuration of the facility would be a major source that would need to be considered under federal PSD regulations, while the ULE Alternative configuration would be a minor source not subject to federal PSD regulations.

Although the ULE Alternative would not be a major source subject to the federal PSD permitting requirements, Ecology's rules incorporate an out-of-date version of EPA's PSD rules that require a PSD permit for new sources of GHGs with annual emissions greater than 100,000 tons per year.[2] Consequently, the facility with the ULE Alternative would require a state PSD permit for GHG even though it is not a major source under the federal PSD rules. The state PSD permit would require air quality impact analysis and best available control technology (BACT) for GHGs and each other pollutant that may exceed the significant emissions rate (NOx, volatile organic compounds [VOCs], PM_{10}, and $PM_{2.5}$).

If the project proceeds with the CR Alternative configuration, it would be subject to the federal PSD program as implemented by Ecology, including implementation of BACT for GHG and other pollutants that exceed significant emission rates. If the project proceeds with the ULE Alternative configuration, it would require a PSD permit under Ecology's rules, but not under the federal PSD program (i.e., because emissions would be less than the federal PSD thresholds). The state PSD permit also would require an air quality impact analysis but might not include all the same elements as required under the federal PSD program and would require BACT for GHGs and other pollutants that exceed significant emission rates. Additional requirements for the permitting review are described in **Appendix D**.

4.3.1.4 Air Quality Conformity Review

Special air quality "conformity: rules requiring additional reviews for some projects apply in areas that are designated as nonattainment or maintenance for one or more air pollutants. These rules do not apply in the project study area because the area is considered in attainment for all criteria air pollutants. Consequently, neither the "transportation" nor the "general" air quality conformity rules apply to this project.

4.3.2 Existing Air Quality Conditions

Existing sources of air pollution in the vicinity of the project site include industrial emission sources and transportation-related activities, including river marine diesel-fueled vessels and both diesel and gas vehicles on the nearby freeway. With diesel-fueled sources operating around industrial sources, the criteria air pollutants of primary concern are NO_X and particulate matter (PM_{10} [i.e., coarse particulate matter of 10 microns in diameter or less] and $PM_{2.5}$ [i.e., fine particulate matter of 2.5 microns in diameter or less]). Other pollutants include ozone precursors (hydrocarbons and NO_x) and SO_2. Given the setting, industrial and transportation sources likely comprise the largest contributors to ambient pollutant concentrations in the vicinity of the project site. Refer to **Appendix D** for additional information.

[2] Until June 2014, EPA's PSD rules required PSD review for major sources of GHG, but the U.S. Supreme Court struck down those rules.

Estimated existing background air pollutant concentrations were developed by Ecology using modeling methods to provide this information for locations at which there are insufficient data from local air quality monitoring to allow more direct estimates. The estimated existing background concentrations for all criteria air pollutants were far less than the levels allowed by the ambient air quality standards (**Appendix D**, Table 2). These background concentrations were considered in the dispersion modeling analyses of the proposed project. Several air pollutants of particular interest and their sources are described below.

4.3.2.1 Inhalable Coarse and Fine Particulate Matter

Particulate matter air pollution is generated by industrial activities, fuel combustion sources like marine vessels, residential wood burning, locomotives, motor vehicle engines and tires, and other sources. Federal, state, and local regulations set limits for particulate concentrations in the air based on the size of the particles and the related potential threat to health. When first regulated, airborne particulate matter rules were based on concentrations of "total suspended particulate," which included all size fractions. As air sampling technology has improved and the importance of particle size and chemical composition to human health risk has become clearer, ambient standards have been revised to focus on the size fractions thought to be most dangerous to human health. Based on the most recent studies, EPA has redefined the size fractions and set more stringent standards for particulate matter based on fine (i.e., $PM_{2.5}$) and coarse (i.e., PM_{10}) inhalable particulate matter to focus control efforts on the smaller size fractions.

There are currently health-based ambient air quality standards for PM_{10}, as well as for $PM_{2.5}$ (**Table 4-1**). $PM_{2.5}$ and even smaller (ultra-fine) particles are now thought to be the most dangerous size fractions of airborne particulate matter. With the revocation of the federal annual standard for PM_{10} in October 2006, the focus of ambient air monitoring and control efforts related to particle air pollution in the region has been almost entirely on $PM_{2.5}$. The project study area has never been included in a particulate matter nonattainment area. Particulate matter concentrations associated with the proposed project were analyzed in detail as part of the air quality review reported in this section.

4.3.2.2 Ozone

Ozone is a highly reactive form of oxygen created by sunlight-activated chemical transformation of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Ozone problems tend to be regional in nature because the atmospheric chemical reactions that produce ozone occur over a period of time, during which ozone precursors can be transported far from their sources. Transportation sources, including large marine vessels, locomotives, and trucks, are some of the sources that produce ozone precursors. Because ozone is not emitted directly, only very sophisticated air quality models are capable of considering ozone formation in the atmosphere, and such models are typically used for regional assessments of air quality plans. Thus, ozone modeling is not typically performed for project-specific reviews, and ozone was not considered in the air quality impact analysis for the proposed project.

In October 2015, EPA adopted a new primary NAAQS for ozone based on an 8-hour average concentration of 70 ppb that became effective 28 December 2015. The current standard of 75 ppb (**Table 4-1**) will remain in effect until it is revoked sometime in the next several years. The current standard and the new standard have no immediate implications for the proposed project.

4.3.2.3 Sulfur Dioxide (SO_2)

SO_2 is a colorless, corrosive gas produced by burning fuels containing sulfur like coal and oil, and by industrial facilities, such as smelters, paper mills, power plants, and steel manufacturing plants. Except near large emission sources, SO_2 levels are typically well below federal standards. The potential SO_2 concentrations associated with the proposed project were analyzed in detail as part of the air quality review reported in this section.

4.3.2.4 Nitrogen Oxides (NO_x)

The combination of nitric oxide and NO_2 is commonly called oxides of nitrogen or NO_X. Other oxides of nitrogen, including nitrous acid and nitric acid, are part of the nitrogen oxide family. Of this family of gasses, NO_2 is the only component for which ambient air quality standards have been established, and this pollutant is used as the indicator for the larger group of NOx. There is an annual average standard for NO_2 that has been in effect for many years, and EPA adopted a 1-hour standard for NO_2 that became effective in April 2010. Modeling-estimated existing background concentrations in the project vicinity are about 33 percent and 10 percent of the concentrations allowed by the hourly and the annual NAAQSs, respectively. Potential NO_2 concentrations attributable to sources associated with the proposed project were considered in detail in the air quality review documented in this section.

4.3.2.5 Toxic Air Pollutants (TAPs)

In addition to the criteria air pollutants for which health-protective air quality standards have been set, all fuel combustion sources emit a number of known or suspected TAPs that may be directly harmful due to their chemistry and/or cause cancer or other detrimental effects to human health with long-term exposure. Although there are no specific health-related air quality standards for such pollutants, EPA, Ecology, and SWCAA have established screening levels for a variety of TAPs that can be used in assessing the relative potential of adverse impacts. Three TAPs—diesel engine exhaust particulate matter (DPM), methanol, and ammonia—were considered in this analysis to account for proposed project-related emissions of these pollutants.

A common method of assessing the relative risk of exposure to TAPs is to estimate the likelihood of increases in incidents of cancer due to a lifetime of exposure (usually assumed to be 70 years) to a given contaminant. Some screening levels for assessing such potential risk are based on an increased risk of one additional cancer among one million people. Ecology has adopted this sort of conservative screening approach for TAPs using screening level ASILs. ASILs are used during air quality permitting reviews of proposed new or modified stationary emission sources, and ASILs are applied based on the incremental changes in pollutant concentrations expected to occur due to proposed projects. The Washington State ASILs are not intended for use in evaluating emissions from mobile sources; however, the ASILs were considered in the air permit application for stationary sources associated with the proposed methanol manufacturing facility. The ASILs represent very conservative benchmarks that can be used as one of several factors for assessing potential risk related to exposure to TAPs. If an air quality permitting modeling analysis indicates a predicted ambient concentration that exceeds an ASIL, the applicant has the opportunity to prepare a health impact assessment to evaluate the potential of whether the project-related emission increases would represent an unacceptable health risk. Such an assessment considers the ASIL in conjunction with several other factors (e.g., land use types, age of population, etc.) to estimate potential exposure and risk. But again, other than federally mandated emission controls for various engines, no specific air quality regulations pertain to mobile sources (i.e., vessels) operating near the project site.

Diesel Engine Particulate Matter (DPM)

The ASIL for DPM that was considered in the assessment reported here is also fundamentally different than the NAAQSs adopted to protect human health and welfare with a margin of safety. The NAAQSs (**Table 4-1**) are designed to protect against known or suspected short-term acute and long-term chronic health effects due to exposure over certain periods. The NAAQSs are based on protecting even the most sensitive populations from exposure over periods ranging from 1 hour to one year. For example, SO_2 standards are based on 1-hour, 3-hour, 24-hour, and annual average concentrations, and the ambient standards for other criteria pollutants are similarly based on time-weighted average exposure limits.

In contrast, the ASILs, such as the one for DPM considered in this analysis, are based on estimates of the possible risk of the additional incidence of cancer in a population with continuous (i.e., 24 hours per day) exposure over 70 years. So instead of standards based on relatively well-defined dose responses, the long-term TAPs screening levels are based on the estimated potential risk associated with long-term, constant exposure.

The ASIL for DPM was considered in this assessment to provide a benchmark for gauging potential impacts of DPM emissions from on-site diesel-fueled equipment and vessels maneuvering to and from the facility dock and for general cargo vessels hoteling (i.e., operating while stationary) at the dock. This Washington TAP screening impact level for DPM is based on an annual average concentration (**Table 4-2**), and it establishes a very low concentration. EPA has not adopted a similar cancer risk estimate for use at the federal level due to continuing uncertainties in the underlying data. EPA says, "[diesel exhaust] human exposure-response data are considered too uncertain to derive a confident quantitative estimate of cancer unit risk . . ." (EPA 2002). Instead, EPA uses a 5.0 µg/m^3 reference concentration to represent the exposure through inhalation to which humans may be exposed throughout their lifetime without being likely to experience adverse non-cancer respiratory effects (**Table 4-2**). The ASILs and EPA reference levels (for exposure through inhalation) for methanol and ammonia are also presented in the table.

Table 4-2. Air Toxic Impact Screening Levels for Selected TAPs

Toxic Air Pollutant	Washington ASIL [a] (µg/m^3)	Averaging Period	EPA RfC (µg/m^3)
Diesel engine exhaust particulate matter	0.00333	Annual	5.0
Methanol (Methyl Alcohol)	4,000	24-hour	2,000
Ammonia (NH_3)	70.8	24-hour	100

Sources: WAC 173-460-150 (http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460-150); EPA
Notes: ASIL – acceptable source impact level, RfC – reference concentration for inhalation exposure, EPA – U.S. Environmental Protection Agency (http://www2.epa.gov/iris)
[a] ASILs represent screening levels intended to be used during permitting processes for stationary air pollution emission sources. ASILs are not intended to apply to mobile sources and are not required to be considered during environmental reviews. The DPM ASIL is used in Washington as an indicator of potential risk of an increase in cancer rates of 1 in 1 million people exposed for 70 years. EPA has not adopted a cancer risk factor for DPM due to uncertainties in the underlying data; the EPA RfC is a non-cancer risk factor representing an estimated safe level of exposure over a lifetime.

Ecology (2008) indicated it considers the ASIL concentration for DPM to represent a negligible risk, and went on to note: "even the least exposed Washingtonians are likely to be exposed to higher diesel particulate concentrations [than the ASIL]." Ecology (2008) also reported that EPA estimated the median DPM exposure in Washington to be 0.249 $\mu g/m^3$, a level about 75 times greater than the ASIL. This estimated existing common exposure level for people living in a wide variety of environments underscores the point that the DPM ASIL is a very conservative value for estimating the potential for human health effects. For example, the model-calculated existing background concentration for $PM_{2.5}$ (**Appendix D**), which probably overstates DPM levels but which would be in great part comprised DPM, is more than 1,500 times higher than the DPM ASIL.

Odor

Existing odors in the vicinity of the project site can likely be attributed to natural sources associated with the river, diesel-fueled vehicles, and industrial activities. This location along the Columbia River may also be subject to odors associated with marine transportation activities. The proposed project would be subject to SWCAA regulations requiring any source of emissions of odorous substances to use recognized good practice and procedures to reduce such odors to a reasonable minimum to prevent unreasonably interfering with any other property owner's use and enjoyment of his property.

4.3.2.6 Meteorological Conditions and Climate

Air quality is substantially influenced by climate and meteorological conditions, so prevalent weather patterns are a major factor in both short- and long-term air quality conditions. Regional geography affects climate in the study area. The combination of mountains and water create a regional meteorology unique to the Pacific Northwest. The climate in the proposed project study area is predominately temperate, characterized by wet, mild winters and dry, warm summers. The climate is influenced by the relative proximity of the Pacific Ocean and the Cascade and Coast ranges of Oregon and Washington.

Wind direction and wind speed are complicated by geography and terrain, so it is more difficult to represent predominant winds using more distant climatological data. A three-year data set for purposes of dispersion modeling was created using meteorological data from an on-site meteorological station operated at Noveon Chemical in Kalama. This meteorological data set was used in the air quality modeling analysis documented in later sections of this EIS.

4.3.2.7 Greenhouse Gases and Global Climate Change

The phenomena of natural and human-caused effects on the atmosphere that cause changes in long-term meteorological patterns due to global warming and other factors is generally referred to as climate change. Due to the importance of the greenhouse effect and related atmospheric warming to climate change, the gases emitted globally that affect such warming are called GHGs. The GHGs of primary importance are CO_2, methane, and nitrous oxide. Because CO_2 is the most abundant of these gases, GHGs are usually quantified in terms of CO_2 equivalents (CO_2e), based on the relative longevity in the atmosphere and the related "global warming potential" of these constituents. CO_2 is not considered an air pollutant that causes direct health-related impacts, so it is not subject to ambient standards used to gauge pollutant concentrations in the air.

The global climate changes continuously, as evidenced by repeated episodes of warming and cooling documented in the geologic record. But the rate of change has typically been incremental, with warming or cooling trends occurring over the course of thousands of years.

The past 10,000 years have been marked by a period of incremental warming, as glaciers have steadily retreated across the globe. However, scientists have observed an unprecedented increase in the rate of warming over the past 150 years. This recent warming has coincided with the Industrial Revolution, which resulted in widespread deforestation to accommodate development and agriculture along with increasing use of fossil fuels. These sources have released substantial amounts of GHGs into the atmosphere and resulted in GHG levels unprecedented in the modern geologic record.

GHGs are emitted by both natural processes and human activities, and GHGs trap heat in the atmosphere. The accumulation of GHG in the atmosphere affects the earth's temperature. While research has shown that the Earth's climate has natural warming and cooling cycles, the overwhelming preponderance of evidence indicates that emissions related to human activities have elevated the concentration of GHGs in the atmosphere far beyond the level of naturally occurring concentrations and that this in turn is resulting in more heat being held within the atmosphere.

Fuel combustion used for transportation is a significant source of GHG emissions primarily through the burning of gasoline and diesel fuels. National estimates indicate the transportation sector (including on-road, construction, airplanes, and vessels) accounts for about 33 percent of total domestic CO_2e emissions from fossil fuels in 2013 (EPA 2015). In an interim tabulation of 2012 emissions within Washington, Ecology estimated transportation accounted for about 46 percent of statewide GHG emissions, in part because emissions in other sectors are reduced because the state relies heavily on hydropower for electricity, unlike other states that rely more heavily on fossil fuels (e.g., coal, petroleum, and natural gas) to generate electricity. The next largest contributors to total gross GHG emissions in Washington were about 22 percent from fossil fuel combustion for a combined residential, commercial, and industrial category and about 16.5 percent for electricity generation. Agricultural activities and specific industrial processes, such as aluminum and cement manufacturing, accounted for about 5 percent each, while solid waste management activities, including GHG emissions from landfills, contributed about 4 percent (derived from Ecology 2014).

Note that CO_2 is not subject to ambient standards used to gauge pollutant concentrations in the air in relation to potential health impacts to people. The GHG tabulations for this proposed project were developed using accepted techniques for emission inventories, but these listings are intended only to provide an approximate indication of GHG emissions related to the proposed project based on estimated direct and indirect emissions from fuel combustion sources related to the proposed project within Washington State.

No specific federal, state, or local emission reduction requirements or targets are applicable to the proposed project, and there are no generally accepted emission level thresholds against which to assess potential localized or global impacts of GHG emissions. Ecology has issued internal guidance to assist its staff in determining which projects should be evaluated and how to evaluate GHG emissions under SEPA (Ecology 2011). This guidance provides the following regarding how to assess the relative significance of project-related GHG emissions:

> *The SEPA rules also state, in defining significance, that it involves context and intensity and does not lend itself to a formula or quantifiable test (WAC 197-11-794). However, we believe that we can identify what level of greenhouse gas emissions would not be significant, especially taking into account the state's greenhouse gas reduction targets and other legal requirements to reduce or mitigate emissions.*

RCW 70.235.020 establishes greenhouse gas reduction targets for Washington. By 2020, we are to return to 1990 levels. While there are also reduction targets for 2035 and 2050, at this point we are concentrating on meeting the 2020 targets. Based on Ecology's most recent Comprehensive Plan to meet those targets, the state must reduce its emissions by 11% in order to return to 1990 levels by 2020.

There are also some legal requirements to reduce or mitigate GHG emissions. These include:

- *Facilities subject to Prevention of Significant Deterioration (PSD) requirements under the Clean Air Act that have been determined to meet "Best Available Control Technology" for GHGs.*
- *New fossil-fueled thermal electric generating facilities required to offset a portion of their CO_2 emissions under RCW 80.70.*
- *Baseload power generation facilities subject to the state Emissions Performance Standard (RCW 80.80).*

A proposal will be presumed to be not significant for GHG emissions and thus no further mitigation for GHG emissions will be necessary if it is:

- *Expected to result in fewer than 25,000 metric tons a year;*
- *Subject to a legal requirement to reduce or mitigate GHG emissions; or*
- *Expected to result in emissions of 25,000 metric tons or more a year and has incorporated mitigation measures to reduce its emissions by approximately 11% below what its emissions would have been without those mitigation measures.*

These proposals should still disclose their emissions as outlined in Section D of this document and at the appropriate level of detail as outlined in Section G.

For projects that have incorporated mitigation measures to reduce emissions by 11%, the project proponent should use a reasonable amount of effort to demonstrate that those measures will get as close to the 11% reduction as possible, however it is not necessary to mitigate emissions by exactly 11%.

By identifying the level of emissions that would be presumed to be not significant, the agency is not taking the position that emissions exceeding those levels would be presumed to be significant. It is unlikely that a proposal would be considered significant based solely on its GHG emissions. We would expect a project with high GHG emissions to also have other environmental impacts.

As discussed above, both the ULE Alternative and the CR Alternative would be required to obtain a PSD permit consistent with Ecology's existing PSD rule, which would require BACT for GHGs (i.e., the project would be "subject to a legal requirement to reduce or mitigate GHG emissions"). In addition, because the ULE Alternative was investigated and selected for the very purpose of reducing air emissions that the CR Alternative would produce, the ULE technology itself is a mitigation measure as discussed in more detail in section 4.5.2.

4.3.3 Analytical Methods

This section summarizes the methods applied in the air quality impact analysis. Refer to **Appendix D** for additional details regarding these methods.

4.3.3.1 Criteria Air Pollutants and TAPs

The air quality impact analysis included two basic steps: (1) emission inventory development to estimate emissions related to operation of the proposed Facility with full capacity operations, and (2) dispersion modeling to estimate air contaminant concentrations in the ambient air that would result from these emissions. The estimates of emissions and subsequent dispersion

modeling employed several standard computer tools, as well as emission rate calculations using formulas published by EPA.

A separate review that considered the stationary sources that would be developed at the proposed methanol manufacturing facility was conducted for the purpose of preparing a permit application for the project. The additional analyses conducted for the EIS built onto the air quality permitting review and also considered emissions related to vessels associated with operation of the proposed project and other vessels expected to use the new marine terminal.

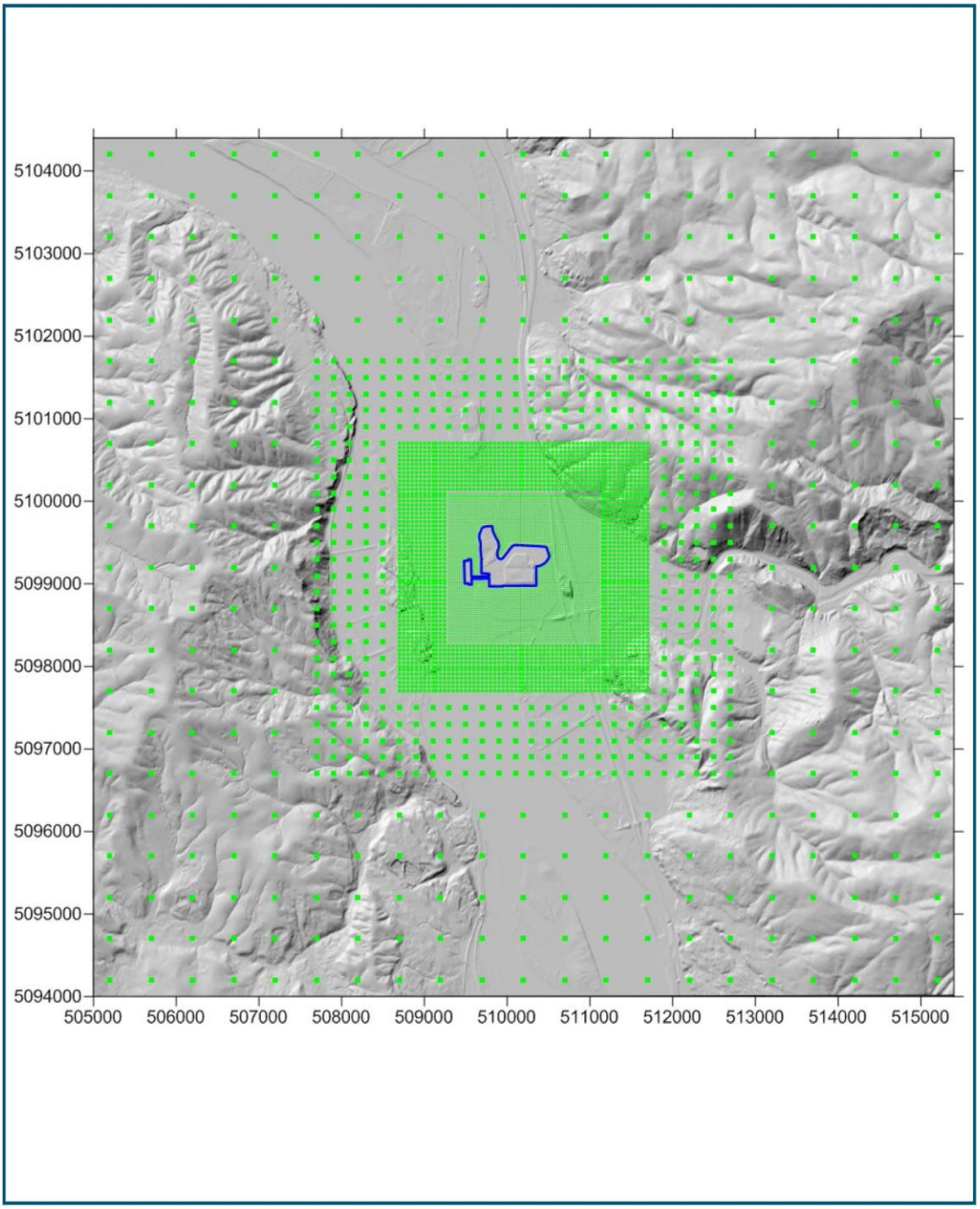
The air quality analysis for the proposed methanol manufacturing facility air permit application considered facility-related air pollutant emission sources subject to permitting. That analysis included the following sources: three natural gas-fired boilers, a 12-cell cooling tower, steam reforming units, flare, tanks, tank and ship vent scrubbers, emergency generators, fire pumps, and component leaks. Emissions related to vessels traveling to and from the proposed project considered methanol tanker and general cargo vessels (i.e., vessels that would use the marine terminal when it is not in use for loading methanol) in transit over about 1 nautical mile down river from the proposed project, and the combination of large vessels and tugs assisting them during docking and undocking and departure.

The proposed project would provide shore power to allow all methanol tankers to "cold iron" while docked (i.e., not have to generate their own power). Thus the vessel fleet used to transport methanol would not generate emissions once they are docked. However, other vessels unrelated to the proposed methanol plant also are expected to use the marine terminal, and these vessels may not be equipped to use shore power and would need to run fossil fuel-fired engines or auxiliary generators for power. Therefore, to consider potential worst-case, short-term (i.e., 1 hour) emissions, the air quality modeling considered hoteling emissions by general cargo vessels at the marine terminal.

The air quality modeling was conducted using approved EPA modeling tools called AERMOD. This modeling system includes preparation of a meteorological data set along with surface roughness estimates based on nearby land uses. These data are used in conjunction with detailed estimates of emissions that are both temporally and spatially distributed to simulate operation of the sources being considered. The modeling used a 10- x 10-kilometer (6.2 x 6.2 miles) "domain" with variously spaced "receptor" grids (see **Figure 4-1**). As shown, in the outer portions of the domain, the receptors were more thinly spaced, and they were more densely spaced nearer to the proposed project boundaries.

Note that the air quality permitting review was based on the fence line of the property that would be controlled by the NWIW as the demarcation for where the ambient air quality standards apply. Modeling receptors, therefore, begin at the proposed methanol manufacturing facility fence line. The air quality impact modeling documented in this chapter used the same fence line boundary for upland receptors and an expanded facility footprint that incorporated the proposed marine terminal (see **Figure 4-1**).

The AERMOD assessments for compliance with long-term (i.e., annual average and daily) NAAQSs (**Table 4-1)** were based on estimated annual and daily emission rates, respectively. But the modeling for the short term (i.e., 1-hour, 3-hour, and 8-hour), NAAQSs very conservatively assumed maximum hourly emissions were occurring during every hour of every day of the three-year meteorological data set.



AERMOD Modeling Domain
Figure 4-1

KALAMA SEPA
Manufacturing & Marine Export Facility

Additional details regarding the methods and findings of these analyses are documented in the air permit application and summarized in **Appendix D**.

4.3.3.2 Cooling Tower Effects on Ground-Level Fog and Visibility

Almost all industrial, commercial, and even multi-family residential facilities need to dispose of excess or unwanted heat. While some excess heat can be put to productive uses, in most cases it is impossible, infeasible, or impractical to capture and use all the excess heat. As a result, systems have been developed to dispose of waste heat, with the most common method being using a device/system called a cooling tower. Cooling tower systems collect waste heat in water and then cool the water with air.

Exhaust air from cooling towers has the potential to result in environmental impacts due to the high moisture content of the exhaust and the temperature differential of the exhaust and the air into which it is emitted. Air entering a cooling tower is normally at ambient temperature, but air exiting the cooling tower is usually considerably warmer. In addition, entering air contains ambient levels of water vapor, but will be nearly or completely saturated (i.e., able to contain no additional water) as it exits the cooling tower. As the exhaust air mixes with the surrounding air, it cools rapidly and can no longer carry the water vapor it held while inside the tower. The resulting condensation releases the water vapor, so most cooling towers emit a visible plume. Such water vapor is not an air pollutant, and any visible plumes of water vapor are not considered air pollution. Such plumes, however, have the potential to result in fogging, icing, and/or visible plume impacts. Additional details regarding the methods and findings of these analyses are documented in the air permit application and summarized in **Appendix D**.

Cooling Tower Plume Analytical Tool (SACTI)

Assessing potential cooling tower impacts involves estimating the expected frequencies that different exhaust plume conditions could occur within a project-specific setting. Analyzing fogging, for example, involves estimating the number of hours per year of cooling-tower related fogging at locations of interest. These results can then be plotted to provide graphical indications of the potential level of impact from the tower system.

One computer tool available for considering the potential effects of cooling towers is the Seasonal Annual Cooling Tower Impact (SACTI) model.[3] The SACTI model was used in the analysis documented here to estimate the impacts of the proposed facility cooling towers based on the meteorology of the area (typically on an hourly basis for multiple years) and the specifics of the cooling tower systems, including the location, the physical dimensions, air flows, temperatures, and the heat rejection rates. Additional discussion of cooling towers and information regarding the technical details of the modeling are included in **Appendix D**.

4.3.3.3 GHG Emissions

The GHG emissions associated with operation of the proposed project were estimated using standard emission inventory techniques for the stationary and mobile sources involved in normal operations. Stationary source GHG emissions were estimated based on the sources considered in the air quality permitting review, along with vessel operation emissions associated with transport of the final manufactured product within Washington State waters. In

[3] Electric Power Research Institute (EPRI), *User's Manual: Cooling-Tower-Plume Prediction Code*, Document Number EPRI CS-3403-CCM Project 906-1, April 1984, developed by Argonne National Laboratory.

addition, both purchased and on-site generated electricity used in the production process were considered.

4.4 Environmental Impacts

4.4.1 Combined Reformer Alternative

4.4.1.1 Potential Construction Impacts

Construction activities related to the development of the proposed project are described in Chapter 2, Proposed Project and Alternatives. Construction would include ground moving, ground improvement, and structure erection activities typical to an industrial facility. Such activities could result in temporary, localized increases in particulate concentrations due to emissions from construction-related sources. For example, dust from construction activities, such as excavation, grading, sloping, and filling, would contribute to ambient concentrations of suspended particulate matter.

Construction would require the use of heavy trucks, excavators, graders, work vessels, pile drivers, and a range of smaller equipment, such as generators, pumps, and compressors. Emissions from diesel equipment could reduce ambient air quality, resulting in potential health risks. Although construction-related emissions would be minor, pollution control agencies are nonetheless now urging that emissions from diesel equipment be minimized to the extent practicable to reduce potential health risks.

Construction of the proposed project would include some activities that would generate odors. For example, some of the site would be paved with asphalt, and asphalt odors may be perceptible for a short period during such paving. If oil-based paints were applied to structures or equipment at the site, paint odors may be perceptible nearby. These impacts are anticipated to be slight and of short duration and to occur within the area of the activity that is the source of the odor. Construction contractor(s) would be required to comply with SWCAA regulations requiring any source of emissions of odorous substances to use recognized good practice and procedures to reduce such odors to a reasonable minimum to prevent unreasonably interfering with any other property owner's use and enjoyment of his property.

Construction would require the use of a variety of machinery, including tugs, heavy trucks, cranes, excavators, graders, concrete pumps, work vessels, pile drivers, and a range of smaller equipment, such as generators, pumps, and compressors, as wells as from vehicles used by workers to commute to the site that will result in GHG emissions. In addition, GHG emissions would be generated during the creation of material used in project construction, such as steel and concrete. An accurate estimate of construction-related GHG emissions was not completed as detailed information on the construction methods is not currently available. GHG emissions from construction would be minor in comparison to GHG emissions from the operation of the facility.

4.4.1.2 Potential Operational Impacts

Criteria Air Pollutants

The CR Alternative was not evaluated with dispersion modeling because this configuration was not sufficiently engineered to allow such an analysis. To provide a means for reasonably comparing the CR Alternative with the ULE Alternative, total annual emissions of criteria pollutants and GHGs were estimated for both technology alternatives and compared.

As shown in **Table 4-3**, the CR Alternative methanol manufacturing process would result in larger quantities of all criteria pollutant and GHG emissions than the ULE Alternative methanol manufacturing process. As shown in the final row of **Table 4-3**, compared with the CR Alternative, annual emissions from the ULE Alternative methanol manufacturing process would represent large decreases in all criteria pollutants. The inclusion of emissions related to on-site power generation using two combustion turbines as would be necessary with the ULE Alternative projects would increase total emissions related to this alternative, but overall emissions would still be substantially less than with the CR Alternative facility.

While these reductions do not allow direct comparisons with the dispersion modeling results (i.e., ambient concentrations) for the ULE Alternative discussed in the next section (because the sources are different and in some instances in different locations on the project site), this comparison suggests that the CR Alternative would have a greater potential to cause off-site air quality impacts than the ULE Alternative. If the CR Alternative were selected, it would be necessary to proceed with an air quality permitting analysis that includes complete dispersion modeling.

TAPs

TAP emissions under the CR Alternative would be greater than the ULE Alternative. Because the design was not sufficiently complete, the air quality permitting analysis and the air quality impact analysis were not able to consider dispersion modeling for TAPs associated with the CR Alternative. Such modeling was conducted for the ULE Alternative and is discussed later in this section.

Odor

Based on what is likely to be a very limited potential for emission of odorous substances and the SWCAA requirements restricting offensive odors being received off site, there would be little likelihood of significant adverse odor impacts from the CR Alternative.

Cooling Tower Effects on Ground-Level Fog and Visibility

Results of the plume fogging analysis for the CR Alternative suggest limited patterns of plume fogging to the north-northwest of the cooling towers, extending out to a distance of 500 meters. This projection is consistent with the wind patterns in the area. Areas of the fogging associated with the CR Alternative would not be expected to pose a driving hazard on nearby roadways or freeways. The modeling predicted zero hours of icing due to the plumes.

The SACTI modeling analysis of the potential frequencies of visible plumes indicated relatively long plumes would be expected during conditions of high relative humidity, cooler air temperatures, and stable atmospheric conditions. Plumes that occur more than 7 percent of the time would be generally restricted to plant property itself. Some visible plumes extending north and south to a distance of 7 kilometers are projected to occur much less often. Most plumes are projected to be less than 1,000 meters high. The largest plumes have a radius of less than 500 meters, with a majority of the plumes, 63 percent or greater, projected to be less than 60 meters in radius. Modeling predicted visible plume lengths for the CR Alternative at 50, 100, 500, and 5,000 meters for 63 percent, 62 percent, 40 percent, and 17 percent of the time, respectively. Additional details are provided in **Appendix D**.

Table 4-3. Total Annual Emissions from Normal Facility Operations

Emission Unit	Annual Emission Rate (tons per year)					
	NOx	CO	PM	SO_2	VOC[a]	GHG (CO_2e)[b]
Combined Reforming (CR) Alternative						
Reformer Heaters (2)	48	454	107	23	59	1,281,764
Boilers (3)	26	86	18	8.8	12	280,136
Cooling Tower	--	--	2.94	--	--	--
Flare	3.7	0.94	0.55	0.159	0.35	6,419
Tank Vent Scrubber	--	0.72	--	--	2.5	6.2
Ship Vent Scrubber	--	--	--	--	10.3	--
Tank Fugitives	--	0.0072	--	--	2.5	0.063
Miscellaneous Component Leaks	--	--	--	--	0.55	12
Emergency Generators	2.7	0.19	0.021	0.0029	0.027	301
Emergency Fire Pumps	0.26	0.08	0.010	0.0005	0.010	50
Total CR Process Emissions	**80**	**541**	**128**	**32**	**87**	**1,569,000**
Ultra-Low Emissions (ULE) Alternative						
Firebox Heaters (2)	0.422	0.429	0.0950	0.0926	0.0686	1,544
Boilers (2 + 1 reserve)	23	18	28	0.027	12	606,173
Cooling Tower	--	--	2.71	--	--	--
Flare Pilot	0.10	0.45	0.015	0.0052	0.20	171
Flare	6.3	9.3	0.93	0.00055	17.0	3,504
Tank Vent Scrubber	--	0.72	--	--	2.5	6.2
Ship Vent Scrubber	--	--	--	--	1.2	--
Tank Fugitives	--	0.0072	--	--	2.5	0.063
Misc Component Leaks	--	--	--	--	0.55	12
Emergency Generators	0.40	0.19	0.018	0.0029	0.095	301
Emergency Fire Pumps	0.26	0.08	0.010	0.0005	0.010	50
Total ULE Process Emissions	30	29	32	0.13	36	611,759
ULE Process Emissions Compared with CR Alt	-62%	-95%	-75%	-100%	-59%	-61%
On-Site Combustion Turbines (2)	44	43	33	14	18	464,569
Total ULE Emissions w/ On-Site Power Generation	75	72	64	14	54	1,076,329

Source: Ramboll Environ 2016

a. Note that VOC (Volatile Organic Compound) is a general category of air contaminant and not a specific air pollutant, so there is no ambient air quality standard for VOCs. VOCs include a variety of toxic air pollutants (TAPs). All directly emitted facility TAPs were considered and found to be less than the applicable screening level for each pollutant. A complete listing of the "non-criteria" air pollutants that would be emitted by the project facility, including VOCs and TAPs, is included in Appendix D.

b. Note values for GHGs are in short tons and do not match the values in Table 4-4, which are shown in metric tons (tonnes).

GHG Emissions

GHG emissions are often categorized by source/activity types, as follows:

- Scope 1 emissions include direct stationary combustion of fossil fuels, vehicle fleet emissions, any loss of carbon storage from the permanent conversion of forested lands, and facility emissions, such as methane emissions from new landfills, wastewater treatment plants, or manure management systems.
- Scope 2 emissions are those associated with purchased electricity or steam consumed by the project.
- Scope 3 emissions include heavy-machinery emissions during site preparation, construction, or cleanup activities, new ongoing project-related product transportation emissions within Washington State and its 3-mile nautical boundary, and project-related vehicle trips during construction and operation.

Each category was considered as described further below.

Scope 1 – Manufacturing Process Emissions

GHG emissions from the proposed methanol manufacturing facility process sources were tabulated for the two Technology Alternatives and are listed in **Table 4-4**. As shown, the CR Alternative manufacturing process would be projected to result in direct emissions of about 1.4 million metric tons of GHGs annually. The ULE Alternative manufacturing process would emit substantially less GHGs, but because adequate electrical transmission capacity is not available at the site, the ULE Alternative will require on-site power generation. As shown in **Table 4-4**, the ULE Alternative would emit substantially less GHGs even when the on-site power generation emissions are considered.

Scope 2 – Purchased Power Emissions

Both Technology Alternatives project facilities would require the use of electricity to provide power for a portion of manufacturing process. While all such electrical power needed for the CR Alternative facility could be provided by purchased power from the local utility, the ULE Alternative would require both purchased power and on-site generation to provide sufficient electricity. The CR Alternative would require about 50 megawatts of purchased electricity that would result in emissions of about 133,000 tonnes of CO_2e annually; the 100 megawatts of purchased electricity for the ULE Alternative would result in about 266,000 tonnes of CO_2e annually.[4]

Scope 3 – Product Transport Emissions

Transport of the finished methanol product would involve oceangoing vessels and assist tugs that would emit GHGs. These emissions would be the same with either Technology Alternatives. Estimated annual emissions associated with this vessel traffic within Washington State waters are about 3,900 tonnes of CO_2e. Both project construction and project employee trip GHG emissions would be minimal compared with the other categories that were considered.

[4] Estimated GHG emissions stemming from purchased electricity are based on EPA eGrid2012 emission rates for the northwest region of the United States.

Table 4-4. Facility Manufacturing Process GHG Emissions Summary

Operational Emissions	Annual CO_2e Emissions (Metric Tons) [a]
Facility Operations Stationary Sources (Scope 1)	
Combined Reforming (CR) Alternative Process Emissions [b]	1,423,397
Ultra-Low Emissions (ULE) Alternative Process Emissions [b]	554,183
Scope 1 process emissions reduction with ULE versus CR	-61.1%
ULE Alternative On-Site Power Generation [c]	421,457
Total ULE Facility-Related Direct GHG Emissions	976,445
Scope 1 total process-related emissions reduction with ULE versus CR	-31.4%

Source: Ramboll Environ 2016

[a] Note that these values are in metric tons (tonnes), a standard unit of measure for GHGs, so they do not match the values in Table 4-3, which are shown in short tons. Tonnes = short tons * 0.9072

[b] Direct methanol manufacturing process operations emissions based on calculations performed as part of the air quality permitting review for the two technology alternatives.

[c] The lack of electrical power available for purchase requires on-site generation using combustion turbines. But for the lack of power for purchase, this generation would not be required, so these emissions are separate from the manufacturing process emissions.

4.4.2 Ultra-Low Emissions Alternative

4.4.2.1 Potential Construction Impacts

Probable air quality impacts associated with construction of the ULE Alternative would be the same as those described for the CR Alternative.

4.4.2.2 Potential Operational Impacts

Criteria Air Pollutants

The ULE Alternative emissions were considered with detailed dispersion modeling that combined the ULE Alternative source emissions (i.e., manufacturing processes and on-site power generation) with those from vessel sources (i.e., oceangoing vessels and harbor assist tugs). This modeling considered all the operational scenarios (i.e., start-up and shutdown, normal operations, etc.) along with short-term worst-case and expected long-term vessel operations. Modeling results for typical operational scenarios are shown in **Table 4-5**. As shown, all the model-calculated off-site pollutant concentrations, including existing background concentrations, are well below the levels allowed by the NAAQSs and the Washington State standards. Complete modeling results are presented in **Appendix D**.

TAPs: Ammonia/Methanol/DEEP

All TAPs were considered in the air quality permitting analysis, and the proposed project sources were found to comply with all emission standards and to cause off-site concentrations

less than the respective screening level thresholds (Ramboll Environ 2016).[5] A subset of all the TAPs evaluated in the permitting analysis are shown in **Table 4-6**, and a complete listing of the TAPs considered is provided in **Appendix D**. As noted in the table, the air toxics assessment summarized in **Table 4-6** considered diesel engine exhaust particulate matter (DEEP) based only on the filterable portion of the emissions from stationary sources as is the mandated approach in permitting analyses.

TAPs: DPM

The air quality impact assessment for the EIS also considered diesel particulate matter (DPM) emissions from both on-site and mobile sources (i.e., vessels) associated with the project. That analysis indicated the ULE Alternative of the proposed project could result in DPM concentrations exceeding the Washington State ASIL. The ASIL is not intended to be applied to emissions from mobile sources or unoccupied areas like the river, but to provide a benchmark for considering this pollutant, the air quality review conservatively considered the ASIL along with mobile source emissions in estimating annual average DPM concentrations. The results of this assessment are depicted in **Figure 4-2**. As shown, the areas in which DPM concentrations exceed the ASIL are limited primarily to within the river. Note that although the DEEP (DPM) ASIL is used as a screening threshold in air quality permitting processes for considering whether additional analyses are necessary, the ASIL does not represent an actual indication of a health risk. Instead, it is only one factor that would be considered in a more comprehensive analysis to estimate actual likely exposure over a lifetime, and concentrations compared with the ASIL should not be construed to indicate risk, particularly for areas that are not continuously occupied, such as the Columbia River.

Table 4-5. ULE Alternative Modeling Results: Maximum Criteria Pollutant Concentrations

Operational Scenario	Pollutant	Period	Ambient Concentrations (µg/m³)				% of NAAQS
			Project	Background	Total	NAAQS	
Normal Operations	CO	1-hr	142	1,018	1,160	40,000	3%
	CO	8-hr	43	718	761	10,000	8%
	NO_2	1-hr	62	62	124	188	66%
	PM_{10}	24-hr	11	27	38	150	26%
	$PM_{2.5}$	24-hr	5	18	23	35	64%
	SO_2	1-hr	17	21	39	196	20%
	NO_2	Annual	1	10	11	100	11%
	$PM_{2.5}$	Annual	1	6	7	12	59%
Ops w/Start-up and Shutdown	NO_2	Annual	1	10	11	100	11%
	$PM_{2.5}$	Annual	1	6	7	12	56%

Source: Ramboll Environ 2016

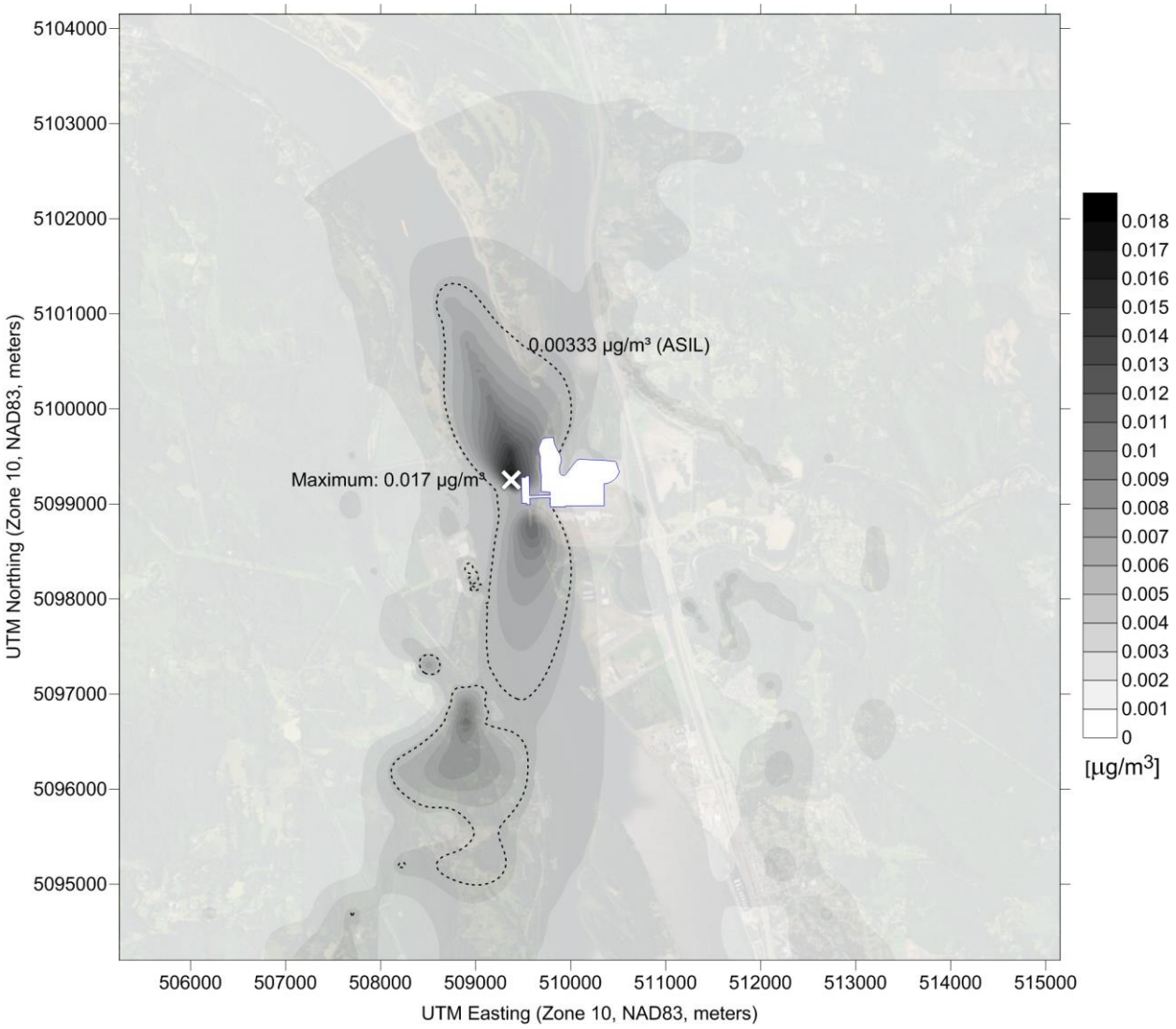
[5] The TAPs review process included comparing estimates of Facility emissions with the Small Quantity Emission Rates (SQERs) provided in the version of WAC 173-460 that was in effect in 1998 – because this version of the rule is still being used by SWCAA. Any TAPs that were found to exceed the respective SQERs were considered with dispersion modeling, and the modeling resulted were compared with the respective Acceptable Source Impact Levels (ASILs). All TAPs from the methanol plant were found to be less than their SQERs or less than their ASILs. A complete listing of all TAPs that will be emitted by the proposed project is included in **Appendix D**.

Table 4-6. ULE Alternative TAPs AERMOD Results – Stationary and Mobile Sources

Operational Scenario	TAP	Period	Ambient Concentrations (µg/m^3)	
			Facility Sources	Guideline
Normal Operations	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
	DPM	Annual	0.01739	0.00333
Start-up Line 1	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Shutdown Line 1	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Start-up Line 2	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Shutdown Line 2	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Annual w/SUSD	DPM	Annual	0.01739	0.00333
Normal - EGen1 test	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Normal - EGen2 test	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Normal - FP test	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Upset	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Emergency	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
ComTurb SU/SD	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
Duct Firing	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000
	DPM	Annual	0.01739	0.00333
Reserve Boiler SU	NH_3	24-hr	20	70.8
	Methanol	24-hr	21	4,000

Source: Ramboll Environ 2016

Note that the ASIL for ammonia (NH_3) presented in this table is based on the latest version of the ASIL adopted by Ecology. Because SWCAA has not yet updated its regulations to adopt the latest version of the Ecology ASIL, and because the SWCAA rules govern in the permitting review of this proposed facility, the NH_3 ASIL presented here (Ecology's) is not the same as the SWCAA ASIL presented in the air quality permit application (Ramboll Environ 2016).


5104000
5103000
5102000
5101000
5100000
5099000
5098000
5097000
5096000
5095000
UTM Northing (Zone 10, NAD83, meters)
0.00333 µg/m³ (ASIL)
Maximum: 0.017 µg/m³
506000
507000
508000
509000
510000
511000
512000
513000
514000
515000
UTM Easting (Zone 10, NAD83, meters)
0.018
0.017
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
[µg/m3]

To consider the issue of project-related off-site DPM concentrations further, an additional analysis was conducted in accordance with Ecology's 2nd Tier TAPs review procedures that may be applied during permitting assessments when direct facility emissions result in predicted concentrations exceeding the ASILs.[6] For this analysis, the procedures intended for application only to direct facility emissions were adapted to consider potential increased cancer risk associated with total (i.e., direct plus mobile source) DPM emissions from the proposed project. Background DPM concentrations were not considered because no data are available.

During permitting reviews of stationary emissions sources, if model-estimated TAP concentrations exceed an ASIL, Ecology allows a 2nd Tier analysis to more specifically consider the potential for increased cancer risk. For residential receptor locations, a 2nd Tier analysis under Ecology policy applies a criterion level of 10 times the ASIL.[7] This equates to an estimated increased cancer risk of one incidence in a population of 100,000 people – assuming continuous exposure over 70 years. This sort of assessment is intended to consider only the increased cancer risk associated with increased direct emissions from a proposed facility.

As shown in **Figure 4-2** (above), the highest model-predicted DPM annual average concentration even very near the facility was 0.017µg/m^3. Because this concentration occurs in the river, it would not result in long-term exposure to any people. In addition, because this value is less than 10 times the ASIL (i.e., < 0.033 µg/m^3), project-related DPM concentrations at all the nearest homes would all be less than allowed by the 2nd Tier criterion.

The additional modeling focused on four nearby residential areas. This modeling determined that DPM concentrations at all these nearby residences would be far less than the Ecology 2nd Tier DPM criterion. The highest model-predicted concentration occurs at a location southwest of the facility across the river, where the estimated increase in cancer risk is about three in a population of 1 million exposed continuously for 70 years, which is well below the 2nd Tier criterion. Additional details of the Tier 2 impact assessment for DPM are included in **Appendix D**.

Cooling Tower Effects on Ground-Level Fog and Visibility

Model-projected micro meteorological effects from cooling tower plumes are even less with the ULE Alternative than with the CR Alternative. As with the CR Alternative, the analysis indicated ULE Alternative plumes also would not be expected to pose a driving hazard on nearby roadways or freeways due to fogging or local icing. In addition, the frequency of visible plumes would be lower with the ULE Alternative. Refer to **Appendix D** for additional information including graphic depictions of the limited extents of potential cooling tower plume effects.

Odor

The potential for odor impacts and the applicable required control measures with the ULE Alternative would be the same as those described for the CR Alternative. Thus, no significant odor impacts would be anticipated.

6 WAC 173-460-090

7 Ibid.

GHG Emissions

GHG emissions from the alternative Facility sources, product transport, and indirect emission sources were tabulated for the two project alternatives and are provided in **Table 4-4** (above). As shown, expected GHG emissions associated with the ULE Alternative methanol manufacturing process (excluding on-site power generation) are about 61 percent lower than with the CR Alternative. And even with on-site generation of electricity, the direct (Scope 1) GHG emissions with the ULE Alternative are projected to be about 31.5 percent less than with the CR Alternative.

4.4.3 Marine Terminal Design Alternatives

As mentioned previously, in the absence of methanol transport tanker vessels hoteling and using fossil fuel-fired engines or auxiliary generators while at the proposed marine terminal (i.e., because the project would provide shore power to obviate this need), the vast majority of vessel emissions would occur while transiting to and from the dock and not at the dock. There are expected to be about 12 general cargo vessels hoteling at the dock per year. Such hoteling was considered in the worst-case modeling for the most restrictive 1-hour averaging period described previously. Because the location of the new dock would be about the same with either of the Marine Terminal Alternatives and they would receive the same type and frequency of vessel traffic, the air quality impacts of these alternatives would be the same. These potential impacts are accounted for in the dispersion modeling and presented in the discussions above as part of the overall proposed project air pollutant concentrations.

4.4.4 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed on the project site.

Given the project site's highway, rail, and waterfront access and the Port's Comprehensive Scheme for Harbor Improvements, it is expected that, absent the proposed project, the Port would pursue other industrial or marine terminal development of the site. If the project site were developed for water-dependent, industrial uses, it is likely that any construction-related air quality impacts would be similar to those assessed for the proposed project. No significant unavoidable adverse air quality impacts were identified for construction of the proposed project.

The No-Action Alternative could result in operational air quality impacts greater than or less than those of the proposed project, depending on the type of development ultimately pursued. For example, previous design concepts for such uses included a railroad loop for materials and product transport. A facility design that included rail uses would have locomotive emissions in addition to other project-related emissions.

4.4.5 Related Actions

4.4.5.1 Proposed Pipeline

Northwest Pipeline GP is proposing to permit, construct, and operate a 3.1-mile, 24-inch-diameter natural gas pipeline to provide a natural gas supply to the proposed project. The proposed pipeline is undergoing a separate permitting process under the jurisdiction of the Federal Energy Regulatory Commission. Potential impacts are summarized below.

Construction of the proposed pipeline-related action would involve excavation and drilling activities at a much smaller scale of disturbance than with the proposed project. Such activities could result in temporary, localized increases in particulate concentrations due to emissions from construction-related sources, though on a much smaller scale.

There are no permanent sources of operational emissions proposed for the pipeline with the exception of minor fugitive methane emissions. Fugitive emissions may result in small amounts of pollutants, while maintenance activity of the permanent right-of-way may result in small amounts of pollutants as well from mowing, cutting, and trimming. Any emissions from the operation of the proposed pipelines would not result in impacts to local or regional air quality, including fugitive methane emissions.

4.4.5.2 Electrical Service

The electrical service-related action would result in limited construction activities and would not introduce new permanent sources of air emissions. Therefore, it would not have the potential to result in significant adverse air quality impacts.

4.5 Mitigation Measures

4.5.1 Construction

Air quality impacts are not anticipated due to construction of the proposed project. Construction activities would comply with applicable federal and state air quality rules requiring minimization of construction-related emissions. No additional mitigation measures are warranted or proposed.

4.5.2 Operation

As discussed in section 4.3.2.7, Ecology's SEPA guidance for GHG (Ecology 2011) provides that, if certain criteria are met, a project's GHG impacts are "presumed to be not significant for GHG emissions and thus no further mitigation for GHG emissions will be necessary." Relevant to this project, a proposed project's GHG impacts are not significant if the project is required to employ BACT or the project will incorporate mitigation measures to reduce its emissions by approximately 11 percent below what they would be without mitigation. Both the CR Alternative and the ULE Alternative would be subject to Ecology's existing PSD rule for GHG, which would require them to employ BACT. The ULE technology would result in substantial reductions of GHGs compared to any other methanol manufacturing technology and is expected to constitute BACT. Because both alternatives would be required to employ BACT for GHGs, their GHG impacts would not be considered significant in accordance with Ecology's SEPA guidance for GHG.

In addition, because the ULE Alternative was investigated and selected for the purpose of reducing air emissions that the CR Alternative would otherwise produce, the ULE technology itself is a mitigation measure. Assuming that the ULE Alternative is selected, this project would be the first full-scale methanol facility in the world to employ ULE technology. All other methanol plants currently proposed or recently permitted for construction in the United States are based on the CR technology or another traditional technology with GHG emissions similar to the CR technology.

Scope 1 direct emissions of GHGs (**Table 4-4**) would be 31.4 percent lower with the ULE Alternative than those with the CR Alternative. This GHG reduction exceeds the 11 percent goal recommended in Ecology guidance for mitigating project-related GHG emissions and

meets Ecology's guidelines supporting the presumption that the project's impacts will not be significant for GHG emission (Ecology 2011).

The emission controls required as part of the stationary source air quality permitting would ensure compliance with applicable air quality regulations and minimize the potential for significant adverse air quality impacts related to operation of the proposed project. Because no significant impacts have been identified, no additional mitigation measures are warranted or proposed.

4.6 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts related to air quality or GHG emissions.

4.7 References

Ecology. 2011. Guidance for Ecology Including Greenhouse Gas Emissions in SEPA Reviews. 6/3/11. http://www.ecy.wa.gov/climatechange/docs/sepa/20110603_SEPA_GHGinternalguidance.pdf.

Ramboll Environ. 2016. Prevention of Significant Deterioration and Air Discharge Permit Application: Kalama Manufacturing and Marine Export Facility. Ramboll Environ US Corporation. February 2016.

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U.S. Environmental Protection Agency (EPA). 2002. *Health Assessment Document for Diesel Engine Exhaust*. National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, Washington, DC. EPA/600/8-90/057F. May 2002.

Washington State Department of Ecology (Ecology). 2014. Interim *GHG Emissions Inventory*, accessible at: http://www.ecy.wa.gov/climatechange/ghg_inventory.htm.

Chapter 5 Water Resources

5.1 Introduction

This chapter evaluates the potential impacts of the proposed project's two technology alternatives (the Combined Reformer [CR] Alternative and the Ultra-Low Emissions [ULE]) Alternative), two marine terminal alternatives (Marine Terminal Alternative 1 and Marine Terminal Alternative 2), and a No-Action Alternative, as well as the related actions, on water resources. The analysis describes the naturally occurring water resources at the project site and the locations of the related actions. The water resources include surface water, groundwater, floodplains, and wetlands. The chapter assesses the potential impacts of the construction and operation of the proposed project on these resources, and presents measures to mitigate potential impacts as appropriate. Potential impacts to water resources due to incidents or spills at the proposed methanol manufacturing facility or during vessel transport on the Columbia River are discussed in Chapter 8, Environmental Health and Safety.

5.2 Regulatory Context

As described in this section, surface water, groundwater, wetlands and floodplains are regulated at federal, state, and local levels.

5.2.1 Clean Water Act

The Clean Water Act (CWA) is the primary federal law governing water pollution. The CWA is intended to restore and maintain the integrity of "waters of the United States," which comprise most surface waters, including wetlands. The CWA requires permits for discharges of dredged or fill material into waters of the United States, including wetlands (Section 404), and for point source discharges of wastewater, including industrial stormwater, into waters of the United States (Section 402).

5.2.1.1 Section 401 Water Quality Certification and Standards

A federally issued license or permit for an activity that involves a discharge of fill material to waters of the United States may not be issued without a state certification pursuant to Section 401 of the CWA that the discharge would meet applicable water quality standards and certain other CWA requirements. In Washington, the Washington State Department of Ecology (Ecology) is the agency authorized to issue Section 401 certifications.

Water quality standards, including designated uses, quality criteria, and an antidegradation policy, are set forth in the State of Washington Administrative Code (WAC) Chapter 173-201A. Because the proposed project involves a discharge to waters of the United States, including the Columbia River, a Section 401 certification would be needed for federally issued permits for the project, including any permit issued by the U.S. Army Corps of Engineers (USACE).

5.2.1.2 Section 402, National Pollutant Discharge Elimination System

U.S. Environmental Protection Agency (EPA) has delegated authority to Ecology in Washington to issue CWA Section 402 (National Pollutant Discharge Elimination System [NPDES]) permits for point source discharges to waters of the United States.

An NPDES construction stormwater permit is required for stormwater discharges to waters of the United States from any construction activity disturbing more than 1 acre of land. The proposed project would disturb more than an acre of land and would require permit coverage for discharges of construction stormwater to waters of the United States (i.e., most surface waters, including the Columbia River and adjacent wetlands). Ecology has issued the NPDES Construction Stormwater General Permit to authorize stormwater discharges associated with construction activity. It is anticipated that the proposed project would apply to Ecology for coverage under the general permit.

An NPDES industrial permit is required for point source discharges of wastewater to waters of the United States, including discharges of stormwater associated with industrial activity. Cooling water and other wastewater from the proposed project would be treated at the project and discharged through the Port of Kalama's (Port) existing outfall into the Columbia River, which is a water of the United States. Therefore, the discharges would need to be authorized by an NPDES permit issued by Ecology. Stormwater associated with industrial activities during the operation of the facility would be treated and infiltrated into the ground onsite without discharge to waters of the United States. No NPDES permit is required for stormwater infiltrated into the ground.

5.2.1.3 Section 404 Discharge of Dredge or Fill Material

Section 404 of the CWA governs the discharge of dredged or fill material into waters of the United States, including wetlands. A 404 permit is required prior to discharging dredge or fill material into waters of the United States unless the activity falls under an exemption. The USACE, the Section 404 co-implementing agency along with EPA, evaluates 404 permit applications under a public interest review, as well as environmental criteria (EPA 2012). To the extent that the proposed project would discharge dredged or fill material into the Columbia River, or other waters of the United States, a Section 404 permit would be required.

5.2.2 Rivers and Harbors Appropriation Act of 1899

Section 10 of the Rivers and Harbors Appropriation Act of 1899 requires authorization from the USACE for the construction of any structure in or over any navigable water of the United States. The law applies to any excavation, filling, rechannelization, or any other modification of a navigable water of the United States. The proposed project would trigger this law owing to the placement of structures and dredging within the Columbia River, a navigable waterway.

5.2.3 Executive Order 11988 – Floodplain Management

Since 1977, federal actions that occur within the floodplain have been subject to review under Executive Order (EO) 11988, Floodplain Management. In January 2015, President Obama issued EO 13690, which amended EO 11988 and created the Federal Flood Management Risk Standard (FFRMS). The FFRMS was developed by the Mitigation Framework Leadership Group in consultation with the Federal Interagency Floodplain Management Task Force, at the direction of the President. EO 11988, as revised, and the FFRMS establish a higher floodplain standard, known as the FFRMS floodplain, applicable to all federally funded projects. In implementing the FFRMS, federal agencies may select one of three approaches for establishing the flood elevation and hazard area when siting, designing, and constructing federally funded projects:

- Utilizing best-available, actionable data and methods that integrate current and future changes in flooding based on science (known as the "Climate Informed Science Approach");

- Adding two or three additional feet of elevation, depending on the criticality of the building or structure, above the 100-year, or 1-percent-annual-chance, flood elevation; or

- Using the 500-year, or 0.2-percent-annual-chance, flood elevation.

In addition, the EO, as revised, and FFRMS recommend that federal agencies use the 500-year, or 0.2-percent-annual-chance, flood elevation for "critical actions" that are not federally funded. Further, EO 11988, as revised, requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

On October 8, 2015, the Water Resource Council approved revised Guidelines for Implementing Executive Order 11988, Floodplain Management, and Executive Order 13690, establishing the Federal Flood Risk Management Standard and a Process of Further Soliciting and Considering Stakeholder Input.

The proposed project would trigger compliance with EO 11988 as a result of certain project facilities located within the mapped 100-year floodplain and the need for permits from the USACE.

5.2.4 Cowlitz County Critical Areas Ordinance

The Cowlitz County Code (CCC) (Chapter 19.15 – Critical Areas) establishes regulations that are protective of water resources.

- CCC Chapter 19.15.120 establishes protections for wetlands and associated buffers.

- CCC Chapter 19.15.130 establishes fish and wildlife habitat conservation areas and associated riparian habitat area (RHA) buffers, which are protective of surface water resources.

- CCC 16.25 Floodplain Management and Chapter 19.15.140 establishes standards for frequently flooded areas, defined as the 100-year floodplain.

- CCC Chapter 19.15.160 establishes critical aquifer recharge areas (CARA) for the protection of groundwater resources.

The proposed project would trigger review under the Critical Area ordinance owing to the placement of some structures and facilities within critical area buffers and the Columbia River, a navigable waterway.

5.3 Methodology

The evaluation used the following methodology and data sources to characterize the affected environment and assess the potential impacts of the proposed project, the No-Action Alternative, and related actions. The Port and potential tenants have completed technical studies and prior investigations of the project site, and the following documents discuss their results.

- Pacific Mountain Energy Center Draft Environmental Impact Statement (State of Washington Energy Facility Site Evaluation Council [EFSEC] 2007)

- Groundwater Rights Evaluation (CH2M Hill 2002)
- Groundwater Use Applications (Ecology 2002a, 2002b, and 2005)
- Collector Well Feasibility Study Report (Collector Wells International, Inc. 2006)
- Phase I Environmental Site Assessment - North Port Marine Industrial Park (Maul Foster Alongi 2014)
- Federal Emergency Management Agency (FEMA) Letters of Map Revision (LOMR) for the Port of Kalama (FEMA 1994 and 1995) and current Flood Insurance Rate Maps

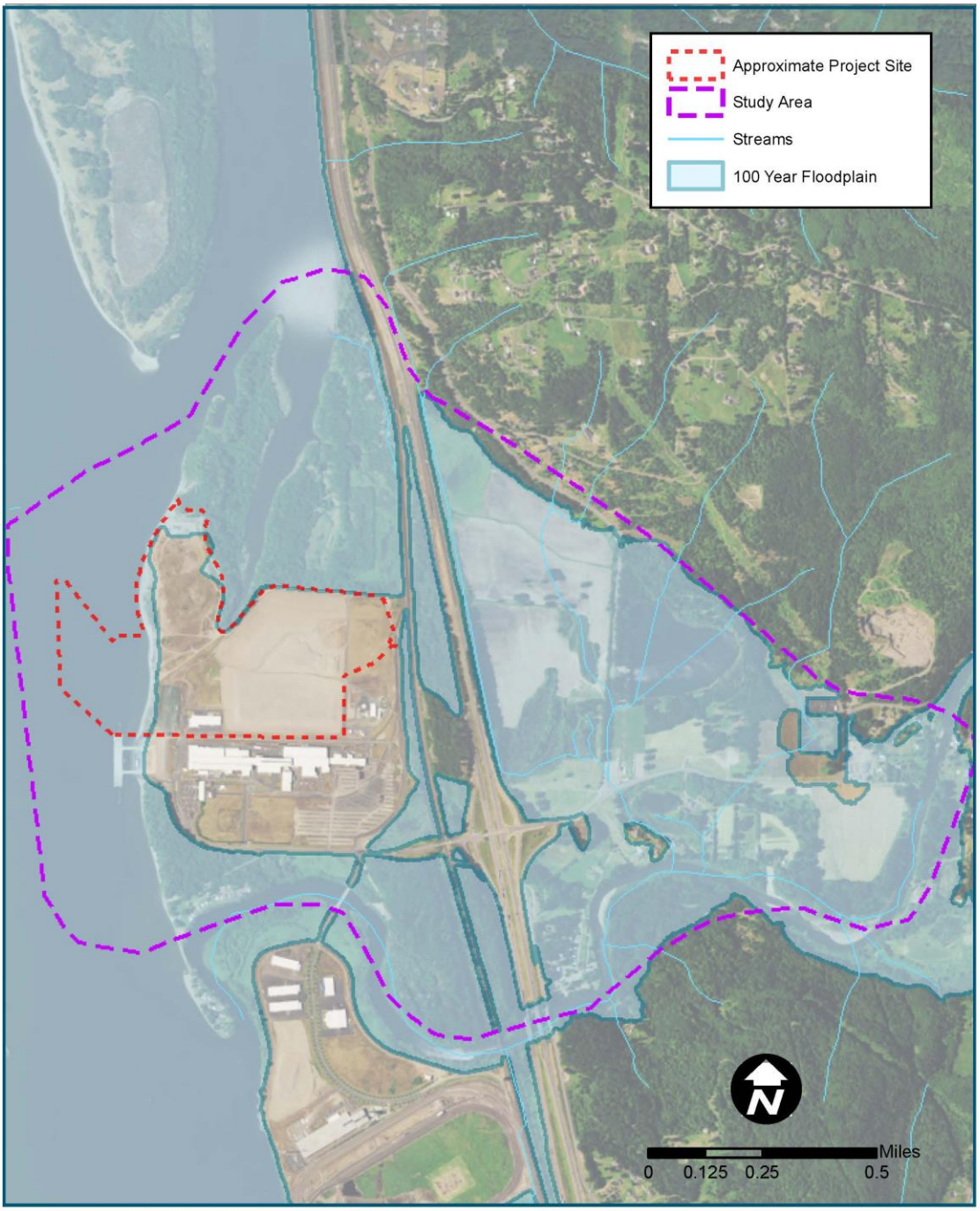
Publicly available information for water resources was also reviewed to document existing conditions. These sources include:

- Ecology Water Quality Database (Ecology 2015a)
- Ecology Water Resource Inventory (Ecology 2015b)
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) (U.S. Fish and Wildlife Service 2015)
- Publicly available geospatial data for water resources, including Washington State Department of Natural Resources hydrography and FEMA floodplains data, among others

The characterization of the affected environment for the Kalama Lateral Project (the proposed pipeline) was obtained from publicly available Federal Energy Regulatory Commission (FERC) filings for the project.

5.4 Affected Environment

The study area for water resources includes surface waters, wetlands, groundwater, and floodplains within and adjacent to the project site (see **Figure 5-1**). For the purposes of this assessment, adjacent is defined as the area approximately within the boundaries of the alluvial aquifer beneath the project site. The study area includes the Columbia River in the vicinity of the proposed dock and adjacent dredge prism. This includes, but is not limited to, a potential area of mixing in the Columbia River for establishing compliance with state water quality standards (WAC 173-201A-400), extending approximately 300 feet downstream and 100 feet upstream of the Port's existing wastewater outfall to the river.



Water Resources
Figure 5-1

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5.4.1 Surface Water

The project site is situated within the Lower Columbia River basin and Water Resource Inventory Area 27 – Lewis. The Columbia River flows south to north in this location; the project site is located on the east side of the river, north of its confluence with the Kalama River. The Western Regional Climate Center reports an average annual precipitation of 43 inches at the Kelso Southwest Regional Airport (Station ID #454135), approximately 5 miles north of the project site. In this area, most precipitation falls as rain.

Surface water resources within and in the vicinity of the study area include the mainstem Columbia River and a backwater channel at the north end of the project site (**Figure 5-1**). At this location, the Columbia River is approximately 2,500 feet wide. Water levels in the river are influenced by tides, upstream flows that are controlled by a series of dams, and contributing rivers such as the Lewis River and Kalama River, located upstream of the project site. Water depths at the project site vary with river stage and range between -0 and -50 feet Columbia River Datum (CRD). The existing North Port (Steelscape) marine terminal south of the project site maintains (through maintenance dredging) a depth of approximately 48 feet, plus 2 feet of overdredge, to accommodate marine vessels.

The Columbia River also has regulatory riparian habitat areas (RHAs) that extend onto portions of the project site under Cowlitz County Code (CCC). However, CCC Section 19.15.130.E.3(b) provides that where an existing natural or manmade barrier isolates a riparian area and that area is not within any 100-year floodplain, and the isolated area does not provide shade, fine or large woody material, nutrients, organic and inorganic debris, terrestrial insects, or habitat for riparian-associated wildlife, the standard RHA widths may not apply. For this reason, only the portions of the project site that are below the 100-year floodplain and also within 150 feet of the ordinary high water mark (OHWM) are regulated as RHAs.

The Port operates a wastewater treatment plant (WWTP) adjacent to the project site; the plant discharges to the Columbia River. The WWTP processes wastewater from nine businesses, including the adjacent Steelscape facility. The Port's system is a package that provides wastewater treatment and is designed for an average annual capacity of 20,000 gallons per day (gpd). The WWTP operates under NPDES permit WA0040843. Steelscape discharges treated industrial wastewater under a separate NPDES permit (WA0040851) with a maximum daily capacity of 180,000 gpd. Steelscape's treatment includes oil treatment, for waste streams associated with oil processing, and metal treatment. Treated wastewater from Steelscape and the WWTP are combined and discharged through a shared outfall located on the existing Northport dock structure. A diffuser is attached to the farthest offshore pile of the existing North Port dock in a vertical orientation with four ports fitted with duckbill check valves. The ports range in depth between -12.5 and -27.5-feet relative to the CRD. The average depth of the diffuser is 20 feet below the ordinary low water elevation (CRD base elevation).

A stormwater infiltration ditch is located in the western portion of the site, north of the existing marine terminal. Runoff from the existing marine terminal is directed to the ditch (Maul Foster Alongi 2014). No other surface water features (e.g., ditches, wetlands, or open water) occur within the project site (ELS 2014).

Historically, the Port has used the project site for dredged material disposal, resulting in a buildup of permeable sandy and silty materials (Maul Foster Alongi 2014). The site soils are well-drained and very little runoff and few signs of sheet or rill erosion were observed. Site investigations have measured high infiltration rates (9 to 99 inches per hour) in the project site (Carpenter Engineering 2015); GRI 2015a). The lack of water features and observed signs of

erosion indicate that the site surface water runoff is minimal, with a significant portion infiltrating into the well-drained site soils. Excess surface water likely enters the Columbia River via sheet flow to the western property boundary or into the wetlands located to the north.

Surface water quality standards are designated for the Columbia River between the river mouth (RM-0) and the Washington-Oregon border (RM-309.3), inclusive of the project site, as: salmonid spawning, rearing, and migration habitat; primary contact recreation; various water supply uses (domestic, industrial, agricultural, and stock water supply); and miscellaneous uses (i.e., wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics) (WAC 173-201A-602). Water quality in the project site is generally good, with no reported violations for chemical contaminants (Ecology 2012). **Table 5-1** presents the surface water quality standards (WAC 173-201A-200 and WAC 173-201A-602, Table 602) to support the designated uses associated with this reach of the Columbia River.

Table 5-1. Water Quality Standards for Lower Columbia River

Parameter	Water Quality Criteria	
Temperature	20.0 °C 1-day maximum	
Dissolved Oxygen	90% of saturation	
Turbidity	If background less than or equal to 50 NTU:	Background Turbidity plus 5 NTU
	If background greater than 50 NTU:	Background Turbidity plus 10 percent
Total Dissolved Gas	Not to exceed 110 percent saturation	
pH	pH must be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 unit.	
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.	

Note:
NTU = Nephelometric Turbidity Unit

In addition to the parameters listed in **Table 5-1**, there are water quality criteria for specific toxic substances. Criteria for aquatic life are contained in WAC 173-201A-240(3). Criteria for human health are listed in 40 CFR § 131.36(d)(14).

Surface waters that exceed these criteria and for which a total maximum daily load (TMDL) has not yet been established are listed on the state water quality impairment lists known as the 303d list. The most recent 303d list approved by EPA is the 2012 list (Ecology 2012). Impaired waters are subject to improvement strategies that are determined on a case-by-case basis through a TMDL. Impaired waters in the study area, including those for which a TMDL has been developed, are shown in **Table 5-2**.

Table 5-2. Impaired Waters within Project Vicinity

Surface Waterbody	Water Quality Parameter (Listing ID)	Location	Approved TMDL
Columbia River	Temperature (21538)	RM 71.9, immediately downstream of proposed marine terminal	No
Columbia River	Temperature (3785)	RM 74, upstream of project site	No
Columbia River	Total Dissolved Gas (3786)	RM 74, upstream of project site	Yes[1]
Columbia River	Dioxin (8776)	RM 74, upstream of project site	Yes[1]
Kalama River	Temperature (6587)	RM 2.5, upstream of project site	No

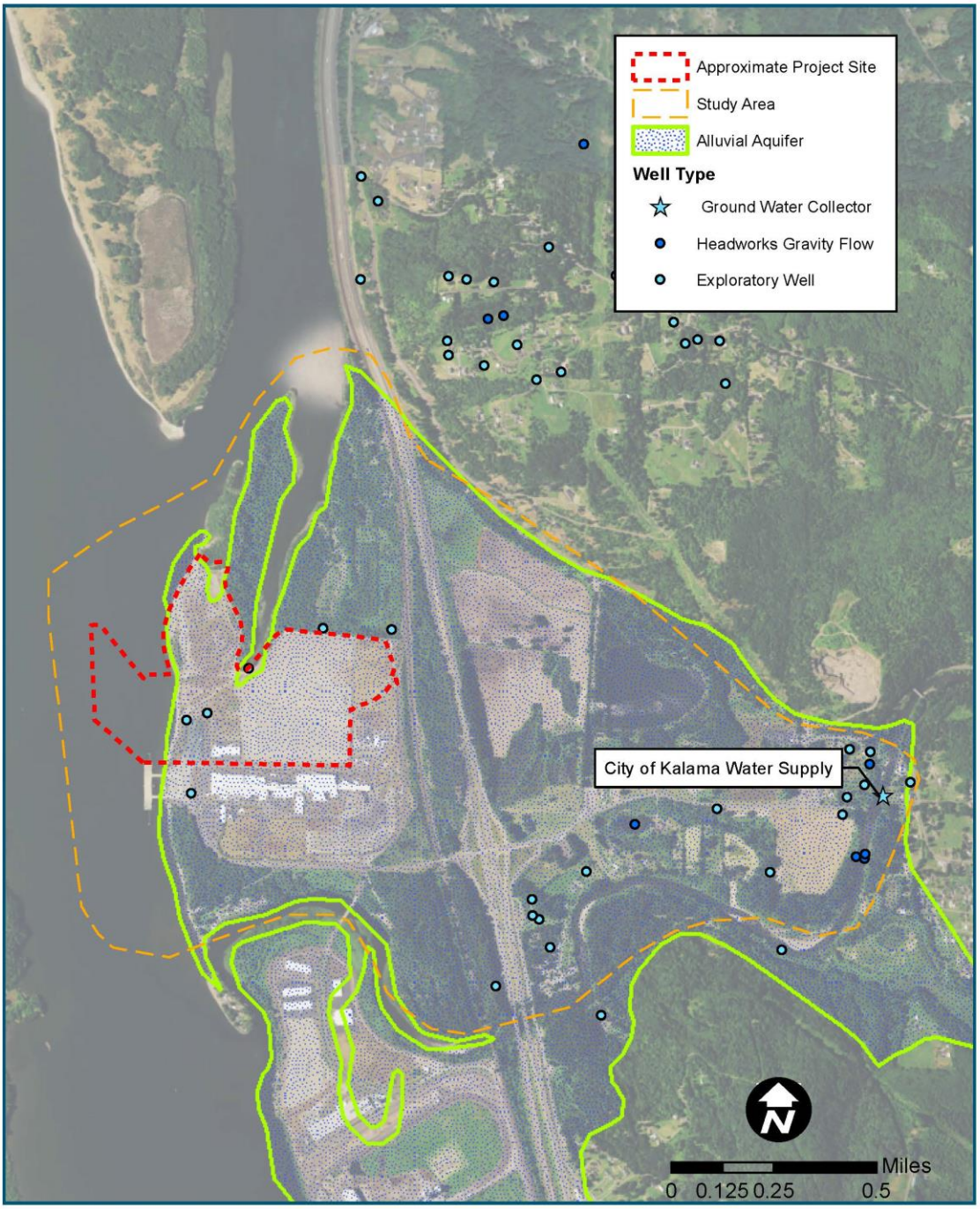
Source: Ecology 2015a.

5.4.2 Groundwater

The project site is underlain by an alluvial aquifer associated with the Columbia and Kalama rivers (CH2M Hill 2002). The alluvial deposits are mapped as Quaternary Alluvium and generally correspond to the historic Kalama River delta (**Figure 5-2**). Site investigations have determined that groundwater is present between 8 and 13 feet below ground surface and exhibits variations based on tidal influence and season (CH2M Hill 2002; GRI 2015b). Groundwater in the aquifer is hydrologically connected directly to the Columbia River and does not show measureable lag time in response to changing river levels (CH2M Hill 2002). The recharge in this aquifer is rapid as it depends on precipitation and the connection to the river.

The Port receives water from the City of Kalama system to meet most of the needs of tenants and Port facilities. Additionally, the Port maintains three water rights in the project area with a total permitted use of 10,450 instantaneous gallons per minute (gpm) and an annual use of 16,805 acre-feet (**Table 5-3**). The effects of existing Port wells (G2-30035 and G2-30036) on the water supplies for other users in the alluvial aquifer have been determined to be negligible (CH2M Hill 2002).

[1] The TMDL applies throughout the Columbia River; the listing ID shown is for the nearest specific location identified as impaired by Ecology.



Groundwater Aquifer
Figure 5-2

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Table 5-3. Summary of Port of Kalama Water Rights

Permit Number	Date	Max Flow Rate (gpm)	Max Annual Use (acre-feet)	Number of Wells	Allowable Uses
G2-30035	12/28/2001	350	565	1	Industrial, Commercial, Domestic
G2-30036	12/28/2001	3,500	5,600	2	Industrial, Commercial
G2-30283 *(well associated with this water right is currently unconstructed)*	09/16/2005	6,600	10,640	1	Industrial, Manufacturing, Commercial, Irrigation, Power Generation, Highway/Fire Protection
Totals		*10,450*	*16,805*	*4*	

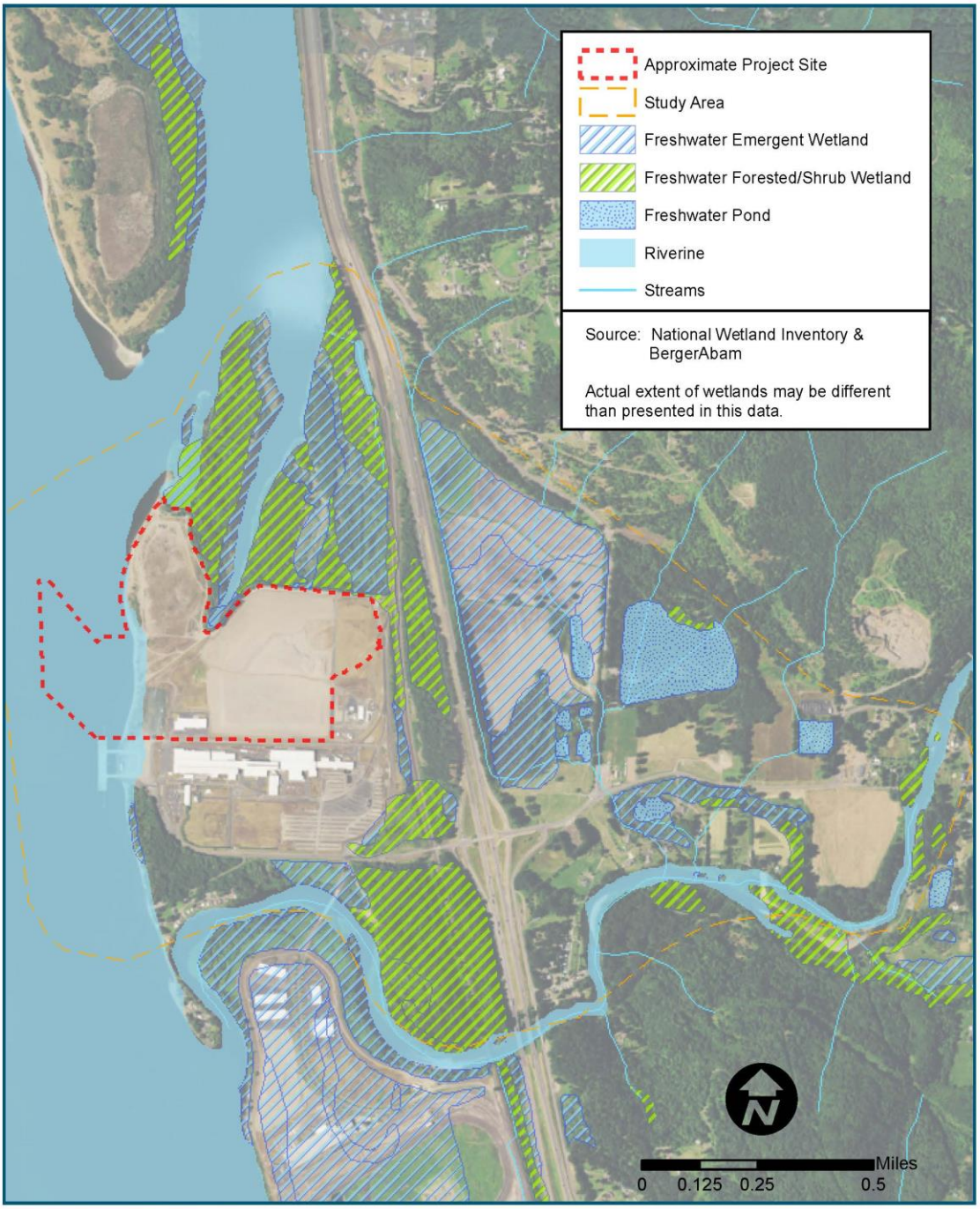
Data compiled from Ecology groundwater use permits (Washington State Department of Ecology 2002a, 2002b and 2005). The Port of Kalama has filed an application with Ecology to integrate the system withdrawal points of G2-30036 and G2-30283.

The City of Kalama draws municipal water from the same alluvial aquifer. The City well, a collector well installed on the Kalama River, is located approximately 1.7 miles east of the project site (**Figure 5-2**). The City has current permitted rights of 1,800 gpm and 2,284 acre-feet per year (Ecology 1974; Ecology 1988). The City has submitted a new request, which would bring total water allocations to 3,000 gpm and 3,585 acre-feet per year if approved (Ecology 2001). CH2M Hill has characterized the City well as a surface water withdrawal because of its shallow construction and direct connection to the Kalama River (CH2M Hill 2002).

Washington State groundwater quality standards are contained in WAC 173-200. Groundwater quality is typical of alluvial aquifers. Prior testing has shown high concentrations in iron (8.1-20 mg/l) and manganese (0.85-3.1 mg/l) which exceed groundwater quality criteria of 0.30 mg/l and 0.05 mg/l respectively (CH2M Hill 2006). Monitoring wells associated with adjacent industrial sites have not shown any contamination (Maul Foster Alongi 2014). There are no critical aquifer recharge areas (CARAs) present within the project site (Cowlitz County 2012).

5.4.3 Wetlands

The NWI indicates riverine wetlands associated with the Columbia River present on the western portion of the project site at the marine terminal, immediately adjacent to the shoreline (USFWS 2015). NWI riverine wetlands include riverine-tidal unconsolidated shoreline and riverine-tidal unconsolidated bottom (**Figure 5-3**). NWI data identifies palustrine emergent wetlands at the site but these were filled by authorized dredge disposal activities. NWI data also indicates the presence of tidally influenced palustrine forested, palustrine scrub-shrub, and palustrine emergent wetlands north of the project site that are associated with the Columbia River.



Wetlands
Figure 5-3

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Site investigations completed by the Port in the project site have not found wetlands (ELS 2014). As previously described, site soils are dredged fill material and highly permeable, and do not pond water for a length of time sufficient to develop wetland characteristics. The riverine wetlands associated with the Columbia River are present and their extent corresponds with the OHWM.

The site investigations delineated two wetlands within the study area, but they do not extend onto the project site (**Figure 5-3**). Additional off-site wetlands were noted southwest of the Steelscape facility but were not delineated. The wetland north of the site is associated with the Columbia River and was characterized as a riverine wetland. The second wetland is located near the intersection of Kalama River Road and Tradewinds Road, southeast of the site. It is associated with a ditch and beaver dam impoundment (Ecological Land Services 2014).

These wetlands have regulatory buffer widths, which would extend onto portions of the project site under CCC. However, CCC Section 19.15.120.C.4.a provides that, where applicable, buffers based on the standard widths are not required to extend beyond existing natural or manmade barriers, such as rock outcroppings, dikes, levees, or roads that isolate the area from the wetland resource. The existing roadways and dredged material placement functionally isolate most of the project site from the adjacent wetland resources. The only portion of the project site that includes a functional wetland buffer is at the north end of the project site. The wetland buffer that extends onto the site consists of a stand of young black cottonwood and willow trees, with limited understory vegetation aside from Himalayan blackberry and Scotch broom. The buffer likely provides a moderate level of water quality and habitat functions for the adjacent wetland.

5.4.4 Floodplains

The majority of the project site is not located within the regulated FEMA 100-year floodplain. As shown on the published FEMA Flood Insurance Rate Map (Panel 53015C0711G, effective December 16, 2015), the majority of the project site is not located within the 100-year floodplain. The project site boundary extends into the Columbia River for the proposed marine terminal alternatives and that portion of the project site is within the 100-year floodplain along with a narrow strip along the Columbia River shoreline and along the north tip of the site.

Floodplain in Cowlitz County is regulated under CCC Chapter 16.25 Floodplain Management, and construction activities in the floodplain require a permit. Construction of the proposed marine terminal is subject to the following CCC section:

> CCC 16.25.080 F Areas within the 100-Year Floodplain. *A hydraulics analysis demonstrating that proposed development will not increase the water surface elevation of the base flood more than one foot at any point within the community may be required for any new construction, substantial improvements, or other development, such as buildings, bridges, road embankments, or fills within Zones A and AE on the Federal Emergency Management Agency FIRM (2015).*

5.5 Environmental Impacts

This analysis evaluates the potential direct and indirect impacts to water resources for each alternative and the related actions. Direct impacts to water resources occur as a result of construction activities or proposed project operations that take place within, or are adjacent to, the study area and contribute measurable impacts to water resources (e.g., uncontrolled runoff)

in the area. Direct impacts would be considered significant if they resulted in permanent or measureable long-term impacts to water resources.

Indirect impacts to water resources occur as a result of unintended consequences of construction activities or facility operation. Indirect impacts would be considered significant if they had a permanent or long-term impact on water quality or public water supplies. Permanent impacts to water quality would occur if receiving waters were no longer able to meet state water quality standards. Permanent impacts to public water supplies would occur if the project results in decreased water availability at nearby wells.

5.5.1 Proposed Project Alternatives

The proposed project includes two technology alternatives – the CR Alternative and the ULE Alternative – and two marine terminal alternatives – Marine Terminal Alternative 1 and Marine Terminal Alternative 2. These alternatives are assessed below.

5.5.1.1 Construction Impacts

Surface Waters

During construction activities, water quality could be affected by surface water runoff from exposed soils that increase turbidity. In- and over-water work could result in sediment, fuel, oil, grease, and other pollutant discharges that could affect water quality. In-water work activities under either marine terminal alternative include the installation of precast concrete piles and steel pipe piles that could generate temporary turbidity. Berth dredging in deep water would be completed to accommodate methanol shipping vessels at the dock and would require the removal and placement of approximately 126,000 cubic yards of material that could result in temporary, short-term turbidity.

Over-water construction includes construction of the pile caps, dock, access trestle, and necessary ship loading infrastructure that could introduce pollutants or debris through accidental spills. The most common of these pollutants are wet concrete, petroleum products from construction vehicles, and possible drips, spills, and leaks of lubricants and other products.

Construction activities that expose soils to erosion include all physical ground disturbances, such as site preparation, foundations, access roads, upland ground improvements, and in-water pile driving. Ground disturbing activities may cause an increased delivery of sediment to the Columbia River and increase turbidity in the water column. The potential for an effect on water quality increases the closer the action is to surface waters. The construction of either marine terminal alternative, including access roads and trestle, has the potential to impact surface water quality, especially where activities are completed at or near the Columbia River.

Construction activities on the site include the installation of ground improvements necessary to mitigate the risks of liquefaction resulting from possible seismic activity. The ground improvements may include the installation of stone columns, soil mixing and jet grouting, and the installation of driven piles.

The installation of stone columns uses a combination of water, air and aggregates with vibratory instruments to increase the soil density and construct aggregate columns below the surface of the ground. If uncontrolled, this process may result in a sediment-laden slurry at the ground surface, depending on the construction method (either a dry or wet feed), that could run off into adjacent surface waters. Additionally, compressed water, air, and vibratory installation

methods can result in horizontal migration of air and turbid water through the ground to distances exceeding 70 feet horizontally from the column installation as well as creating mud and turbid water at the surface that could run off to nearby surface waters.

Similar to stone columns, the jet grout construction would result in a cementitious slurry at the ground surface as the columns are installed. If uncontrolled, the high pH slurry could run off into adjacent surface waters. Soil mixing is a ground improvement technique that mechanically mixes the in-situ soils with a cementitious binder that is injected either as a dry powder or as a liquid slurry. Similar to the jet grout method, the soil mixing process can produce high pH spoils or surface runoff if a slurry method is used. The use of dry powders typically produces very little spoils.

The installation of pile supports would be completed by a combination of impact and vibratory techniques, depending on soil properties and design requirements. Ground improvements would not occur in water and there would be no direct impacts to surface waters. When driven piles are placed close to water bodies, short-term increases in turbidity may occur from vibrations generated by pile-driving activities under certain conditions.

Both technology alternatives would have similar construction-related effects on surface water. Minor differences between the facility layouts of the technology alternatives would shift the location of the physical disturbances that could result in increased erosion, but would not result in measureable changes in the amount of erosion that would occur. The initial phase of construction would include the installation and maintenance of erosion and sediment control devices to reduce the erosion impacts associated with either technology alternative.

A detailed construction stormwater pollution prevention plan (SWPPP) would be prepared and adhered to during construction as required by the construction stormwater permits granted by Ecology. The SWPPP would contain best management practices (BMPs) specific to the proposed project designed to reduce erosion and sediment delivery to surface waters. Additionally, specific BMPs related to spoils management for ground improvements, if stone columns, jet grouting, or deep soil mixing are selected, would be implemented to minimize impacts to adjacent surface waters. Implementation of the construction SWPPP is expected to reduce potential sediment delivery to the river and avoid any water quality exceedances. The proposed project, with either technology alternative, is not expected to result in significant adverse impacts to surface water quality associated with ground-disturbing activities and in-water pile driving.

In-water work and disturbance to the riverbed from pile installation associated with construction of the marine terminal would be limited to the maximum extent practical. Short-term increases in turbidity may occur during pile installation under either marine terminal alternative. During test-pile installations completed in support of the Columbia River Crossing, no significant changes in turbidity were observed under the driving condition of more than 130 test piles near Vancouver (Columbia River Crossing 2011). Similar construction methods would be used to install piling for either marine terminal alternative and are expected to have similar effects on turbidity.

The construction of Marine Terminal Alternative 1 would require the installation of 336 piles, plus temporary piles during construction. This activity is not expected to result in measurable changes to turbidity and likely would not exceed water quality standards. Appropriate BMPs would be used during pile driving activities to minimize the amount of disturbance to benthic sediments and associated turbidity.

Marine Terminal Alternative 2 would require the installation of 779 piles, plus temporary piles during construction, with potential impacts similar to those described for Marine Terminal Alternative 1. Construction-related impacts would occur over a longer period as compared to Marine Terminal Alternative 1 because of the number of piles that must be installed.

Both marine terminal alternatives propose dredging the new berth to -48 feet CRD to allow vessels to dock at the facility. The depth of the river in the proposed berth area varies from -39 to -50 feet CRD. The dredge prism and volume of dredging (126,000 cubic yards) would be the same for either marine terminal alternative.

Dredging operations would typically be completed using hydraulic or mechanical methods. Dredging activities have the potential to affect water quality in several ways including temporary increases to turbidity. Implementation of BMPs for dredging (e.g., work timing, equipment operating procedures, and water quality monitoring, among others; described in detail in section 5.6 – Mitigation Measures) would reduce sediment loss and turbidity generation. The USACE determined that the material was suitable for upland and/or in-water placement (USACE 2015). Dredged materials would be placed at an approved upland or in-water location. Dredged material placement activities would include BMPs, such as those listed for dredging to prevent the creation of excess turbidity by either upland runoff or in-water disposal.

Water quality can be affected through the release of chemical contaminants contained in the sediments. Sediment testing of the proposed dredge material indicated that concentrations of chemical contaminants were less than the associated in-water disposal screening levels (BergerABAM 2015a). Therefore, the proposed project's dredging activities are not expected to result in the release of chemical contamination. The proposed project, with either marine terminal alternative, is not expected to result in significant adverse impacts to surface water quality due to dredging activities.

Activities that potentially introduce pollutants to surface water also include overwater construction and operation of construction equipment close to waterbodies. Overwater construction would include a combination of cast-in place and precast concrete structures placement, grated steel walkways construction, and associated placement of structures such as rails, fenders, bollards, etc. The operation of equipment that uses petroleum fuels, oils, grease, or hydraulic fluids has the potential to release pollutants into surface water through spills.

Overwater work on the marine terminal would be isolated from the water below by the use of temporary construction containment and work platforms. Construction debris and wastes would be collected and disposed of at an approved location and would not be permitted to enter the watercourse. Under either marine terminal alternative, impacts to surface water quality associated with ground-disturbing activities and in-water pile driving are not expected to rise to the level of significance.

All the alternatives would include the preparation of a construction spill prevention, control, and countermeasure plan (SPCCP) for petroleum products, liquids and solvents and adherence to it during construction activities. The SPCCP guides the safe operation of equipment, mandates construction practices that prevent accidental spills or leaks of fluids and the deposition of construction debris, and recommends measures to control and clean up after an incident. At a minimum, spill response kits (e.g., absorbent pads, booms) would be staged near the marine terminal during construction for rapid response in the event of a spill. The construction of the proposed project, under either technology alternative and either marine

terminal alternative, is not expected to result in significant adverse impacts to surface water quality associated with accidental leaks or spills.

Groundwater

Construction activities are not anticipated to result in a significant adverse impact on the groundwater under either technology alternative. Anticipated impacts would be typical of any other large-scale industrial construction project in a similar setting. In the absence of mitigation and minimization measures, the following potential construction-related impacts could occur:

Foundation excavations and construction of the well for the project may require dewatering during construction. Groundwater extraction for dewatering during construction would result in the temporary drawdown of groundwater in localized areas immediately surrounding the work site. Water would be pumped to settling ponds or temporary containment tanks to allow fines to settle out, and then would infiltrate back into the ground. The extraction of groundwater through dewatering would have a negligible effect on groundwater abundance and availability for other users.

Chemicals and fuels used during construction (vehicle fuels, welding gases, oil, solvents and thinners, paints, antifreeze, coatings and sealants) could be spilled during use resulting in contamination that may impact groundwater at the site. Large construction equipment has the potential to leak oil or hydraulic fluids. Tanks used for temporary storage can leak from faulty valves resulting in contamination of groundwater at the site.

Ground improvements may be implemented to strengthen the soil under some of the larger structures being constructed under either technology alternative and either marine terminal alternative. Several types of ground improvement methods could be implemented to mitigate the liquefaction-induced settlement and lateral spreading deformations of the nature possible at the site. The proposed construction method would be determined based on the final geotechnical analysis of site conditions. Potential ground improvement techniques may include stone columns, jet grout, soil mixing, or driven piles. These techniques involve the injection of material (aggregate, cementitious grout, binders, or piles) into the ground that could result in decreased groundwater quality. The potential impact of the technique on groundwater resources would vary based on the depth of the improvement below the ground surface, the proximity of the improvement to groundwater, the characteristics of material injected (if any) into the subsoil or groundwater during construction, the rate of injection, the volume of water or fluid used during construction, and other site-specific conditions. Impacts to groundwater from ground improvement measures can occur as a result of driving contaminated soil from the surface into groundwater or from introducing contamination through the injected material. As discussed in Chapter 8, Environmental Health and Safety, there is no identified soil contamination on the site. Furthermore, injected material would solidify quickly and would not be expected to migrate to surrounding groundwater once set.

Additionally, ground improvements can result in localized areas of denser soils where permeability is low, which could result in change to flow paths. The alluvial aquifer where ground improvements would occur is large and directly connected to the Columbia River. Ground improvements would occur in close proximity to the river, rather than landward limits of aquifer. Some localized groundwater impedance and flow diversions are expected to occur at the immediate project site. Permeability of the aquifer has been tested and determined to be high (CH2M Hill 2002; GRI 2015b). As a result, groundwater is expected to move quickly around the improvement zone and is not expected to result in any mounding that would affect the aquifer. Therefore, ground improvement measures with the proposed project would not result in impacts to groundwater.

During construction, the primary cause of impacts (both direct and indirect) to groundwater would be from spills and the release of contaminants that could leach into the groundwater. In general, incidental releases of contaminants during construction activity would be small and short term. The project proponent would prepare both an SPCCP and an SWPPP to establish procedures to prevent and control the impact of spills on the natural environment. The proposed project, with either technology alternative or either marine terminal alternative, is not expected to result in significant adverse impacts to groundwater during construction activities.

Floodplains

Construction within the floodplain includes portions of the existing access road to the recreation area, infiltration pond, and the pumphouse and water well. Construction of the access road would be constructed at ground level and is not expected to contribute to new fill with the floodplain. Similarly, infiltration ponds would be excavated and provide minor storage capacity for floodwaters. The pumphouse would include new structures within the floodplain that would result in fill. Due to the small volume of the facility in comparison to the floodplain, no measureable impact is expected to occur.

Additionally, the new marine terminal and the proposed dock, access trestle and abutment, and breasting and mooring dolphins associated with it would occur within the 100-year floodplain. The proposed dock top elevation would be 18 feet CRD (Elevation 21 feet NAVD88 for both marine terminal alternatives), which is below the 100-year floodplain elevation (18.9 feet CRD/22 feet NAVD88). The design of the on-dock structures (i.e., transfer piping) would follow applicable codes and federal guidance, including CCC 16.25, Floodplain Management for locating critical infrastructure on the dock two to three feet above the floodplain. These marine terminal structures are not expected to affect the elevation of the water surface measurably as the floodplain at this location is large (more than a mile wide) and the volume of fill (inclusive of structures) would be negligible in comparison to the size of the Columbia River floodplain basin (West Consultants 2015). With either marine terminal alternative, all electrical and mechanical equipment used to transfer methanol to vessels on the proposed dock would be located at an elevation of at least 20.9 feet CRD, above the 100-year floodplain, to comply with applicable codes

Upland construction of the methanol production lines, storage tanks, and other critical facilities are proposed above the limits of the 100-year flood and would not affect the floodplain. Therefore, the construction of the proposed project, with either technology alternative or either marine terminal alternative, would not result in significant adverse impacts to floodplains.

Wetlands

There would be no direct construction-related impacts to wetlands as there are no wetlands on site. Adjacent wetlands could be impacted by unintended stormwater runoff from construction areas, but these impacts would be minimized by the implementation of stormwater management systems at the proposed project. Adjacent wetlands are not expected to be impacted by temporary groundwater drawdowns during construction. Wetland hydrology is connected to river fluctuations and surface precipitation. While temporary drawdown may affect local soil moisture levels, it is not expected to occur for a long enough time period to affect the overall wetland characteristics. Proposed ground disturbance for project facilities would be guided by a construction SWPPP, which would specify measures to capture surface water runoff and direct it to treatment facilities and subsequent infiltration.

The proposed recreation access improvements would be constructed in the regulatory wetland buffer at the north end of the project site. Approximately 3,904 square feet (0.09 acre) of

moderately functioning wetland buffer would be eliminated. The mitigation proposed for the loss of wetland buffer includes riparian enhancement and invasive species management within adjacent wetland buffer at the north end of the project site. The existing wetland buffer habitats would be enhanced by removing invasive species and installing native trees and shrubs that are common to this reach of the Columbia River shoreline and adjacent wetlands. Native plantings proposed for the riparian restoration include black cottonwood (*Populus trichocarpa*) and a mix of native willow species including Columbia River willow (*Salix fluviatilis*), Pacific willow (*Salix lasiandra*), and Sitka willow (*Salix sitchensis*). Portions of the wetland buffer would be planted with black cottonwood. Invasive species management at the site would target locally common and aggressive invasive weed species, primarily Scotch broom (*Cytisus scoparius*) and Himalayan blackberry (*Rubus armeniacus*).

Therefore, the proposed project, with either technology alternative or either marine terminal alternative, is not expected to result in significant adverse impacts to wetlands.

5.5.1.2 Operational Impacts

The operation of the proposed project could result in impacts to water resources in terms of decreased water quality in surface waters and changes to surface water and groundwater from the operation of the new well. Water quality could be affected by operational water discharges, stormwater runoff, and accidental spills of methanol. Groundwater levels could be affected by the operation of the proposed well, which could affect water supplies at other wells located in the alluvial aquifer. There would be no operational impacts to floodplains or wetlands.

Potential impacts to water resources due to incidents or spills at the proposed facility or during vessel transport on the Columbia River are discussed in Chapter 8, Environmental Health and Safety.

Surface Water

Water Systems

Approximately 4.8 million gallons per day (gpd) would be used to supply the facility needs. Water for the facility would be obtained from two sources, raw water from a new groundwater well and the City of Kalama water system. Water obtained from the City, approximately 5,600 gpd, would be used as potable water for the facility for domestic uses. Domestic water use is further analyzed in Chapter 13, Public Services and Utilities, and not included here. The following sections describe the impacts of these systems to surface water. The water system for the proposed project includes three distinct water systems:

- Stormwater System
- Industrial Water – includes raw water treatment, cooling water, methanol production water, and wastewater (manufacturing facility)
- Domestic Water – includes water potable water for buildings and wastewater (Port facility)

Stormwater

The operation of the proposed project would generate stormwater from impervious surfaces (i.e., access roads and buildings) and create sources of wastewater that could affect surface water quality. With either technology alternative, the stormwater from the proposed methanol manufacturing facility would be segregated into two streams depending on the anticipated pollutant loadings. Stormwater from areas of the project site that are physically separated from the production process (i.e., access roads, parking lots, and building rooftops) and from on-site

paved areas would be directed to an infiltration facility for discharge into the ground. Stormwater from the production process areas of the facility would be directed to a first flush pond for treatment. The first flush pond would discharge treated stormwater to the infiltration facility. Stormwater from the first flush pond may be reused on site as raw water. The first flush ponds and infiltration facility would be sized to manage stormwater on site consistent with Cowlitz County and state standards. The infiltration facility would be sized to infiltrate the 100-year, 24-hour rainfall event. Stormwater generated from site access roadways outside the methanol manufacturing facility would be directed to roadside ditches and shallow containment to infiltrate into the ground

The stormwater system for either marine terminal alternative would capture all runoff from the deck and trestle and convey it to a pumping station. The pumping station would include two pumps, one designed to process the design storm (100-year, 24-hour event) and a second that would handle any overflow above the design event. The treatment system for the stormwater would include an oil/water separator, water quality swale, and infiltration basin. Treated water would be conveyed to the infiltration basin and would not be discharged directly to the Columbia River. Under either marine terminal alternative, stormwater from the existing North Port dock (i.e., the dock used by Steelscape) also would be directed to this system.

In summary, all stormwater would be captured on site and, under either technology alternative or either marine terminal alternative, would infiltrate into the ground. There would be no stormwater discharge to the Columbia River for events up to and including the 100-year design storm.

Industrial Water

Table 5-4 summarizes the water supply and use for the ULE Alternative. Approximately 3,340 gpm (4.8 million gpd) of water is needed for the facility to operate under the ULE Alternative. Water would be obtained from the proposed groundwater well and reused water from the facility. Water use for the ULE Alternative is summarized below. The methanol production process for the CR Alternative would use slightly less make-up water[2] (approximately 340 gpm compared to 375 gpm for the ULE Alternative) but the difference is not significant. The net change in water use between alternatives would not change due to design considerations for the cooling towers.

[2] Make-up water refers to the additional water supply that is necessary to compensate for water lost as evaporation, condensate, or other causes during the cooling process.

Table 5-4. Industrial Water Cycle

Facility Element	Approximate Flow Rate (gpm)
Industrial Water Supply	
Raw Water Supply	3,340
Process Wastewater Reuse as Raw Water	170
Stormwater Reuse as Raw Water	100
Total Water Supply	3,610
Raw Water Use	
Cooling Tower	3,235
Process Water System	375
Process Water Disposition	
Evaporation from cooling tower	2,831
Average Discharge to Columbia River	407
Maximum Discharge to Columbia River	470
Process Wastewater Reuse as Raw Water*	170
Consumed in chemical reactions	<100

BergerABAM 2015b.

* In addition, approximately 950 gpm of process wastewater from the methanol reforming process would be recirculated to the demineralization plant for reuse.

The majority of the water would be obtained from the proposed collector well (3,340 gpm). The remaining make-up water would be obtained through reuse of stormwater (100 gpm) and process wastewater (170 gpm). Raw water from the well would be chlorinated and treated at a proposed water treatment plant. Reused water is also treated on site before re-entering the process. On-site treatment of raw water includes a cold lime softener and reverse osmosis/electro-deionization to remove metals and other impurities in the groundwater for uses other than cooling water. Treated raw water would be used on site for cooling water and water in the methanol production process.

The majority of the water used on site would be sent to the cooling towers, which are designed for recycling water through eight cycles. The cooling towers are designed for an approximate discharge rate of 404 gpm to the firewater pond where it is cooled through a heat exchanger with incoming raw water and ultimately sent to the existing outfall and discharged to the river (described below). Approximately 2,831 gpm would be lost to the atmosphere at the cooling towers through evaporation. The remaining water would be either reused in the production process (170 gpm) or consumed in chemical reactions (<100 gpm) in the reforming process.

Wastewater

Wastewater from the proposed project includes domestic and industrial wastewater streams. Domestic wastewater would be generated from the restrooms, washbasins, and breakrooms and would be directed to the existing Port WWTP. In compliance with the existing WWTP permit, the Port would treat and discharge this wastewater to the Columbia River through an outfall shared with the Steelscape facility. The domestic wastewater from the proposed project would not exceed the permitted capacity of the WWTP. Additional information on domestic wastewater is provided in Chapter 13, Public Services and Utilities.

Industrial wastewater includes reject water from reverse osmosis and electrodeionization, treated wastewater from the methanol production process, and blowdown from the on-site cooling, power generation, and boiler systems. The only wastewater stream discharged directly

to the Columbia River would be cooling water blowdown, which would be treated and cooled before discharge. Process wastewater from the saturator (50 gpm) would contain methanol and other organic contaminants; this wastewater would be treated in the membrane bioreactor before reuse. Treated water from the membrane bio-reactor and process condensate (900 gpm) would be recycled through the reverse osmosis and electrodeionization process for reuse. A small portion of the water introduced to the reverse osmosis and electrodeionization process (120 gpm) would be rejected to the raw water treatment plant for general reuse as raw water, including make-up water for the cooling towers. Blowdown from boilers, the power plant, and the reformers (total of 50 gpm) also would be recycled to the raw water treatment system (BergerABAM 2015b).

NPDES regulations required that all known, available and reasonable methods of prevention, control and treatment (AKART) must be applied to limit pollutants from wastewater discharges, incorporating both engineering and economic factors.

The wastewater discharge from the facility would consist of cooling tower blowdown. Cooling tower blowdown constituents include those present in the raw water feeding the cooling tower, additives to control biofouling, and heat. An evaluation of the alternative technologies to limit pollutant discharges that may adversely affect water quality in the Columbia River was completed for the proposed facility's process wastewater discharge. The evaluation considered effects on water and air quality, solid waste, maintenance, facility footprint, annualized cost, and economic reasonableness. The analysis concluded that the alternative discussed here had the most advantages of all alternatives considered (BergerABAM 2015b).

EPA has developed new source performance standards (NSPS) for process wastewater discharges from methanol manufacturing plants (40 CFR 414.64). The NSPS require the achievement of discharge limits based on the application of the best available demonstrated control technology. The NSPS apply to BOD_5, TSS, pH, and the 58 toxic pollutants listed in 40 CFR 414.91. Of these constituents, pH, chromium, copper, lead, and zinc, would be present in the process wastewater. The NSPS for those constituents that are present would be met at an internal monitoring point before the process wastewater is piped to the raw water treatment system for reuse within the facility.

Only the blowdown from the cooling towers (after treatment as described below) would be discharged to surface water. Blowdown from the cooling towers would be routed to the firewater pond and cooled to 20°C (the ambient water quality standard for the Columbia River) through evaporative cooling and a heat exchanger. Cooled water would then be conveyed to the Columbia River through the Port's existing outfall. Average wastewater discharge generated by the CR Alternative would be 330 gpm, with a maximum of 400 gpm. Comparatively, the ULE Alternative would generate an average wastewater flow of 390 gpm with a maximum of 470 gpm. The wastewater discharge of either technology alternative would not exceed the permitted capacity of the Port's outfall.

An analysis was completed to evaluate the proposed discharge's compliance with water quality standards for the Columbia River (ESA Vigil Agrimis 2015). For those few constituents that do not meet water quality criteria at the point of discharge from the facility using conservative assumptions, the analysis also considered existing authorized discharges from Steelscape and the Port WWTP and a proposed mixing zone in the river that has approximately the same dimensions as the existing mixing zones for Steelscape and the Port WWTP. The proposed mixing zone is approximately 300 feet downstream and 100 feet upstream of the outfall. The analysis demonstrates that the proposed wastewater discharge would not cause or contribute to

a violation of water quality standards in the river and would result in only negligible changes in water quality.

The proposed project's operational impacts from either the CR or ULE Alternatives to water quality would be minimal as stormwater would be infiltrated into the ground and wastewater discharges from the facility would be authorized and regulated by an NPDES permit issued by Ecology to ensure compliance with applicable water quality standards and other water quality regulations. In particular, the discharged wastewater would be cooled to meet the water quality standards for temperature in the Columbia River at the point of discharge. Therefore, the proposed project, with either technology alternative and with either marine terminal alternative, would not result in significant adverse impacts to surface water quality associated with stormwater and wastewater.

Groundwater

The project would draw approximately 3,340 gpm from the collector well that would be treated on site and used as process water. Operation of the new water well is not expected to result in aquifer drawdown or affect the ability of other users (e.g., private landowners and the City) to draw water from permitted wells in the alluvial aquifer. Aquifer testing determined that a pumping rate of up to 6,600 gallons/minute would have no discernible drawdown (i.e., less than 0.1 foot within 3,400 feet of the well) (Collector Wells International, Inc. 2006). The well would have a negligible effect on the City of Kalama water supply, which is located over a mile away and is connected directly next to the Kalama River. Similarly, there are no other private landowner wells within 3,400 feet of the proposed Port well (Ecology 2015b).

Groundwater withdrawals have the potential to affect surface water flows by diverting water that would normally contribute to Columbia River flows. While there is no specific gauge near the site, flows within the Columbia River typically range between 110,000 and 400,000 cubic feet per second (cfs) in the tidal portions of the river (http://waterdata.usgs.gov/wa/nwis/). The approximate 3,340 gpm that the project would use represents approximately 7.4 cfs, which represents less than 0.0067 percent of the lowest anticipated flows in the river. The collector well is designed such that it would not directly draw water from the Columbia River. The volume of water withdrawn from collector well is insubstantial relative to the flows in the river at the project site. Therefore, the proposed project would not result in significant adverse impacts to groundwater due to the proposed collector well water withdrawals.

5.5.2 Related Actions

The proposed pipeline would consist of installing approximately 3.1 miles of 24-inch-diameter pipeline, metering facilities, and miscellaneous appurtenances extending from the Northwest Pipeline GP mainline to the project site (FERC 2015). According to the Environmental Assessment completed for the project by FERC, project construction could result in minor short-term impacts on water resources (FERC 2015). These resources include:

- Five crossings of intermittent streams constructed using open trench methods when there is no water present. If water is present, the work area would be isolated and dewatered and flows would be bypassed prior to construction.
- Two crossings of manmade perennial streams utilizing a horizontal directional drill. This drilling is in conjunction with the undercrossings of Interstate 5 (I-5) and the BNSF tracks.
- Four wetland crossings totaling 2,372 linear feet. Two wetlands would be crossed by horizontal directional drill and impacts would be entirely avoided. Approximately 25 linear

feet, less than 0.1 acre, of a palustrine scrub-shrub wetland associated with an intermittent stream would be crossed by open trenching.

- The proposed pipeline would cross through 14 mapped CARAs designated as either Slight or Moderate Sensitivity.

The construction of the proposed pipeline may result in minor, short-term impacts on water resources. These impacts could occur because of construction activities located within or adjacent to stream channels and wetlands. Clearing and grading of streambanks, removing riparian vegetation, in-stream trenching, trench dewatering, and backfilling could result in modification of aquatic habitat, increased sedimentation, turbidity, increases in temperature, decreased dissolved oxygen concentrations, releases of chemical and nutrient pollutants from sediments, and the introduction of chemical contaminants, such as fuel and lubricants (Northwest Pipeline LLC 2014). Standard construction BMPs for pipeline construction would be implemented as part of the project to reduce impacts to water resources. As such, impacts to water resources during construction are not expected to rise to the level of significance.

Operation of the proposed pipeline would permanently affect less than 1 acre of wetland by converting it from a Palustrine Scrub Shrub wetland to a Palustrine Scrub Shrub/Palustrine Emergent wetland and would not result in significant impacts (FERC 2015).

The proposed electrical service improvements would cross over a narrow slough that is located east of the existing rail lines and west of I-5. The slough drains to the Kalama River. Activities adjacent to this slough could affect water quality in the slough temporarily due to soil and/or vegetation disturbance. However, the extent of impacts would be temporary, localized, and minimized by the use of typical construction BMPs, including erosion control measures. No work would be conducted below the OHWM of the slough.

A review of the NWI data for the site of the proposed transmission line improvements indicates that the area east of I-5, where the transmission lines would tie into the existing north-south line, could be emergent wetland, and work on the east side of I-5 could result in direct wetland impacts. Impacts to this area would be associated with utility pole footprints, and as such would have limited effect on wetlands. The area in which utility poles could be constructed would be within an existing utility right of way, in an area where an existing utility line is already established.

5.5.3 No-Action Alternative

Under the No Action Alternative, the proposed project would not be constructed. However, it is anticipated that the Port would pursue future industrial or marine terminal development at the North Port site consistent with the Port's comprehensive scheme. Future industrial development under the No-Action Alternative could result in impacts similar to, greater than, or less than those of the proposed project, depending on the nature of the project and site development plans.

5.6 Mitigation Measures

5.6.1 Project Mitigation

The design features and BMPs the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the Project and have been considered in assessing the environmental impacts to water resources and are listed below.

5.6.1.1 General BMPs

General BMPs include those listed below.

- In-water work would be conducted only during the in-water work window that is ultimately approved for this project.

- Project construction would be completed in compliance with Washington State Water Quality Standards (WAC 173-201A), including those listed below.
  - Petroleum products, fresh cement, lime, concrete, chemicals, or other toxic or deleterious materials would not be allowed to enter surface waters.
  - There would be no discharge of oil, fuels, or chemicals to surface waters, or onto land where there is a potential for re-entry into surface waters.
  - Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc., would be checked regularly for leaks, and materials would be maintained and stored properly to prevent spills.

- A spill prevention, control, and countermeasures plan (SPCCP) would be prepared by the contractor and used during all construction operations. A copy of the plan with any updates would be maintained at the work site.
  - The SPCCP would outline BMPs, responsive actions in the event of a spill or release, and notification and reporting procedures. The plan would also outline management elements such as personnel responsibilities, project site security, site inspections, and training.
  - The SPCCP would outline the measures to prevent the release or spread of hazardous materials found on site or encountered during construction but not identified in contract documents including any hazardous materials that are stored, used, or generated on site during construction activities. These items include, but are not limited to, gasoline, diesel fuel, oils, and chemicals.

- Applicable spill response equipment and material designated in the SPCCP would be maintained at the job site.

5.6.1.2 Overwater Work BMPs

Typical construction BMPs for working in, over, and near water would be applied; these include activities such as the following.

- Checking equipment for leaks and other problems that could result in the discharge of petroleum-based products or other material into waters of the Columbia River.

- Corrective actions would be taken in the event of any discharge of oil, fuel, or chemicals into the water. These actions would include:
  - Beginning containment and cleanup efforts immediately upon discovery of the spill and completing them in an expeditious manner in accordance with all applicable local, state, and federal regulations. Spill response would take precedence over normal work. Cleanup would include proper disposal of any spilled material and used cleanup material.
  - Ascertaining the cause of the spill and taking appropriate actions to prevent further incidents and environmental damage.
  - Reporting spills to Ecology's Northwest Regional Spill Response Office at (425) 649-7000.

- Excess or waste materials would not be disposed of or abandoned waterward of OHW or allowed to enter waters of the state. Waste materials would be disposed of in an appropriate manner consistent with applicable local, state, and federal regulations.

- Demolition and construction materials would not be stored where wave action or upland runoff can cause materials to enter surface waters.

- Oil-absorbent materials would be present on site for use in the event of a spill or if any oil product is observed in the water.

5.6.1.3 Pile Installation BMPs

Pile installation BMPs to be applied would include the following.

- A vibratory hammer would be used to drive steel piles to minimize underwater and terrestrial noise levels.

- If steel piles require impact installation or proofing, a bubble curtain would be used.

- Marine mammal monitoring would be conducted during pile installation activities to minimize impacts to marine mammals. The Applicant has applied for an Incidental Harassment Authorization with National Marine Fisheries Service for the unavoidable incidental harassment of marine mammals that could occur during pile installation.

5.6.1.4 Overwater Concrete Placement Minimization and BMPs

On-site concrete placement would follow appropriate BMPs that include the following.

- Wet concrete would not come into contact with surface waters.

- Forms for any concrete structure would be constructed to prevent leakage of wet concrete.

- Concrete process water would not be allowed to enter the river. Any process water/contact water would be routed to a contained area for treatment and would be disposed of at an upland location.

5.6.1.5 Dredging BMPs

- Dredging would be conducted during the in-water work window that is ultimately approved for this project.

- Dredging would be conducted to prevent impingement of juvenile salmonids by dredging equipment or clamshell or hydraulic dredge. Regular observation of sediment aboard the barge or at the placement areas would be conducted. If impingement occurs, clamshell operations would be adjusted (slowed) or modified to increase the opportunity for juveniles to avoid the bucket and/or suction head. The hydraulic dredge would be lowered deeper into the sand to reduce water entrainment.

- Construction activities would be conducted in compliance with Surface Water Quality Standards for Washington (173-201A WAC) or other conditions as specified in the water quality certification and/or construction stormwater permit.

- Appropriate BMPs would be employed to minimize sediment loss and turbidity generation during dredging. BMPs may include, but are not limited to, the following:
  - Smooth closure of the bucket when at the bottom;
  - No stockpiling of dredged material on the riverbed;
  - Maintaining suction head of hydraulic dredge in the river bed to the extent practicable;
  - Using a buffer plate or other means to reduce flow energy of the hydraulic dredge at the placement area; and
  - Other conditions as specified in the water quality certification.

- Enhanced BMPs may also be implemented and may include, but are not limited to, the following:
  - Slowing the velocity (i.e., cycle time) of the ascending loaded clamshell bucket through the water column;
  - Pausing the dredge bucket near the bottom while descending, and near the water line while ascending; and
  - Placing filter material over the barge scuppers to clear return water.

- If sediment is placed on a barge for delivery to the placement area, no spill of sediment from the barge would be allowed. The barge would be managed such that the dredged sediment load does not exceed the capacity of the barge. The load would be placed in the barge to maintain an even keel and avoid listing. Hay bales and/or filter fabric may be placed over the barge scuppers to help filter suspended sediment from the barge effluent, if needed, based on sediment testing results.

5.6.1.6 Dredge Material Placement BMPs

The following BMPs and conservation measures would be implemented to minimize environmental impacts during dredged material transport and placement:

- The contractor would be required to use a tightly sealing bucket and to monitor for spillage during transfer operations.

- Visual water quality monitoring and, if necessary, follow-up measurements would be conducted around the barge at the removal and upland transfer area to confirm that material is not being released.

- Sediment that is dredged by hydraulic dredge and placed in-water by hydraulic pipeline would be discharged at the riverbed to the extent practicable to minimize turbidity in the water column.

- Material used as beach nourishment would be placed within the limits of the boundaries and below OHWM.

- To prevent fish stranding, the slope for beach nourishment would be 3:1 horizontal to vertical (33 percent) without any swales.

- Sediment placement would use methods that minimize sediment loss and turbidity to the maximum extent possible.

- The placement activities would be monitored visually to ensure placed sediment is contained inside of the specified boundaries.

- Enhanced BMPs may be implemented to control sediment migration and turbidity and may include the following:
  - Selective sediment placement at areas with low dispersion;
  - Lowering the discharge pipeline toward the bottom elevation;
  - Placing sediment to build confinement dikes followed by placing the sediment into them; and
  - Installing a silt curtain or similar equipment where appropriate.

If upland stockpiling of dredged material becomes necessary, BMPs would be employed as appropriate to control runoff and erosion. Such BMPs may include: (1) installing silt fences, hay bales, and/or containment berms; (2) managing runoff and elutriate water; and (3) routine inspection of the stockpile areas to verify that BMPs are functioning properly.

5.6.2 Additional Mitigation

The following mitigation measure has been identified to address specific impacts to water resources. There are no other significant impacts identified for water resources; therefore, no additional mitigation measures are identified.

- Develop and implement a Water Quality Protection and Monitoring Plan for project construction. The plan, at a minimum, shall include provisions for visual monitoring of adjacent surface water bodies and wetlands if stone column installation occurs within 100 feet of the surface water or wetland.

5.7 Unavoidable Significant Adverse Impacts

The proposed project, with either technology alternative or either marine terminal alternative, would not result in unavoidable significant adverse impacts to water resources.

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Chapter 6 Plants and Animals

6.1 Introduction

The purpose of this chapter is to evaluate the potential impacts of the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative, as well as the related actions, on plant and animal (including fisheries and aquatic wildlife) resources. This chapter describes the plant and animal resources at the project site and assesses potential impacts to plant and animal resources that could occur because of the construction and operation of the proposed project and No-Action Alternative. This assessment also describes and accounts for the best management practices (BMPs), compensatory mitigation, and habitat enhancements proposed as part of the project.

A biological assessment (BA) has also been prepared for the proposed project, which is included as **Appendix E**. The BA provides additional detail about species and critical habitats listed or proposed for listing under the federal Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536), which could potentially be affected by the proposed project.

This assessment concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, and accounting for the proposed compensatory mitigation, would not result in significant adverse impacts to plant and animal resources.

6.2 Regulatory Context

Numerous regulations have been enacted to reduce the potential environmental impacts of development and redevelopment on plants and animals. The sections that follow describe the principal existing regulations that protect natural resources and habitat in the study area.

6.2.1 Federal Endangered Species Act

The ESA, as amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the preservation of the ecosystems on which they depend.

The ESA is administered jointly by the U.S. Fish and Wildlife Service (USFWS) (for plants and for most terrestrial and freshwater wildlife species) and by the National Oceanic and Atmospheric Administration (NOAA) Fisheries (for most marine and anadromous species). The ESA defines procedures for listing species, designating critical habitat for listed species, and preparing recovery plans. It also specifies prohibited actions and exceptions.

Section 7(a)(2) of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize endangered or threatened species or their critical habitats. For this project, the U.S. Army Corps of Engineers (USACE) is the federal agency that will be issuing permits for the project and will consult with USFWS and NOAA Fisheries. Section 7(c) of the ESA and the federal regulations on endangered species coordination (50 CFR 402.12) require that, if listed species or designated critical habitat are present and could be affected by a project, a federal agency must analyze the potential effects on listed species and critical habitat on the project site and make an effect determination for each species. USFWS and/or NOAA Fisheries review the BA and, if they conclude that the action may adversely affect a listed species or its habitat, issue a biological opinion, which includes a take statement and may include a list of reasonable and prudent measures to follow during construction. Reasonable and

prudent measures can only include actions that occur within the action area, involve only minor changes to the project, and reduce the level of take associated with project activities (USFWS and NMFS 1998). These measures should minimize the impacts of incidental take to the extent reasonable and prudent. For example, a measure may call for actions like education of employees about the species, reduction of predation, removal or avoidance of the species, or monitoring. If USFWS and/or NOAA Fisheries find that the proposed project may affect, but is not likely to adversely affect a listed species or its habitat, they issue a letter of concurrence.

6.2.2 Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (MMPA) prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States.

The MMPA protects all marine mammals within the waters of the United States. NOAA and USFWS administer the MMPA jointly. NOAA is responsible for managing cetaceans (whales, dolphins, and porpoises) and most pinnipeds (including seals and sea lions), while USFWS is responsible for managing odobenids (walruses), sirenians (manatees and dugongs), and marine mustelids (otters) and ursids (polar bears).

6.2.3 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and the former Soviet Union, for the protection of migratory birds (16 U.S.C. 703-712, July 3, 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986, and 1989). Under the MBTA, taking, killing, or possessing migratory birds or their eggs or nests is unlawful. Most species of birds are classified as migratory under the MBTA, with the exception of upland and nonnative birds such as house sparrow, European starling, and rock dove.

6.2.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 prohibits the taking, possessing, or transporting of a bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*), or the parts, nests, or eggs of such birds without prior authorization. This includes inactive nests as well as active nests. Take means to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb. Disturb is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding or sheltering behavior. In 2009, the USFWS promulgated a finale rule on two new permit regulations that specifically authorize under BGEPA the non-purposeful (incidental) take of eagles and removal of eagle nests in certain situations (50 CFR 22.26, 22.27).

6.2.5 Washington State Hydraulic Code

The stated purpose of the Washington State Hydraulic Code (Washington Administrative Code [WAC] 220-660) is to "ensure that construction or performance of work is done in a manner that protects fish life." The Washington State Hydraulic code is administered by Washington State Department of Fish and Wildlife (WDFW) through the Hydraulic Project Approval (HPA) process. The WAC 220-660 defines a hydraulic project as the "construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state." Hydraulic projects, unless specifically exempted, must secure an HPA from WDFW.

6.2.6 Cowlitz County Critical Areas Ordinance

The Cowlitz County Code (CCC) (Chapter 19.15 – Critical Areas) establishes regulations that are protective of sensitive plant, fish, and wildlife resources. CCC Chapter 19.15.130 establishes fish and wildlife habitat conservation areas and associated riparian habitat area (RHA) buffers, which are protective of fish and wildlife habitat resources. CCC Chapter 19.15.120 establishes protections for wetlands and associated buffers, which are also indirectly protective of fish and wildlife resources that rely on wetland habitats.

6.3 Special-Status Species

Special-status species are defined for purposes of this report as those species identified for protection under the following federal or state laws:

- Species listed as endangered or threatened under the federal ESA 1973.
- Species listed as endangered, threatened, or sensitive by the Washington Natural Heritage Program (WNHP).
- Species identified as priority habitats and species (PHS), species of concern, or species of greatest conservation need by WDFW.

6.4 Methodology

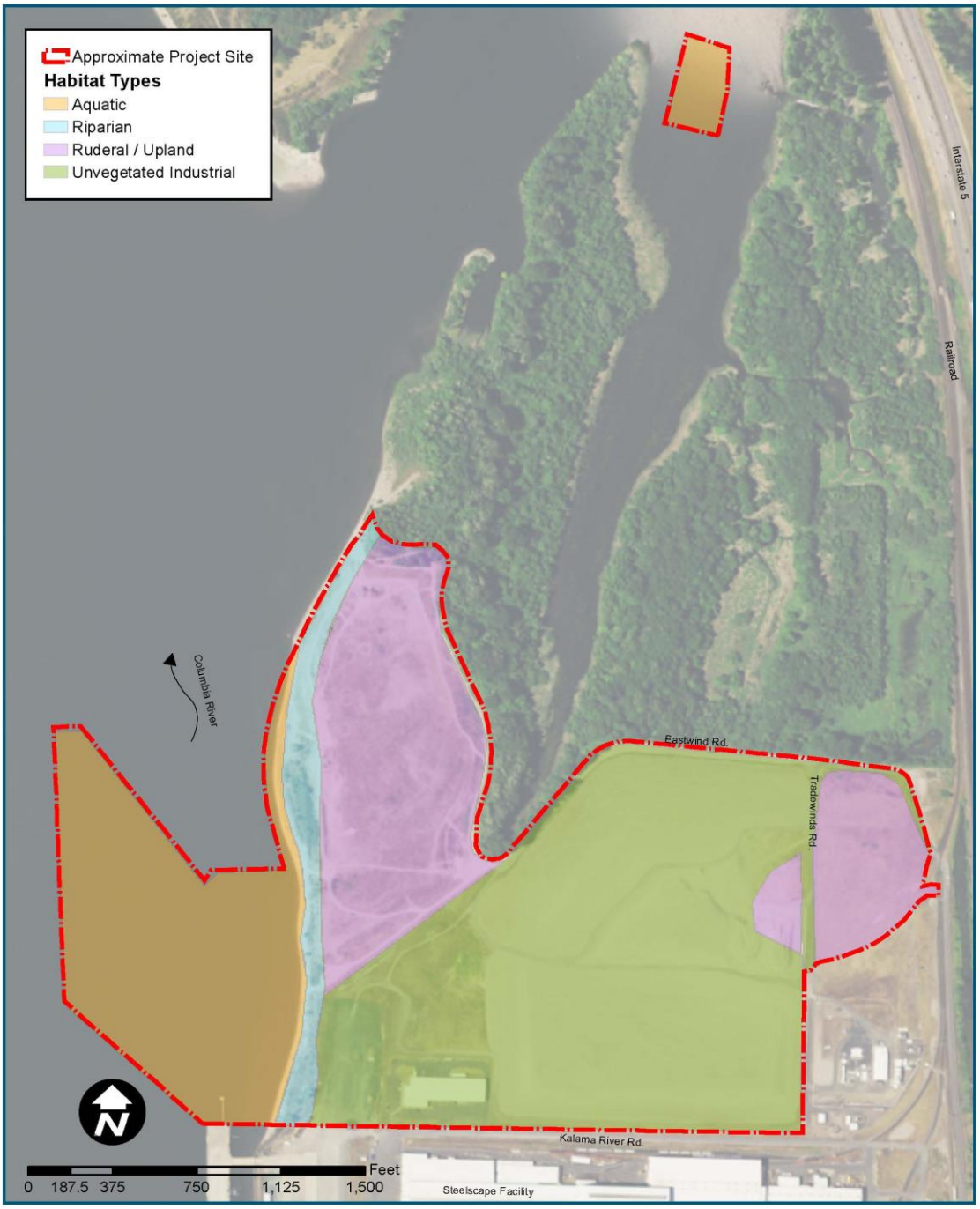
6.4.1 Study Area

The study area for the proposed project includes the footprint of the proposed project, including both Technology Alternatives and Marine Terminal Alternatives (the project site) and the related actions. The study area also includes an area within the project vicinity in which fish or wildlife species could potentially be affected during construction or operation of the proposed project, and includes the project's vessel shipping route within the mainstem Columbia River from the project site downstream to the river mouth.

The project site is located in unincorporated Cowlitz County, Washington, as shown in **Figure 6-1**. The project site includes the upland portions of the site where Technology Alternatives would be constructed, the location of the proposed Marine Terminal Alternatives, and the areas in which compensatory mitigation activities would be conducted (along the shoreline of the Columbia River at the site and in portions of the adjacent backwater).

The study area also includes an area within the project vicinity, which consists of the lands and water immediately surrounding the Project Site, including lands and water east to Interstate 5 (I-5), south to the Kalama River, north to the southern tip of Cottonwood Island, and west into the Columbia River. The project's vessel shipping route includes the mainstem Columbia River from the project site downstream to the river mouth.

The related action sites include the routes of the proposed pipeline that would convey natural gas to the project site (**Figure 2-19**), and of the Cowlitz County Public Utility District No. 1's (Cowlitz PUD) potential transmission line and substation improvements (**Figure 2-20**).



General Habitat Types on the Project Site
Figure 6-1

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6.4.2 Data Sources

The characterization of the affected environment and the assessment of the potential impacts of the proposed project and alternatives used the following methodology and data sources. Project scientists coordinated with regulatory agency biologists, reviewed existing literature and reference material, and conducted field investigations at the project site.

The primary data sources for this chapter include a baseline habitat assessment prepared for the project site (ENVIRON 2014), the BA prepared for the proposed project (ENVIRON 2015), the environmental assessment (EA) prepared for the proposed pipeline project (Federal Energy Regulatory Commission [FERC] 2015), as well as prior technical studies and investigations of the project site conducted by the Port of Kalama and potential tenants. Other sources of publicly available information used to document existing conditions of plants and animal resources at the site include:

- WDFW PHS database (WDFW 2015a)
- WNHP Program database (WNHP 2015a)
- USFWS Critical Habitat Mapper (USFWS 2015a)
- USFWS National Wetland Inventory (USFWS 2015b)
- USFWS Threatened and Endangered Species List (USFWS 2015c)
- NOAA Fisheries background information, listing materials and status reports (NMFS 2015)
- WDFW SalmonScape GIS database (WDFW 2015b)
- Cowlitz County GIS data (Cowlitz County 2015)
- Biological Assessment for USACE operations and maintenance dredging program for the Columbia River Federal Navigation Channel. (USACE 2014)
- USFWS Biological Opinion for USACE operations and maintenance dredging program for the Columbia River Federal Navigation Channel (USFWS 2014)
- NOAA Fisheries Biological Opinions and associated ESA consultation documentation for the operation of the Federal Columbia River Power System (NMFS 2008a; NMFS 2008b; NMFS 2010; NMFS 2014)

Information regarding the potential presence of special-status plant species came from the USFWS website (USFWS 2015c) and from a review of the WNHP database (WNHP 2015a). A list of species documented as occurring or potentially occurring in the project vicinity was generated based on the potential presence or absence of appropriate habitat for each species.

The USFWS website (USFWS 2015c) and the NOAA Fisheries website (NMFS 2015) supplied information regarding the potential presence of special-status fish and wildlife species. Additional information was obtained from two online WDFW databases (Priority Habitat and Species on the Web [WDFW 2015a] and SalmonScape [WDFW 2015b]) and from the 2008 PHS list (WDFW 2008).

Information regarding the potential presence of wetlands at the project site was obtained from reviews of the National Wetlands Inventory (USFWS 2015b), soils data (Natural Resources Conservation Service 2015), recent and historic permitting documentation, and aerial photographic interpretation.

The ordinary high water mark (OHWM) of the Columbia River at the project site was delineated during field visits. Riparian habitat and terrestrial site conditions were also assessed during site visits at the project site.

The characterization of the affected environment and analysis for the related action (i.e., the Kalama Lateral Project) relies on the assessment provided in the environmental assessment (EA) prepared for the pipeline project by FERC (FERC 2015).[1]

6.5 Affected Environment

6.5.1 General Habitat

This section describes the general habitat types and characteristics of the project site and the site of the related action. The affected environment description for the project site applies to both of the Technology Alternatives, both of the Marine Terminal Alternatives, and the No-Action Alternative.

6.5.1.1 Project Site

The terrestrial portion of the project site has been developed and used as a placement site for dredge materials removed from the Columbia River Federal Navigation Channel since approximately 1980. As a result, terrestrial vegetation and wildlife habitat at the project site are of limited quality and quantity with very little vegetation or wildlife habitat present on the upland portions of the site. The boundaries of the project site and general habitat types are shown in **Figure 6-1** and are described below. Most of the project site is unvegetated industrial habitat, while the aquatic habitat portion of the project site is located in the Columbia River and portions of the adjacent backwater. The following habitat types are present on the project site.

Unvegetated Industrial

Approximately half of the project site (48 percent) consists of unvegetated industrial land consisting of unvegetated areas that are either completely developed with industrial infrastructure (e.g., buildings and other paved and graveled surfaces) or consist of unvegetated sandy areas that are actively managed for dredged material management. These areas are devoid or nearly devoid of vegetation and provide little to no wildlife habitat function.

Ruderal Upland Grass/Forb

Approximately 25 percent of the project site consists of the ruderal upland grass/forb habitat type.[2] The areas in this habitat type likely provide potentially suitable habitat for terrestrial mammals, such as coyotes, rabbits, and small rodents, which are accustomed to industrialized and populated environments. Portions of the site in this habitat type may also provide potentially suitable habitat for ESA-listed streaked horned lark and Columbian white-tailed deer (*Odocoileus virginianus leucurus*) (see section 6.5.2.1).

Upland vegetation within this habitat type is primarily limited to small patches of grasses and a mix of native and non-native weedy herbaceous species. These species include annual bluegrass (*Poa annua*), annual bromes (*Bromus* spp.), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), chickweed (*Stellaria media*), colonial bentgrass (*Agrostis capillaris*), common mullein (*Verbascum thapsis*), hairy cat's ear (*Hypochaeris radicata*), narrowleaf plantain (*Plantago lanceolata*), ox-eye daisy (*Leucanthemum vulgare*), Queen Anne's lace

[1] This application is FERC docket CP15-8 and is available online at http://www.ferc.gov/docs-filing/elibrary.asp

[2] Ruderal: Weedy vegetation growing on compacted, plowed, or otherwise disturbed ground and showing a preference for this type of habitat. Source: http://www.biology-online.org/dictionary/Ruderal

(*Daucus carota*), rabbit's foot clover (*Trifolium arvense*), red fescue (*Festuca rubra),* St. John's wort (*Hypericum perforatum*), sheep sorrel (*Rumex acetosella*), velvetgrass (*Holcus lanatus*), and yellow glandweed (*Parentucellia viscosa*).

Mosses also represent a substantial portion of the ground cover within this habitat type, particularly in sections that have not been recently disturbed (ENVIRON 2014). Few woody species are present on the proposed project site with Scotch broom (*Cytisus scoparius*) being the most common.

Nine species previously documented within the ruderal upland grass/forb habitats on the site are identified as noxious weeds by the Washington State Noxious Weed Control Board. These include four species listed as Class B weeds (Scotch broom, Queen Anne's lace, hairy cat's ear, and ox-eye daisy) and five species listed as Class C weeds (Canada thistle, bull thistle, St. John's wort, common groundsel [*Senecio vulgaris*], and reed canarygrass [*Phalaris arundinacea*]). Class B weeds are non-native species designated for control in regions where they are not yet widespread. None of these species are designated for control in Cowlitz County. Class C weeds are already widespread in Washington, but may be designated for control at a local level. Canada thistle is the only one of these species that is designated for control in Cowlitz County.

Riparian

Riparian habitat represents less than 5 percent of the project site. The extent and quality of riparian habitat at the project site is limited due to the dredge material placement activities that have occurred at the site. Dredge material placement associated with the USACE Columbia River navigation channel deepening and maintenance, and Port maintenance dredging activities have established a steep bank bordering the Columbia River along the western boundary of the project site. Similarly, a graveled access road isolates the site from the wetlands and riparian habitats to its north. The upland extent of functional riparian habitat is therefore limited in quantity and quality. The existing riparian area within the project site is mostly devoid of vegetation, with the exception of scattered trees and vegetation below the top of the bank.

Vegetation within the functional portion of the riparian habitat at the site consists primarily of small-diameter black cottonwood (*Populus balsamifera*), willows (*Salix* spp.), and Himalayan blackberry (*Rubus armeniacus*). Specifically, a narrow band of black cottonwood trees and saplings have established in the riparian area between the portion of the site that would be developed and the OHWM. Approximately 66 black cottonwood trees have established within the riparian buffer. These trees are primarily small saplings between 1 and 8 inches in diameter at breast height (dbh), but there are a few larger diameter trees between approximately 8 and 20 inches dbh. Many of these trees are multistemmed (ENVIRON 2014).

The riparian habitat at the project site provides potentially suitable habitat for wildlife species that can tolerate a wide range of habitat conditions and are conditioned to living in industrialized environments (e.g., ground squirrels, rabbits, opossum, raccoons, coyote, and common rodent species). In addition to these terrestrial mammals, the riparian buffer provides potentially suitable seasonal foraging habitat for beaver and resident and migratory songbirds and shorebirds, as well as raptors.

WDFW defines riparian habitats as a priority habitat for the important hydrologic, water quality, and habitat functions they provide (WDFW 2008). However, the riparian habitat at the project site does not provide any significant hydrologic, water quality, or habitat functions because of the highly altered nature of the riparian habitat (i.e., dredged material placement,

minimal riparian vegetation, lack of structural complexity, and continued vehicular access and use by the public).

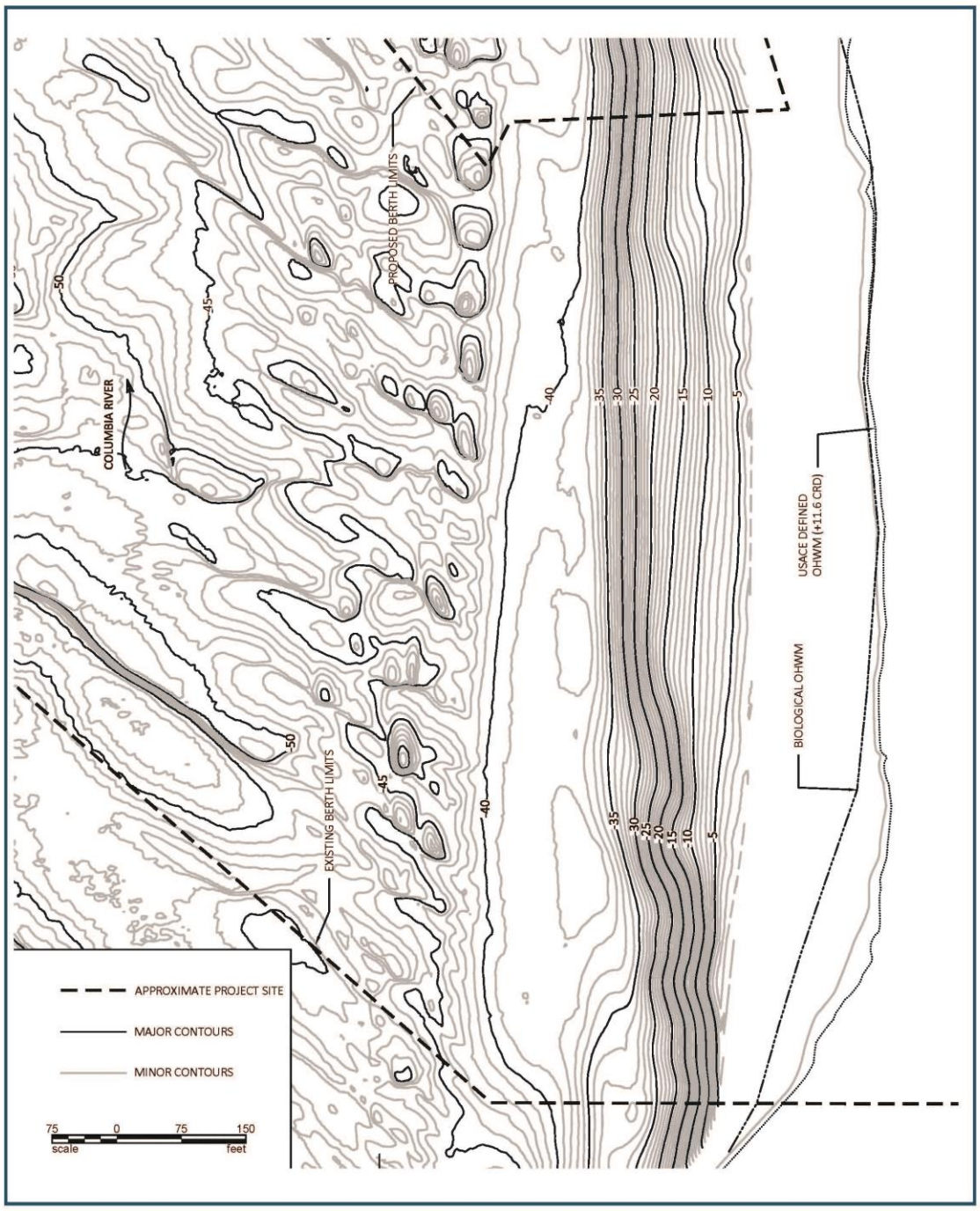
Aquatic

The aquatic environment at the project site consists of the portion of the Columbia River extending from the OHWM into the river to the west boundary of the site where the marine terminals and berth extensions would be constructed under the Marine Terminal Alternatives. Aquatic habitat is also present within the backwater habitat where pile removal activities would occur. In total, aquatic habitat represents approximately 22 percent of the project site.

Aquatic habitats within the Columbia River at the project site include intertidal sandy beaches, subtidal demersal (river bottom) habitat, and water column habitat. There is a shallowly sloping beach below the OHWM at the site, which extends out from the shoreline a distance of approximately 250 feet (**Figure 2-11**). Average water depths in this shallow area are likely between 5 and 15 feet. Beyond this distance, the shoreline drops off rapidly to water depths in excess of 35 feet (**Figure 6-2**). Substrate within both subtidal and intertidal benthic environments consists largely of silts and medium-to-coarse alluvial sands. Channel substrate is very similar throughout the Lower Columbia River and consists primarily of sand with some silt, especially in nearshore shallow water areas. There is no submerged aquatic vegetation in this reach of the river, most likely due to the dynamic nature of the system and the high water velocities.

In general, the aquatic habitat of the Columbia River at the project site provides habitat for a variety of benthic, epibenthic, and water column organisms. The shape, composition, and configuration of benthic topography are in a state of relatively constant change in this reach of the Columbia River, due to natural processes. Sand waves naturally form and propagate along the channel and the adjacent river bottom, with the estimated volume of sand in a single large sand wave in a range of between 100,000 to 200,000 cubic yards (Coast & Harbor Engineering [CHE] 2015).

Water quality conditions of the aquatic environment at the project site are generally appropriate for aquatic life. Turbidity, pH, and dissolved oxygen are generally within the range needed to support aquatic life. The majority of the river in the vicinity of the project site is not identified on the Washington State Department of Ecology (Ecology) 2012 303(d) list for elevated water temperatures (Ecology 2012). However, two areas on the Columbia River, near the project site (one at River Mile [RM] 71.9 immediately downstream of the project site, and one approximately 2 miles upstream at RM 74) are listed on the 2012 Ecology 303(d) list for temperature exceedances (Ecology 2012). Additionally, data published by the U.S. Geological Survey in 2012 indicate that summer water temperatures downstream of Bonneville Dam routinely exceed 70°F (Tanner et al. 2012).



Project Site Bathymetry
Figure 6-2

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6.5.1.2 Project Site Vicinity

Habitat conditions outside of the immediate project site but within the vicinity include habitats similar to those at the project site, including unvegetated industrial habitats, ruderal upland grass/forb, riparian, and aquatic habitats. In addition, several areas of relatively higher quality habitat are also present in the vicinity of the project site. These include emergent and forested wetlands, forested upland habitats, forested riparian habitats, and habitat areas associated with cavity-nesting ducks and Canada geese (*Branta canadensis*) in the project vicinity as mapped by WDFW. These habitat types are described below and mapped in **Figure 6-3**.

Wetlands

The project site is located near the confluence of the Kalama and Columbia Rivers and was historically part of the Columbia River floodplain. The highest quality wetland habitats in the project vicinity are located:

(1) south of the project site where the Kalama River discharges into the Columbia River (USFWS 2015b);

(2) immediately north of the project site in a backchannel, tidally influenced wetland complex (Ecological Land Services, Inc. 2014); and

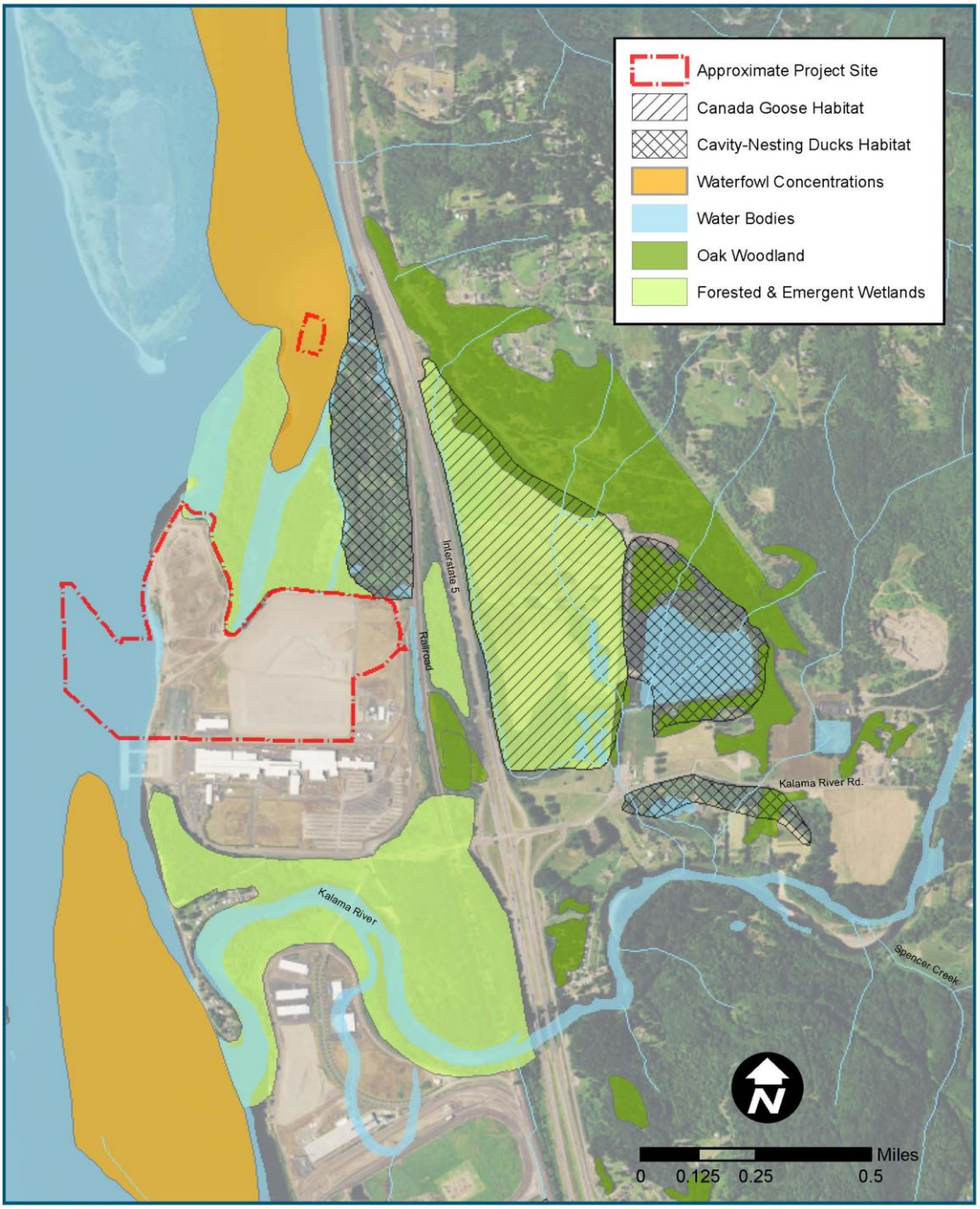
(3) immediately east of the project site, between Tradewinds Road and I-5 (USFWS 2015b).

These wetlands provide high-quality seasonally inundated habitats that most closely resemble the original hydrologic and wetland habitat functions of the Columbia River floodplain.

The WDFW list of priority habitats (WDFW 2008) includes freshwater wetlands, which provide important habitat functions in addition to their water quality and hydrologic functions. Wetlands can provide habitat for several species of waterfowl (i.e., mallard ducks [*Anas platyrhynchos*], pintail [*Anas acuta*], wigeon [*Anas americana*], merganser [*Mergus merganser*], gadwalls [*Anas strepera*], green-winged teal [*Anas crecca*], Canada goose, and snow goose [*Chen caerulescens*]), great blue heron (*Ardea herodias*), sandhill crane (*Grus canadensis*), and a variety of migratory songbird species. Mammals typically found in wetland habitats in the vicinity include beaver, raccoon, and coyote. Various reptile and amphibian species also use wetland habitats.

Oak Woodlands

East of the project site, between I-5 and the BNSF tracks, there is a rock outcropping known as Drays Mound where WDFW identifies oak (*Quercus garryana*) woodland habitat. Oak woodlands provide a mix of feeding, resting, and breeding habitat for many wildlife species (WDFW), including species that are state-listed as sensitive, threatened, endangered, or candidates for these listings (Larsen and Morgan 1998).



Habitat Types in the Vicinity of the Project Site
Figure 6-3

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Manufacturing & Marine Export Facility

Riparian

Riparian habitats within the project vicinity are typical of a developed and industrial reach of the Columbia River. Most streambanks are armored or otherwise altered, and native vegetation is limited to a narrow band of willows and/or cottonwoods. These habitats provide little riparian function. However, both north and south of the project site, there are unarmored sections of streambank with associated willow and cottonwood forests. North of the project site, the riparian forest is contiguous with a Columbia River backwater wetland, and associated cottonwood and willow forest. Similarly, south of the Steelscape facility and north of the confluence of the Kalama and Columbia Rivers, the shoreline is unarmored and there is a small stand of cottonwood forest. These areas provide habitat for both riparian-associated species of birds, mammals, reptiles, and amphibians, and also provide important habitat functions for adjacent aquatic habitats, such as providing sources of shade, leaf litter, insect fauna, and large woody debris.

Cavity-nesting ducks

Breeding concentrations of several species of cavity-nesting ducks are considered priority species by WDFW (WDFW 2008). Cavity-nesting duck species considered in the listing include wood duck (*Aix sponsa*), Barrow's goldeneye (*Bucephala islandica*), common goldeneye, (*Bucephala clangula*), bufflehead (*Bucephala albeola*), and hooded merganser (*Lophodytes cucullatus*).

In Washington, cavity-nesting ducks nest primarily in late successional forests and riparian areas adjacent to low gradient rivers, sloughs, lakes, and beaver ponds (Larsen et al. 2004). They are secondary cavity nesters, using cavities created by large woodpeckers, by decay, or by damage to the tree. Shallow wetlands within approximately 0.5 mile of cavities provide optimal brood habitat (Larsen et al. 2004).

Some of the wetland and forested habitats within the project vicinity provide excellent habitat for these ducks, and one or more of these species may be present within the vicinity year-round. In particular, the backwater forested wetlands north of the project site and the wetlands east of the project site are documented as providing potentially suitable habitat for cavity-nesting ducks.

6.5.1.3 Shipping Route

Aquatic habitat within the project's vessel shipping route includes the mainstem Columbia River from the project site downstream to the river mouth. The shipping route is located within the segment of the river generally referred to as the Lower Columbia River and Estuary. This segment extends from the Bonneville Dam at River Mile (RM) 146 (upstream of the project site) to the river mouth on the Pacific Ocean. The Columbia River federal navigation channel begins at the mouth of the Columbia River and is maintained at a depth of approximately -43 feet and a width of approximately 600 feet up to and past the project site to the BNSF railroad bridge in Vancouver. The channel extends further upriver at a lesser depth and width (USACE 2014).

Historically, the downstream half of the Columbia River estuary was a dynamic environment with multiple channels, extensive wetlands, sandbars, and shallow areas (NMFS 2008b). However, human activities within the estuary including dredging, deepening and maintenance of navigation channels, construction of jetties and pile-dike fields, filling and diking of marsh and riparian habitats, and shoreline armoring have altered the natural landscape within the estuary. More than 50 percent of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses (NMFS

2008b). The dynamics of estuarine hydrology, including peak and base flows and sediment delivery, have also been altered as a result of dam construction and diking.

Despite this existing baseline habitat condition, the reach of the Lower Columbia River and estuary that is in the area of the project's vessel shipping route remains a biologically diverse environment, and provides habitat for a variety of terrestrial and aquatic species. Freshwater aquatic species present in the area include Pacific salmon and other resident and anadromous fish species, marine mammals (Steller sea lion [*Eumetopias jubatus*], harbor seal [*Phoca vitulina*], and California sea lion [*Zalophus califonianus*]), and several species of aquatic reptiles and amphibians (LCFRB 2010, USACE 2014). In addition, terrestrial and aquatic habitats within the shipping route area also provide documented and/or potentially suitable habitat for a number of avian species, terrestrial mammals, reptiles, and amphibians (LCFRB 2010).

6.5.1.4 Related Actions

General habitats within the proposed pipeline alignment include forested, herbaceous, wetland, and riparian habitats (FERC 2015). The route would cross seven waterbodies (five of which are intermittent and non-fish-bearing), and four wetlands. The pipeline would traverse several forest types including conifer, deciduous, and mixed conifer-deciduous forest as well as Oregon white oak woodlands.

Tree species in forested habitats within the alignment for the pipeline include Douglas-fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), western redcedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*) and Oregon white oak (*Quercus garryana*); dominant shrubs species include beaked hazelnut (*Corylus cornuta*), Scotch broom, snowberry (*Symphoricarpos* alba), red elderberry (*Sambucus racemosa*), salmonberry (*Rubus spectabilis*), salal (*Gaultheria shalon*), and osoberry (*Oemleria cerasiformis*). Some of the forested habitats have been disturbed (past logging, residential construction and other development). Herbaceous vegetation (common grasses and forbs), found on disturbed, residential, and maintained lands, include domesticated/ornamental grasses, and emergent species, including stinging nettle (*Urtica dioica*), waterleaf (*Hydrophyllum* sp.) and St. John's wort. Riparian vegetation includes a variety of trees, shrub and herbaceous plant species found adjacent to waterbodies including red alder, Himalayan blackberry, stinging nettle, creeping buttercup (*Ranunculus repens*), horsetails (*Equisetum* spp.), and reed canarygrass (*Phalaris arundinacea*). Additionally, some agricultural vegetation, including hay or pasture grasses, and noxious weeds, including Scotch broom and Himalayan blackberry, would be crossed by the pipeline.

Habitats within the proposed pipeline alignment support the foraging, breeding, and resting activities of a variety of commonly occurring amphibians, reptiles, birds, and mammals. The quality of these habitats varies depending on vegetative components, wildlife requirements, and adjacent land use (FERC 2015).

Habitats within the area that could be affected by the proposed electrical service improvements mostly consist of developed industrial habitats and ruderal upland habitats but may also include some emergent wetland habitats. The portion of the transmission line improvements that would be constructed west of I-5 would be conducted on unvegetated industrial habitat at the existing Kalama Industrial Substation. The proposed transmission line improvements would cross over a narrow slough that is located east of the existing rail lines and west of I-5. The slough drains to the Kalama River, and may potentially be accessible to fish or other aquatic species. However, this habitat is of limited value, given its nature and constrained position on the landscape. A review of the Northwest Innovation Works, LLC – Kalama (NWIW) data for the proposed transmission line improvements indicates that the area east of I-5 where the

transmission lines would tie into the existing north-south line could potentially be emergent wetland. This area could potentially provide habitat for wetland adapted species including birds, small mammals, and amphibians.

6.5.2 Terrestrial Plants and Animals

This section describes the terrestrial plants and animals that may occur on the project site, in the project vicinity, and within the project shipping route, as well as those that could be affected by the related actions. Special-status species that may occur in these areas are discussed in the subsections that follow.

6.5.2.1 Project Site

The project site provides potentially suitable habitat for several species terrestrial wildlife. Song sparrows are known to nest and roost in Scotch broom, crows have been seen foraging within the site, and a pair of nesting osprey have been observed using an artificial nesting platform installed at the northeast corner of the site (PMEC 2007), though osprey have not nested at the location in over two years. Osprey are not considered a priority species by WDFW, but are monitored for status and distribution.

The project site likely supports foraging and perching by migratory songbirds and foraging by birds of prey (e.g., owls and hawks). Small mammals likely use the site for nesting and foraging while larger mammals may pass along the edges of the site. However, the site contains no suitable forage or cover when compared with habitats to the north and east. Snakes may search the site for small mammal or avian prey, particularly the project edges and the less disturbed habitat in the northwest portion. Other reptiles are less likely to use the site because of loss of suitable habitat. Suitable habitat for amphibians or amphibian dispersal does not exist at the site.

WDFW documents the section of the Columbia River north and south of the site as active overwintering habitat for large concentrations of waterfowl, primarily diving ducks (WDFW 2015a). WDFW also documents several osprey occurrence points in this same stretch of the Columbia River.

The large tidal wetland complex adjacent to the north boundary of the proposed site and connected with the Columbia River provides foraging, migration, and nesting habitat for guilds of diving ducks, dabbling ducks, shorebirds, cavity-nesting birds, and other waterfowl (WDFW 2015a).

Several bald eagle breeding sites are listed as occurring at least 1 mile north of the project site on the east bank of Cottonwood Island in the Columbia River (WDFW 2015a). Cottonwoods and red alders growing on the island and in the wetlands directly north of the project site obstruct the line of sight from the nest to the site, but the project site contains a few cottonwoods that may be used for perching to view the Columbia River and the tidal wetland complex to the north. The project site may also provide opportunities for bald eagles and other raptors to feed on their prey if caught on or near the site.

Special-Status Plant Species

This section identifies the potential for special-status terrestrial plant species to occur within the project study area. A review of the WNHP database did not identify any documented occurrences of any special-status plant species within the township/range/sections in which the project site is located (WNHP 2015a). No special-status plant species have been documented at

the project site and it provides suitable habitat for only one special-status plant species, the soft-leaved willow (*Salix sessilifolia*). Soft-leaved willow is found in lowland habitats, including silty or sandy riverbanks, riparian forests, dredge spoils, sandy beaches, and at the upper edge of an intertidal zone (WNHP 2015b), which is found within the narrow riparian habitat in the project site. **Table 6-1** summarizes the special-status plant species known to occur, or with the potential to occur, at or near the project site.

Table 6-1. Special-Status Plant Species and Their Potential to Occur within the Project Site

Species	Listing Status		Potential for Occurrence At Project Site
	Federal[1]	State[2]	
Nelson's Checker-Mallow (*Sidalcea nelsoniana*)	FT	SE	Low – no suitable habitat on site
Bradshaw's Desert-Parsley (*Lomatium bradshawii*)	FE	SE	Low – no suitable habitat on site
Kincaid's Lupine (*Lupinus sulphureus* ssp. *kincaidii*)	FT	None	Low – no suitable habitat on site
Willamette Daisy (*Erigeron decumbens* var. *decumbens*)	FE	None	Low – no suitable habitat on site
Tall Agoseris (*Agoseris elata*)	None	SS	Low – no suitable habitat on site
Tall Bugbane (*Cimicifuga elata*)	FSC	SS	Low – no suitable habitat on site
Clackamas Corydalis (*Corydalis aquae-gelidae*)	FSC	SS	Low – no suitable habitat on site
Pink Fawn-Lily (*Erythronium revolutum*)	None	SS	Low – no suitable habitat on site
Western Wahoo (*Euonymus occidentailis*)	None	SS	Low – no suitable habitat on site
Nuttall's Quillwort (*Isoetes Nuttallii*)	None	SS	Low – no suitable habitat on site
Loose-Flowered Bluegrass (*Poa laxiflora*)	None	SS	Low – no suitable habitat on site
Wheeler's Bluegrass (*Poa nervosa*)	None	SS	Low – no suitable habitat on site
Soft-Leaved Willow (*Salix sessilifolia*)	None	SS	Moderate – wet lowland habitats, including silty or sandy riverbanks

1 ESA Classification: FE = federal endangered; FT = federal threatened; FSC = species of concern
2 State Status: SE = state endangered; ST = state threatened; SS = state sensitive
Source: WNHP 2015a; ENVIRON 2015

Special-Status Animal Species

This section evaluates the potential for special-status terrestrial animal species to occur within the project site. **Table 6-2** summarizes the special-status animal species known to occur, or with the potential to occur, at the project site or within the vicinity. The table also includes an

evaluation of the presence or absence of species-appropriate habitat at the project site and vicinity scales.

Of the listed terrestrial animal species identified as special-status species in **Table 6-2**, only two ESA-listed species are expected to occur at the proposed project site. The streaked horned lark (*Eremophila alpestris strigata*), listed as threatened under the ESA, and the Columbian white-tailed deer, listed as endangered under the ESA, have been previously documented on and in the vicinity of the project site (ENVIRON 2015; USFWS 2013b). Bald eagles are also known to forage in the Columbia River. The bald eagle, while no longer considered threatened under the ESA, is considered a state sensitive species by WDFW. The streaked horned lark and Columbian white-tailed deer are discussed in more detail below.

Table 6-2. Special-Status Animal Species and Their Potential to Occur within the Project Site

Species	Listing Status		Potential for Occurrence At Project Site	Critical Habitat Designation
	Federal[1]	State[2]		
Birds				
Marbled Murrelet (*Brachyramphus marmoratus*)	FT	ST	Low – no suitable habitat on site	Designated, but not at project site.
Streaked Horned Lark (*Eremophila alpestris strigata*)	FT	SE	High – previously documented at site; breeds and winters in project vicinity	Designated, but not at project site.
Yellow-Billed Cuckoo (*Coccyzus americanus*)	FT	SC	Low – no suitable habitat on site	Designated, but not at project site.
Northern Spotted Owl (*Strix occidentalis caurina*)	FT	SE	Low – no suitable habitat on site	Designated, but not at project site.
Bald Eagle *(Haliaeetus leucocephalus)*	FSC	SS	High – known to nest and forage in project vicinity	None
Purple Martin *(Progne subis)*	None	SC	Low – no suitable habitat on site	None
Peregrine Falcon *(Falco peregrinus)*	FSC	SS	Low – no suitable habitat on site	None
Vesper Sparrow *(Pooecetes gramineus)*	FSC	SC	Low – no suitable habitat on site	None
Greater Sage Grouse *(Centrocercus urophasianus)*	None	ST	Low – no suitable habitat on site	None
Columbian Sharp-Tailed Grouse *(Tympanuchus phasianellus columbianus)*	None	ST	Low – no suitable habitat on site	None
Brown Pelican *(Pelecanus occidentalis)*	None	SE	Low – no suitable habitat on site	None

Species	Listing Status		Potential for Occurrence At Project Site	Critical Habitat Designation
	Federal[1]	State[2]		
American White Pelican *(Pelecanus erythrorhynchos)*	None	SE	Low – no suitable habitat on site	None
Upland Sandpiper *(Bartramia longicauda)*	None	SE	Low – no suitable habitat on site	None
Sandhill Crane *(Grus Canadensis)*	None	SE	Low – no suitable habitat on site	None
Snowy Plover *(Charadrius nivosus)*	None	SE	Low – no suitable habitat on site	None
Ferruginous Hawk *(Buteo regalis)*	None	ST	Low – no suitable habitat on site	None
Mammals				
Columbian White-Tailed Deer *(Odocoileus virginianus leucurus)*	FE	SE	High – occurs on Lower Columbia River islands and shorelines	No critical habitat has been designated
Pygmy Rabbit *(Brachylagus idahoensis)*	None	SE	Low – no suitable habitat on site	None
Mazama Pocket Gopher *(Thomomys mazama)*	None	ST	Low – no suitable habitat on site	None
Western Gray Squirrel *(Sciurus griseus)*	FSC	ST	Low – no suitable habitat on site	None
Fisher *(Martes pennant)*	FC	SE	Low – no suitable habitat on site	None
Gray Wolf *(Canis lupus)*	None	SE	Low – no suitable habitat on site	None
Grizzly Bear *(Ursus arctos horribilis)*	FT	SE	Low – no suitable habitat on site	Designated, but not at project site.
Woodland Caribou *(Rangifer tarandus caribou)*	FE	SE	Low – no suitable habitat on site	Designated, but not at project site.
Amphibians/Reptiles				
Oregon Spotted Frog (*Rana pretiosa*)	FT	SE	Low – no suitable habitat on site	Proposed, but not at project site.
Northern Leopard Frog *(Lithobates pipiens)*	None	SE	Low – no suitable habitat on site	None
Western Pond Turtle *(Actinemys marmorata)*	None	SE	Low – no suitable habitat on site	None
Insects				
Oregon Silverspot Butterfly	FT	SE	Low – no suitable habitat on site	Designated, but not at project site.

Species	Listing Status		Potential for Occurrence At Project Site	Critical Habitat Designation
	Federal[1]	State[2]		
(Speyeria zerene hippolyta)				
Taylor's Checkerspot Butterfly *(Euphydryas editha taylori)*	FE	SE	Low – no suitable habitat on site	Designated, but not at project site.
Mardon Skipper Butterfly *(Polites mardon)*	FSC	SE	Low – no suitable habitat on site	None

1 ESA Classification: FE = federal endangered; FT = federal threatened; FSC = species of concern
2 State Status: SE = state endangered; ST = state threatened; SS = state sensitive; SC = state candidate
Source: ENVIRON 2015; USFWS 2015c; NMFS 2015; WDFW 2015a; WNHP 2015a

Streaked horned lark

Streaked horned lark have been previously documented on portions of the project site. However, the majority of the project site does not provide suitable nesting habitat for streaked horned lark. The area of the project site that may currently provide up to approximately 3 acres of potentially suitable nesting habitat for streaked horned lark is located in the northern section of the site, on an area of dredge material that was placed as part of the USACE Columbia River Navigation Channel project.

The USACE recently conducted an ESA Section 7 consultation for dredging associated with the maintenance of the Columbia River Navigation Channel. In their BA, as part of this consultation, the USACE used the normalized difference vegetative index (NDVI)[3] data to conduct an analysis of the extent of suitable nesting habitat throughout the Lower Columbia River (USACE 2014). According to the analysis presented by USACE, site preparations and placement of dredged materials removes or buries all vegetation in the placement footprint. Habitat in the placement footprint is then considered yet-to-be suitable because the area is devoid of all vegetation (>90 percent bare sand). If left undisturbed, these areas are assumed to transition into suitable streaked horned lark nesting habitat conditions after sufficient time has elapsed for vegetation to become established following placement. Once areas have developed into suitable habitat, it is further assumed they would remain suitable for a given number of years, based on the amount of time it takes for vegetation to grow and exceed 50 percent cover (USACE 2014). It should also be noted that without placement of dredged materials, many areas would transition into unsuitable streaked horned lark nesting habitat and these areas would remain unavailable to larks until habitat conditions change through other disturbance mechanisms. The USACE placement of dredged materials is therefore a crucial disturbance event for maintaining suitable breeding habitat for streaked horned larks on upland placement sites.

According to the analysis, the USACE expects approximately 3 acres of the project site to remain as suitable habitat for larks only through the end of the 2015 nesting season, after which time it is expected to be "unsuitable" for lark nesting habitat due to vegetation succession (USACE 2014; USFWS 2014). This was confirmed by the USFWS in their biological opinion (USFWS 2014). Further, the USACE and USFWS stated that larks that might otherwise

[3] NDVI = normalized difference vegetation index. Based on satellite data, NDVI is a method of assessing whether a given area is covered by live vegetation.

attempt to nest at the site would be expected to find suitable habitat on islands in the vicinity (USACE 2014; USFWS 2014).

Columbian white-tailed deer

Columbian white-tailed deer have been reported as being occasionally present at the project site and within the vicinity. These deer likely are among a small number of deer translocated to nearby Cottonwood Island (USFWS 2013a; Washington State Department of Transportation [WSDOT] 2014). In the fall of 2010, 15 Columbian white-tailed deer were moved to Cottonwood Island, due north of the Project site, as part of the Revised Recovery Plan (USFWS 2013b). Telemetry monitoring by WDFW personnel in the spring of 2011 detected three radio-collared Columbian white-tailed deer on Cottonwood Island and two on the Oregon mainland near Rainier, Oregon. A second translocation of 12 Columbian white-tailed deer to Cottonwood Island (from Puget Island) occurred in conjunction with the 2013 emergency translocation effort (USFWS 2013a).

While Columbian white-tailed deer have been previously documented at the project site and within the vicinity, the project site provides little suitable habitat for Columbian white-tailed deer because of the amount of human activity in the area, both recreational and port-related, as well as the poor forage quality of the vegetation and low amount of cover. Except for the few trees and dense Scotch broom located along one stretch of the beach, there is no cover for the Columbian white-tailed deer. It was noted in the 5-Year Review that habitat quality may be a factor in the movement of Columbian white-tailed deer off Cottonwood Island, and the project site contains little cover, browse, or other forage habitat. It likely that any deer present at the site would be passing through to habitat north of the project site.

6.5.2.2 Project Vicinity

There are several areas of relatively higher quality habitat adjacent to and in the immediate vicinity of the project site that may provide potentially suitable habitat for one or more special-status plant and animal species. These include emergent and forested wetlands, forested terrestrial habitats, rock outcroppings, and agricultural lands identified as foraging and nesting opportunities.

Special-Status Plant Species

The project vicinity contains several higher-functioning wetland, riparian, and aquatic habitats, as well as upland and riparian forested habitats that may provide potentially suitable habitat for one or more special-status plant species. Several wetland, riparian, and aquatic habitats within the project vicinity may be suitable for soft-leaved willow. In addition, WDFW PHS data notes unspecified "unique plant species" and Oregon white oak woodlands associated with Drays Mound and additional Oregon white oak woodlands east of I-5 (WDFW 2015a).

Special-Status Animal Species

Several special-status animal species have the potential to occur in the project vicinity based on the presence of potentially suitable habitat. The project vicinity provides some relatively high quality wetland, riparian, and aquatic habitats that may provide habitat for one or more species of special-status animal species listed in **Table 6-2**. These species include Columbian white-tailed deer, bald eagle, purple martin (*Progne subis*), sandhill crane, and northern leopard frogs.

6.5.2.3 Shipping Route

As described in section 6.5.1.3, aquatic habitat within the project's shipping route includes the mainstem Columbia River from the project site downstream to the river mouth. This segment of the river generally referred to as the Lower Columbia River and estuary. The Lower Columbia River and estuary is a biologically diverse region and provides documented and potentially suitable habitat for a variety of terrestrial plant and animal species.

Terrestrial habitats within the portion of the Lower Columbia River and estuary that are within the project shipping route area include sandy island habitats in the lower river, as well as associated riparian and floodplain habitats. These habitats provide habitat for a number of terrestrial- and riparian-associated species of birds, mammals, reptiles, and amphibians, including several special-status species, including streaked horned lark and Columbian white-tailed deer.

Aquatic habitats within the project shipping route area provide limited habitat for terrestrial species of plants and animals, though some terrestrial species such as Columbian white-tailed deer are at least occasionally present within aquatic habitats within the projects shipping route.

6.5.2.4 Related Action

The only special-status terrestrial plant species identified with potential to occur within the Kalama Lateral Project (proposed pipeline) is the ESA-listed threatened Nelson's checkermallow (*Sidalcea nelsoniana*) (FERC 2015). The nearest documented occurrence of Nelson's checkermallow is approximately 18 miles north of the proposed pipeline alignment (FERC 2015).

FERC identified four federally listed terrestrial and/or avian wildlife species with potential to occur within the alignment for the proposed pipeline project: Columbian white-tailed deer, marbled murrelet, streaked horned lark, and yellow-billed cuckoo (*Coccyzus americanus*) (FERC 2015). WDFW also identifies four priority wildlife species that may potentially occur in the Kalama Lateral Project (proposed pipeline) – bald eagle, eastern wild turkey (*Meleagris gallopavo silvestris*), Canada goose, and elk (*Cervus elaphus*).

6.5.3 Fisheries and Aquatic Species

The portion of the Columbia River that is within the project site, vicinity, and shipping route contains documented and/or potentially suitable habitat for several special-status fish and other aquatic species, including marine mammals. These include species and critical habitat listed or proposed for listing under the ESA (NMFS 2015, USFWS 2015c), Washington state-listed species, and WDFW priority species (WDFW 2008). The Columbia River has also been designated critical habitat for 13 Evolutionarily Significant Units (ESUs)/Distinct Population Segments (DPSs) of Columbia River salmon, steelhead, and bull trout, and has been proposed for designation for Lower Columbia River coho salmon. The Columbia River is also designated as Essential Fish Habitat (EFH) for Pacific Salmon.

The BA prepared for this project (see **Appendix E**) provides additional information regarding the ESA-listed fish species known to occur, or with the potential to occur, at the project site, within the vicinity, and/or within the proposed shipping route along the Columbia River. The report discusses each species' life history, listing status, and potential to occur within the study area based on an evaluation of the presence or absence of appropriate habitat for it at the project site and in the surrounding vicinity.

6.5.3.1 Project Site

This section identifies special-status fisheries and aquatic species known to occur, or with the potential to occur, within the project site. **Table 6-3** summarizes the state and federal listing status and the status of federal critical habitat designation for each species.

The environmental baseline conditions for fish habitat within the reach of the Columbia River that flows through the project site are typical of those associated with an urbanized and industrial reach of the Columbia River. At the watershed scale, the natural fluvial processes of the river have been altered dramatically (LCFRB 2010). The main channel of the river is maintained as a navigation channel for deep draft shipping traffic, limiting the potential for any dynamic migration of the river thalweg.[4] Dam construction, diking, and streambank armoring throughout the watershed have limited floodplain connectivity and greatly reduced the quantity and quality of available backwater and off-channel habitats (LCFRB 2010).

Fish habitat at the proposed project site is primarily limited to migratory habitat for fish species that use nearshore habitats in the Lower Columbia River, including 13 ESUs/DPSs of Columbia River salmon, steelhead, and bull trout. Sediments at the proposed project site are not appropriate spawning material for any salmonid species, and the relative lack of instream habitat complexity limits the suitability for juvenile rearing or extensive foraging or wintering habitat. The portion of the Columbia River that is present at the project site does not provide suitable spawning habitat for Pacific eulachon (*Thaleichthys pacificus*), and there has been no documented eulachon spawning at the project site. However, eulachon larvae may be present in the early spring, as larvae are carried downstream from upstream spawning locations near the mouth of the Kalama River. Green sturgeon (*Acipenser medirostris*) and white sturgeon (*Acipenser transmontanus*) occur within the reach of Columbia River that is at the project site. Green sturgeon, which typically prefer more saline environments, are not typically found in the Columbia River upstream of RM 37 (68 FR 4433), but could occasionally occur. White sturgeon are distributed throughout the Lower Columbia River, and could potentially occur, primarily in deep water habitats at the project site.

The backwater habitat in which pile removal would be conducted provides relatively higher functioning aquatic habitat, particularly as a backwater refugia for juvenile salmonids. Small fish, amphibians, and a variety of invertebrates are all likely to be present in this portion of the site. In addition, the riparian vegetation bordering this backwater channel provides terrestrial invertebrate, large woody debris, and leaf litter inputs.

[4] Thalweg: The line defining the lowest points along the length of a riverbed or valley. http://www.merriam-webster.com/dictionary/thalweg

Table 6-3. Special-Status Fisheries and Aquatic Species Potentially Present within Project Site

Common/ Scientific Name	ESU or DPS	Federal Status	State Status	Federal Critical Habitat
Fish				
Chinook Salmon (*Oncorhynchus tshawytscha*)	Upper Columbia River Spring-run ESU	FE	SC	Designated
	Lower Columbia River ESU	FT	SC	Designated
	Upper Willamette River ESU	FT	SC	Designated
	Snake River Spring/Summer run ESU	FT	SC	Designated
	Snake River Fall-run ESU	FT	SC	Designated
Coho Salmon (*O. kisutch*)	Lower Columbia River ESU	FT	SC	Proposed
Chum Salmon (*O. keta*)	Columbia River ESU	FT	SC	Designated
Sockeye Salmon (*O. nerka*)	Snake River ESU	FE	SC	Designated
Steelhead (*O. mykiss*)	Upper Columbia River DPS	FT	SC	Designated
	Middle Columbia River DPS	FT	SC	Designated
	Lower Columbia River DPS	FT	SC	Designated
	Upper Willamette River DPS	FT	SC	Designated
	Snake River Basin DPS	FT	SC	Designated
Bull Trout (*Salvelinus confluentus*)	Columbia River DPS	FT	SC	Designated
North American Green Sturgeon (*Acipenser medirostris*)	Southern DPS	FT	SC	Designated, not at project site
Pacific Eulachon (*Thaleichthys pacificus*)	Southern DPS	FT	SC	Designated
Mammals				
Steller Sea Lion (*Eumetopias jubatus*)	None	None	ST	None
Harbor Seal (*Phoca vitulina*)	None	None	None	None
California Sea Lion (*Zalophus califonianus*)	None	None	None	None

1 ESA Classification: FE = federal endangered; FT = federal threatened
2 State Status: ST = state threatened; SC = state candidate
Source: ENVIRON 2015; USFWS 2015c; NMFS 2015; WDFW 2015a; WNHP 2015a

6.5.3.2 Project Vicinity

Fisheries and aquatic habitat resources within the project vicinity include the mainstem Columbia River and associated areas, including portions of the backwater that are outside of the immediate project site, and the area at the mouth of the Kalama River upstream of the project site.

In general, the reach of the Columbia River that is within the vicinity of the proposed project location provides aquatic habitat conditions suitable as a migratory corridor for several species of native fish, including salmon, trout, sturgeon, lamprey, minnows, and eulachon. Portions of the river also provide rearing, spawning, and/or wintering habitat for one or more of these species. Several non-native fish species are also present throughout the Lower Columbia River.

The area at the mouth of the Kalama River, approximately 0.75 mile upstream of the project site, is an area of documented spawning habitat for Pacific eulachon, and an area where marine mammal species congregate during winter feeding runs into the Columbia River. The portion of the Columbia River backwater to the north that is outside of the project site provides an important function as refugia for juvenile salmonids. Small fish, amphibians, and a variety of invertebrates are all likely to be present in this portion of the vicinity. These areas exhibit a relatively greater degree of habitat complexity, and provide relatively higher aquatic habitat function for fisheries, marine mammals and other aquatic species.

6.5.3.3 Shipping Route

The Lower Columbia River and estuary within the shipping route area for the proposed project and the alternatives provide high quality aquatic habitat for all life stages of Pacific salmon and other anadromous fish, as well as for other aquatic species.

As stated in section 6.5.1.3, aquatic habitat within the Lower Columbia River and estuary has been altered significantly from its historic condition. Nevertheless, the lower river and estuary remains an area of high biological diversity, and it represents both documented and potentially suitable habitat for a number of fish and other aquatic species. In general, the reach of the Columbia River that is within the proposed project's shipping route area provides aquatic habitat conditions suitable as a migratory corridor for several species of native Columbia River fish. These species include several native salmonids, trout, sturgeon, lamprey, minnows, and eulachon. Special-status fish species include 13 ESUs/DPSs of Columbia River salmon, steelhead, and bull trout, Pacific eulachon, and green sturgeon.

Several non-native fish species are also present throughout the Lower Columbia River and estuary. Some of these non-native species (e.g., northern pike minnow) are present in numbers that may be affecting native fish populations.

The portion of the lower river and estuary that are within the project's shipping route area also represents suitable habitat for three species of marine mammals (Steller sea lion, California sea lion, and harbor seal). Several bird species also utilize aquatic habitats within the project's shipping route area, including special-status species, such as marbled murrelet.

6.5.3.4 Related Action

The EA prepared for the proposed pipeline indicate that two of the seven surface water features that are within the project area for the pipeline project have the potential to support fisheries resources, including special-status fish species, designated and proposed critical habitat for ESA-listed fish, and EFH. (FERC 2015).

The proposed pipeline EA documents that the following special-status fish species could potentially be present within the project area for the proposed pipeline: Columbia River ESU chum salmon, Lower Columbia River ESU Coho salmon, Lower Columbia River and Upper Willamette River ESU Chinook salmon, Lower Columbia River and Upper Willamette River DPS steelhead. Southern DPS green sturgeon and Southern DPS Pacific eulachon. However, it was determined that, because of their physical attributes, including size and riparian structure, they are not optimal for these cold-water species. These waterbodies may support warm-water fish species, including brown bullhead, black crappie, bluegill, largemouth bass, pumpkinseed, smallmouth bass, walleye, white crappie, and yellow perch (FERC 2015).

6.6 Environmental Impacts

6.6.1 Technology Alternatives

6.6.1.1 Construction Impacts

The construction of the proposed project would involve the same types and extents of overall activities with either Technology Alternative. Associated impacts to plant and animal resources associated with the construction of the proposed project would also be the same with either Technology Alternative. Both Technology Alternatives would affect the same terrestrial portions of the project site. This assessment, therefore, accounts for the potential impacts that could occur with the construction of either of the Technology Alternatives.

Direct Habitat Impacts

Terrestrial Habitat

Very little terrestrial plant or animal habitat is present at the project site. Most of the site was filled as part of previous authorized dredge material placement activities and the remaining areas of natural vegetation are small, isolated, and/or disturbed from their natural condition.

The construction of the upland portion of the proposed project under either Technology Alternative would occur almost exclusively within the unvegetated industrial and ruderal upland grass/forb habitat types. Similarly, the areas where temporary construction parking areas would be established are all sparsely vegetated ruderal upland habitats. These vegetation types provide little or no wildlife habitat function. The construction of the proposed project would reduce the quantity of low quality foraging, perching, and other habitat for the non-listed, ground-dwelling species now present on the project site but also would create new roosting and nesting opportunities for other species of birds that nest on buildings. As noted previously, osprey have previously been observed using an artificial nesting platform on the project site, though not for several years. The proposed project would relocate the nesting platform structure to another suitable location at the site.

The removal of vegetation as part of the upland construction activities could remove potentially suitable forage vegetation for the Columbian white-tailed deer. However, the degree of use of the habitat is limited and the amount of vegetation that would be removed is not expected to result in significant adverse impacts to any Columbian white-tailed deer (ENVIRON 2015).

Streaked horned lark have been documented on portions of the project site. However, most of the project site does not represent suitable nesting habitat for streaked horned lark. The portions of the project site that have been potentially suitable for streaked horned lark nesting are located on the northern peninsula of the site, on an area of dredge material that was placed as part of the USACE Columbia River navigation channel project. The USACE recently conducted an ESA Section 7 consultation for dredging associated with the maintenance of the Columbia River navigation channel. The USACE cited NDVI data in the biological assessment

that was part of the Section 7 consultation to judge the extent of suitable nesting habitat throughout the Lower Columbia River (USACE 2014). The USACE estimated that approximately 3 acres of the site would be available as suitable streaked horned lark nesting habitat only through the 2015 summer nesting season, as ground cover increases to render the area non-habitat (USACE 2014, USFWS 2014).The proposed project would implement an array of impact minimization measures and BMPs (see section 6.8) to minimize the potential for impacts to terrestrial plant and animal species. The upland facilities associated with the project have been located on developed portions of an existing industrial site, which in its current state provides very little habitat function and native vegetation. Siting the proposed project in a developed location would avoid impacts to native terrestrial habitats and species of vegetation, including special-status species. Ground disturbance and vegetation removal would be limited to the minimum amount necessary to construct the project and construction fencing would be used to protect existing vegetation to be retained. These impact minimization measures and BMPs would minimize the extent of any direct habitat modification impacts associated with the proposed project.

Aquatic Habitat

Impacts to aquatic habitats associated with the construction of the upland portion of the facility associated with either Technology Alternative would be limited to temporary water quality impacts during construction. Aquatic habitat impacts associated with the construction of the marine terminal and berth are discussed in section 6.7.2.

Aquatic habitat suitability could potentially be affected during construction activities that expose soils to erosion including site preparation, foundation construction, access roads, and upland ground improvements. These impacts are described and discussed in detail in Chapter 5, Water Resources. A Water Quality Protection and Monitoring Plan (WQPMP) would be prepared and adhered to during construction to reduce the potential for water quality impacts. This plan would identify the protocol by which water quality conditions would be monitored during construction to document compliance with State water quality standards. A detailed construction stormwater pollution prevention plan (SWPPP) would also be prepared and adhered to during construction, to comply with construction stormwater permits granted by Ecology. The SWPPP would contain BMPs specific to the project designed to reduce erosion and sediment delivery to surface waters. Implementation of the construction SWPPP is expected to reduce potential sediment delivery to the river and avoid any water quality exceedance.

Riparian Habitat

Cowlitz County has established RHAs adjacent to certain rivers and streams, and regulates these RHAs as critical areas under the County's critical areas ordinance (CCC 19.15).

RHAs are established for habitats that include terrestrial and aquatic ecosystems that influence or benefit each other and are located adjacent to rivers or perennial or intermittent streams (Section 19.15.130.E.3). The Columbia River is classified as a Type S Water of the State, and the ordinance provides it with a 150-foot RHA buffer (measured from the OHWM). Within this RHA are an inner and outer zone, each 75 feet in width.

The ordinance also states: "where an existing natural or manmade barrier isolates a riparian area, that area is not within any 100-year floodplain, and a qualified professional demonstrates that the isolated area does not provide shade, fine or large woody material, nutrients, organic and inorganic debris, terrestrial insects, or habitat for riparian-associated wildlife, the standard RHA widths may not apply at the discretion of the Director."

The entirety of the project site is located where dredge material has been placed through previously permitted activities. An access road (accessible to the public by permit) isolates the site from the wetlands and riparian habitats to its north. Similarly, the toe of the dredge material along the shoreline isolates the site from the Columbia River and shoreline habitat. However, a portion of the proposed project would be conducted on portions of this former dredge material placement area that are below the 100-year floodplain. For this reason, those portions of the site that are below the 100-year floodplain and also within 150 feet of the OHWM would still be subject to RHAs. In portions of the site where historic dredge material placement has elevated the site above the 100-year floodplain, the RHA and shoreline buffers do not extend onto the site beyond the existing toe of the dredge placement prism and public access road (**Figure 6-4**).

In total, the project would result in direct permanent impacts to approximately 29,006 square feet (0.67 acre) of RHA buffer. This includes approximately 2,198 square feet (0.05 acre) associated with the construction of the dock trestle, approximately 6,645 square feet (0.15 acre) associated with fencing and upland site improvements in the vicinity of the pump house and collector well, approximately 12,153 square feet (0.28 acre) associated with the construction of the improved recreational access, and approximately 8,010 square feet (0.18 acre) associated with upland site improvements and an infiltration pond at the north end of the site (**Figure 6-4**).

Impacts to riparian habitats at the site would be offset through the implementation of the mitigation measures described in section 6.8 below, including pile removal, engineered log jam (ELJ) installation, and riparian restoration activities.

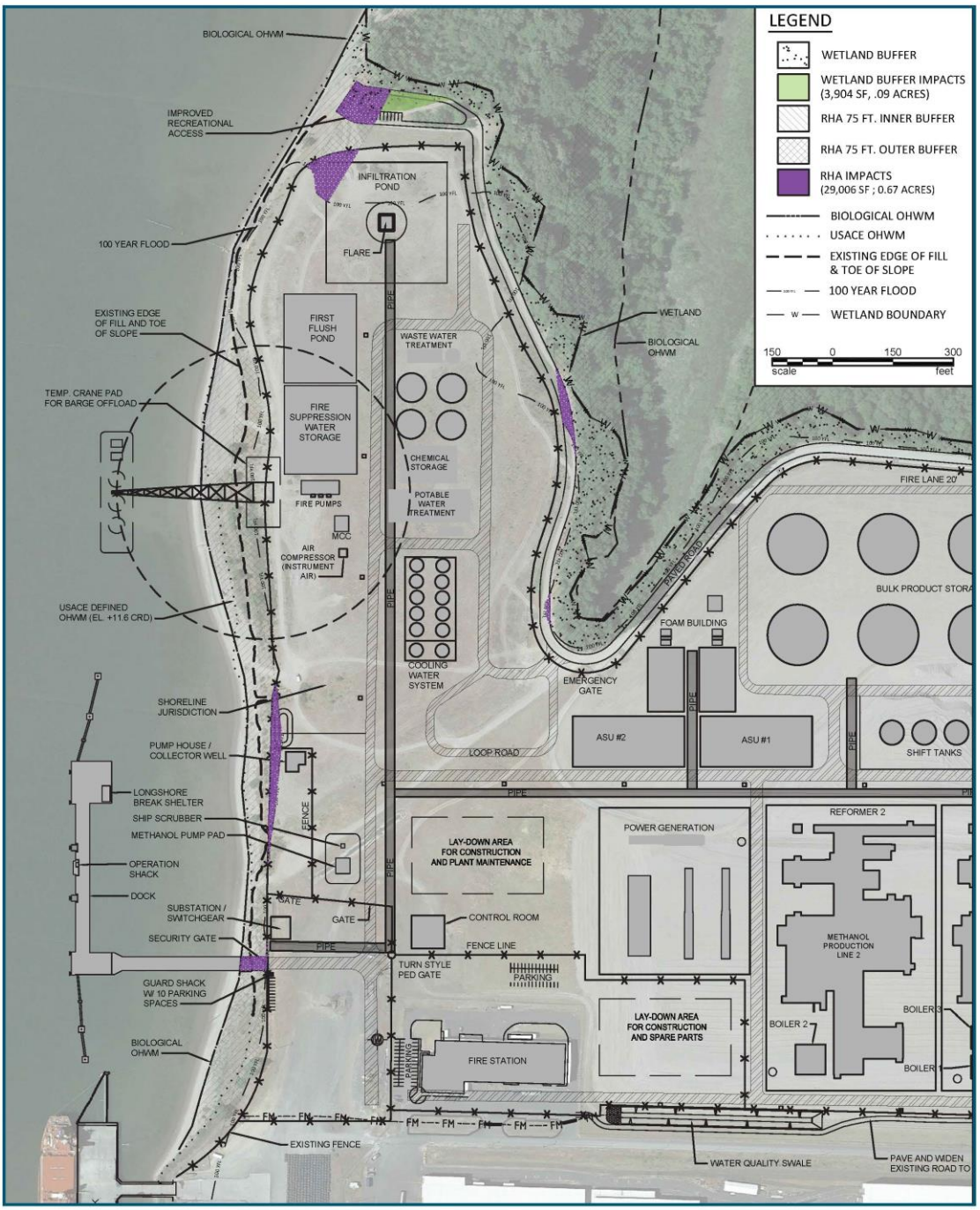
Wetland Buffer

The proposed recreation access improvements at the north end of the project site would permanently impact approximately 3,904 square feet (0.09 acre) of wetland buffer for Wetland A. The portion of the wetland buffer that would be impacted is within a moderately functioning portion of the buffer, consisting of black cottonwood and willows intermixed with Himalayan blackberry and Scotch broom growing on dredge sands.

Wetland buffer impacts would be offset through the implementation of the mitigation measures described in section 6.8 below, specifically through the proposed wetland buffer enhancements.

Temporary Construction Noise

The construction of the proposed methanol manufacturing facility under either Technology Alternative would include ground improvements, which could require pile-driving activities. Pile driving can result in temporarily elevated terrestrial noise that may disturb terrestrial animals. The extent of noise from pile-driving activity in the terrestrial environment is defined as the limit where noise from this activity is indistinguishable from noise or sound generated by the baseline conditions, either background (such as roadway traffic) or ambient conditions, whichever is loudest (ENVIRON 2015). The limit of terrestrial pile-driving noise attenuation is the distance at which a maximum sound level (Lmax) of 110 A-weighted decibels (dBA) pile-driving noise (assuming steel piles) attenuates to traffic noise and/or existing ambient sound. Because of the intervening topography, particularly to the east of the project site, pile-driving Lmax levels would reduce to the background level at a distance of 13,770 feet, or approximately 2.6 miles (ENVIRON 2015).



Riparian & Wetland Buffer Impacts
Figure 6-4

KALAMA SEPA
Manufacturing & Marine Export Facility

Pile-driving noise could potentially cause wildlife at the project site or within the vicinity of the project site, to temporarily avoid the site or vicinity. However, the terrestrial portions of the project site that could experience temporarily elevated terrestrial noise levels provides only marginally suitable habitat for terrestrial species, and most species that could potentially be present are accustomed to the high levels of noise and activity associated with the industrial sites in the vicinity.

The terrestrial noise levels generated during pile driving would not exceed any established injury thresholds for any special-status species, and the effect to any special-status species wildlife species present at the site during pile driving would be expected to be limited to temporary avoidance of the site or vicinity. Habitat suitability at the site for special-status species is low. Elsewhere within the project vicinity, relatively higher quality terrestrial habitat is available, though it is unlikely that terrestrial noise generated at the site would result in any measurable or significant effect on any terrestrial or avian species present within the project vicinity.

Overall, temporary construction noise associated with construction of the two Technology Alternatives would not result in any significant adverse impacts to vegetation or habitat resources for any plant or animal species, including special-status species.

Temporary Water Quality Impacts

Construction of the proposed project under either Technology Alternative also has the potential to affect water quality in adjacent aquatic habitats. Installation of proposed ground improvements (vibro-replacement, soil mixing and jet grouting, and/or driven piles) could potentially disturb sediments and increase turbidity temporarily. Increased levels of turbidity could have temporary, negative impacts on aquatic habitats and, if any special-status fish species are present during the time of construction, could affect them directly.

Impacts to water resources are addressed in Chapter 5, Water Resources. This section addresses impacts to plant and animal resources, including fisheries. Potential impacts associated with spills under either Technology Alternative are addressed in Chapter 8, Environmental Health and Safety. Temporary water quality impacts could affect fish habitat function and special-status fish species both at the site and within the vicinity by reducing water quality, reducing visibility and increasing potential exposure to predators, and reducing habitat suitability for prey species. However, the potential for water quality impacts during installation of ground improvements would be minimized through adherence to the BMPs described in section 6.8. Construction activities would be conducted in compliance with Water Quality Standards for Surface Waters (173-201A WAC) or other conditions as specified in the water quality certification. A WQPMP would be prepared and adhered to during construction to reduce the potential for water quality impacts.

6.6.1.2 Operational Impacts

This section discusses the impacts associated with the operation of the proposed project under either Technology Alternative. The potential impacts of operation of the proposed project on aquatic habitats under the two Marine Terminal alternatives are discussed below in section 6.7.2.

Operational water quality impacts that could be associated with the proposed project under either Technology Alternative include an increased potential for spills or leaks associated with on-site equipment and machinery, potential impacts associated with stormwater and wastewater, and impacts associated with water use. Potential impacts associated with spills

under either Technology Alternative are addressed in Chapter 8, Environmental Health and Safety. This section describes the potential impacts associated with stormwater and wastewater, and water use.

Wastewater and Stormwater

The proposed project under either Technology Alternative would generate wastewater and stormwater runoff at the project site, which could affect water quality and quantity for plant and animal resources. A detailed discussion of the sources and treatment of domestic and process wastewater and stormwater is provided in Chapter 5, Water Resources.

As described in Chapter 5, the proposed project, with either Technology Alternative, would require an individual industrial National Pollutant Discharge Elimination System (NPDES) permit. Detailed spill prevention, control, and countermeasures, including isolation valves and monitoring requirements would also be implemented across the site in accordance with 40 CFR 112. These measures would minimize the potential for impacts to plant or animal resources associated with operational wastewater or stormwater.

Discharge of wastewater from the facility has the potential to affect water temperature within the Columbia River, which could in turn affect fish or other aquatic species. However, as described in Chapter 5, wastewater would be cooled to 20°C (the ambient water quality standard for the Columbia River) through evaporative cooling and a heat exchanger. Cooled water would then be conveyed to the Columbia River through the Port's existing outfall. NWIW proposes to meet the 20-degree temperature standard for wastewater at the point of discharge, rather than relying on a mixing zone to meet the temperature standard. This means that during the critical low flow summer months (when ambient conditions in the river typically exceed 20°C, and elevated water temperature is of greatest concern) the temperature of the effluent would be cooler than the receiving water in the Columbia River.

The normal operation of the proposed project would not result in significant adverse impacts to plant or animal species with the impact minimization measures and BMPs described above and in Chapter 5 implemented. The impact minimization measures and BMPs discussed would fully mitigate the operational water quality impacts associated with the proposed project under either Technology Alternative.

Water Use

The proposed project would require water for process uses as well as for domestic uses (e.g., drinking, sanitation, showers, etc.). A detailed discussion of water use is provided in Chapter 5, Water Resources. Process water would be provided by a collector well (Ranney well) to be constructed by the Port near the Columbia River shoreline. The well would be constructed under Groundwater Permit No. G2-30283 issued by Ecology. The groundwater permit allows the use of up to 10,640 acre-feet and 6,600 gallons per minute (gpm) of water for various uses, including industrial activities.[5] It is estimated that the proposed project would use approximately 5.2 million gallons per day of process water, or approximately 3,610 gpm under the Port's existing water rights certificate.

[5] An acre-foot contains approximately 325,851 gallons of water.

Water withdrawals could have a direct effect on aquatic habitats and fisheries resources by reducing the quantity available for fish. Water withdrawal can reduce stream flows to levels that can affect fish populations, particularly in smaller systems.

However, the volume of water withdrawn from groundwater would be insubstantial relative to the flows in the Columbia River; flows in the tidal portions of the river typically range between 110,000 and 400,000 cubic feet per second (cfs) (USGS 2015). (The average discharge of the Columbia River at its mouth is approximately 265,000 cfs [Kammerer 1990]). The approximately 3,610 gpm that the project would use represents approximately 8.0 cfs, which is less than 0.01 percent of even the lowest anticipated flows in the river. Ranney wells pull water out of deep alluvium in the river bottom and within the substrate, avoiding any possibility of impinging or entraining fish.

For this reason, there would be no significant adverse impact to plant or animal resources as a result of the well and associated withdrawals.

6.6.2 Marine Terminal Alternatives

6.6.2.1 Construction Impacts

This section discusses the impacts associated with the construction of the proposed project under either Marine Terminal Alternative. The potential impacts of construction of the proposed project under the two Technology Alternatives are discussed above in section 6.7.1.

Marine Terminal Alternative 1

The construction of the overwater portions of the proposed marine terminal under Marine Terminal Alternative 1 has the potential to affect plant and animal species at the project site and within the vicinity. Plants and animals could be potentially affected through direct habitat impacts (benthic habitat disturbance and overwater cover), through temporarily reduced water quality conditions during construction, and through generation of temporarily elevated levels of underwater noise during pile installation and removal. The potential effects are described in detail below.

Plant and animal resources in the project shipping route likely would be minimally affected by project construction.

Direct Habitat Impacts

The aquatic portion of the project site provides habitat for a number of native fish and aquatic species, including the special-status species identified in section 6.5.3.1. Nearshore habitats in particular (those less than approximately 20 feet deep) provide suitable migratory and foraging habitat for juvenile salmonids and trout, lamprey, minnows, eulachon, and other native fish species. Deep-water habitats also provide these functions for returning adult ESA-listed salmon and provide suitable migratory and foraging habitat for sturgeon as well.

Construction of the proposed project's marine terminal would affect aquatic habitat through the placement of new piles, removal of old piles, creation of new overwater coverage, and dredging for ship access. The proposed marine terminal includes both concrete piles (for structural support) and steel pipe piles (for fenders and walkway supports). In total the proposed marine terminal would require the installation of approximately 320 24-inch concrete piles, twelve 12-inch steel pipe piles, and four 18-inch steel pipe piles, resulting in the permanent loss of approximately 1,079 square feet of benthic habitat.

The new marine terminal itself would result in a total of approximately 44,943 square feet of new solid overwater coverage. Except for a portion of the access trestle, the platforms, dolphins, and structures associated with the marine terminal would be located in water deeper than 20 feet below OHWM (11.6 feet Columbia River Datum [CRD]). This design would minimize potential effects to aquatic habitats by locating most of the dock terminal in deep water and minimizing structure in and over shallow-water habitats. The dock configuration is designed to require the minimum necessary amount of new piling and overwater structure and has reduced the quantity of direct permanent habitat impacts to the least practicable amount. The terminal is designed such that (with the exception of the access trestle) the platforms, dolphins, and structures associated with the terminal would be located in water deeper than 20 feet below OHWM (11.6 feet CRD), which would minimize the effects to aquatic habitat by minimizing structure in and over shallow-water habitat. Walkways would be grated to further minimize shading and the access trestle abutments are designed and configured to eliminate the need for shoreline armoring along the riverbank.

Of the total new aquatic habitat impact, approximately 34,018 square feet of overwater coverage, and approximately 906 square feet of new benthic impact associated with new pile footprints, would be located in water deeper than 20 feet below OHWM. Approximately 10,925 square feet of new overwater coverage associated with the access trestle, and a total of approximately 173 square feet of new benthic impact associated with new pile footprints for the access trestle, would occur in and over shallow-water habitat (water shallower than 20 feet below OHWM). **Table 6-4** summarizes the unavoidable aquatic habitat impacts associated with Marine Terminal Alternative 1.

Table 6-4. Marine Terminal Alternative 1 Aquatic Habitat Impacts Summary

Shoreline Location Description	Area of Overwater Coverage		Number of Piles			Area of Pile Footprint (sf)
	Solid	Grated	24-inch Concrete	12-inch Steel	18-inch Steel	
Shallow Water (USACE OHWM Elevation [11.6 CRD] to 20 feet below USACE OHWM)						
Access Trestle	10,925	N/A	52	-	-	173
Subtotal	10,925	N/A	52	-	-	173
Deep Water (deeper than 20 feet below USACE OHWM)						
Access Trestle	1,450	N/A	9	-	-	30
Transition Platform	5,400	N/A	41	-	-	136
Berth Trestle	13,470	N/A	58	-	-	192
Turning Platform	11,648	N/A	68	-	-	225
Fender System	N/A	N/A	-	12	-	11
Breasting Dolphins (2)	450	N/A	14	-	-	46
Mooring Dolphins (4)	800	N/A	48	-	-	159
Grated walkways	N/A	1,588	-	-	4	7
Subtotal	34,018	1,588	290	12	4	806
10% Contingency for Concrete Piles*	N/A	N/A	30	N/A	N/A	100
Total In-/Overwater	**44,943**	**1,588**	**320**	**12**	**4**	**1,079**

*Pile layout is conceptual. A 10% contingency has been included (for concrete piles).

Proposed dredging activities associated with the berth extension would occur in deep water, and are not expected to result in habitat impacts greater than those resulting from naturally recurring hydraulic action of the river, and no compensatory mitigation is proposed for temporary effects to benthic habitats associated with berth dredging. As stated previously, sand waves naturally form and propagate along the channel and the adjacent river bottom, with the estimated volume of sand in a single large sand wave in a range of between 100,000 to 200,000 cubic yards (CHE 2015). Dredging is a temporary construction activity, conducted in deep water, which would be expected to have only minor, localized, and temporary effects. No dredging would be conducted in shallow water habitats, and no shallow water habitat would be converted to deep water. The dredged berth would be constructed with side slopes of 3:1, to avoid sloughing. The Port would conduct upland and/or in-water placement at existing permitted placement sites, and impacts associated with dredge material placement have been analyzed and described in these existing permits, described below.

The existing authorized USACE Nationwide Permit (NWP-1994-462-1), in-water placement locations include: (1) flow lane placement to restore sediment at a deep scour hole associated with a pile dike at RM 75.63 located on the Washington side of the river; (2) beach nourishment at the Port's shoreline park (Louis Rasmussen Park) at RM 76; and (3) the Ross Island Sand and Gravel disposal site in Portland, Oregon. The available upland placement sites include the South Port site located north of the CHS/TEMCO grain terminal at approximately RM 77 and the project site. Additional in-water and upland sites may be identified and permitted for dredge material placement for general Port maintenance dredging needs in the future.

Habitat mitigation activities described below in section 6.8, including pile removal, ELJ installation, and riparian restoration and wetland buffer enhancement would serve to offset any impacts to habitat function for fish and other wildlife species.

The proposed pile removal would restore benthic habitat in the backwater and improve hydraulics and sediment transport within approximately 13 acres of backwater habitat, thereby enhancing fish access within an important area of backwater habitat that provides refugia for outmigrating and wintering juvenile salmonids. The ELJs installed along the shoreline would increase aquatic habitat complexity with interstitial spaces that would allow juvenile and adult salmonids to evade predation. The ELJs would provide refuge and foraging opportunities for juvenile and adult salmon, particularly for small outmigrant fish moving downstream during the spring and early summer peak of outmigration activity. ELJs, in conjunction with proposed riparian plantings, would also provide a natural form of bank stabilization and would protect adjacent beaches from erosion. The proposed 1.41 acres of riparian restoration activities would restore a more highly functioning riparian condition, which in turn would improve aquatic and riparian habitat function at the site by providing a natural source of leaf litter and woody debris and insect and invertebrate fauna. These improvements, in conjunction with the proposed ELJs, would also serve to naturally stabilize the bank and protect the adjacent beach form erosion. The proposed restoration would also result in a higher functioning riparian buffer than the portions of riparian buffer that would be impacted, and would also serve as supplemental out-of-kind mitigation for overwater structure and benthic habitat impacts.

Overall, with the mitigation measures proposed as part of the project, Marine Terminal Alternative 1 would not result in any significant adverse impacts to any fisheries or aquatic resources.

Temporary Water Quality Impacts

There is a potential for leaks and/or spills from construction equipment as with any construction project. The proposed overwater work creates the potential for construction debris to enter the waterway. Equipment and storage containers associated with the proposed project also create a potential for leaks and spills of fuel, hydraulic fluids, lubricants, and other chemicals.

The proposed project also has the potential to disturb sediments and increase turbidity temporarily at the project site during pile installation and removal activities and during dredging activities. Increased levels of turbidity may have temporary adverse effects on aquatic habitats and, if any fish or wildlife species are present during the time of construction, could affect them directly.

These potential temporary water quality impacts have the potential to affect fish habitat function and special-status fish species both at the project site and within the project vicinity by reducing water quality, reducing visibility, increasing potential exposure to predators, and by reducing habitat suitability for prey species. These effects would be temporary and localized. These conditions would return to baseline following the completion of construction.

Outmigrating juveniles and migrating adult salmon, steelhead, and bull trout could be present within the action area, as could migrating adult Pacific eulachon during the in-water work period. Larval and juvenile eulachon are not expected to be present during the in-water work period. Similarly, green sturgeon would not be exposed to any direct effects of temporarily decreased water quality as they are not expected to be present within the project vicinity during the in-water work period.

Special-status salmon, steelhead, bull trout, and Pacific eulachon, if present, likely would be transient and migrating through the project site and vicinity. Habitat suitability for adult and juvenile salmonids, steelhead, bull trout, and adult Pacific eulachon is limited at the site and provides little function aside from a suitable migratory corridor. Fish are expected to move rapidly through the site and vicinity. Exposure to temporarily decreased water quality conditions, including temporarily elevated turbidity levels and/or potential debris contamination, is expected to be limited and likely would not result in significant adverse impacts to fish habitat and special-status fish species.

Designated and proposed critical habitats within the action area also may experience temporarily increased levels of turbidity during construction of the proposed project. The geographic extent and duration of any potential short-term increases in sedimentation or turbidity would be limited and are not expected to measurably exceed ambient sedimentation conditions.

The proposed project has the potential to result in spills and temporarily elevated levels of turbidity during construction and dredging. Construction at the site would be governed by a spill prevention, control, and countermeasures plan (SPCCP), which would define specific BMPs to minimize the potential for leaks and spills and the extent of damage from any unavoidable leaks or spills. These BMPs would include inspecting construction equipment daily to ensure that there are no leaks of hydraulic fluids, fuel, lubricants, or other petroleum products, and locating temporary material and equipment staging areas above the OHWM of the waterbody and outside environmentally sensitive areas.

Natural currents and flow patterns in the Lower Columbia River routinely disturb sediments. Flow volumes and currents are affected by precipitation as well as upstream water management at dams. High volume flow events can result in hydraulic forces that re-suspend benthic sediments, temporarily elevating turbidity locally. Any temporary increase in turbidity as a result of the proposed project is not anticipated to measurably exceed levels caused by these normal periodic increases. Additionally, the volume of flow would help minimize the intensity and duration of any temporary episodic increases in sediment suspension or turbidity.

Appropriate BMPs (see section 6.8) would be employed to minimize sediment loss and turbidity generation during dredging. Therefore, any temporarily elevated sedimentation levels would not result in any significant adverse impacts to any designated or proposed critical habitat for any species.

The potential for water quality impacts during construction of Marine Terminal Alternative 1 would be minimized through adherence to the BMPs described in section 6.8. Construction activities would be conducted in compliance with Water Quality Standards for Surface Waters (173-201A WAC) or other conditions as specified in the water quality certification. A WQPMP would be prepared and adhered to during construction to reduce the potential for water quality impacts. Fish and fish habitat at the project shipping route would not be affected by any temporary water quality impacts associated with construction, as these effects would be localized to the project vicinity.

Temporary Construction Noise Impacts

Construction of Marine Terminal Alternative 1 has the potential to result in temporarily elevated terrestrial and underwater noise levels at the project site and within the project vicinity during the installation of piles for the marine terminal, installation and removal of temporary piles used during construction, removal of existing piles, and impact pile driving for upland foundation supports.

Elevated underwater noise has the potential to affect fish in several ways. The effects can range from the alteration of behavior to physical injury or mortality depending 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). The effects of temporarily elevated noise levels can range from mild disturbance to severe auditory damage or death.

The proposed project would install approximately 320 24-inch concrete piles, twelve 12-inch steel pipe piles, and four 18-inch steel pipe piles related to the construction of the marine terminal. The proposed project would use a vibratory hammer for all in-water steel pile driving, to the extent practicable, in order to reduce noise levels and minimize the potential for adverse impacts. A bubble curtain would be used if steel piles require impact installation or proofing. Construction of the marine terminal is expected to install and remove temporary piles with vibratory methods. Temporary piles are typically steel pipe or H-piles and would be driven with a vibratory hammer. These are placed and removed as necessary during the pile driving and overwater construction process. A vibratory hammer would also likely be used to remove approximately 157 existing timber piles from the adjacent backwater as part of the proposed project's mitigation activities. Some piles may also be removed through direct-pull methods, which would further reduce the potential for temporarily elevated underwater noise levels.

Vibratory pile installation and removal are generally considered to not generate levels of underwater noise that result in significant adverse impacts to fish (FHWG 2008). WSDOT has

published a memorandum reporting average sound pressure levels associated with vibratory installation of 30-inch steel piles as ranging from 164 to 176 dB_{RMS} with an overall average value of 171 dB_{RMS} (WSDOT 2010). WSDOT also published data in 2011 documenting average underwater sound pressure levels of 150 dB_{RMS} at a distance of 10 meters from the pile, during vibratory removal of timber piles (WSDOT 2011). None of these underwater noise levels exceed any established injury levels for fish.

Similarly, impact installation of concrete piles, also does not generate underwater sound pressure levels that are injurious to fish. Underwater noise generated during installation of concrete piles is not expected to exceed 188 dB_{PEAK}, 176 dB_{RMS}, and 166 dB_{SEL} (measured at a distance of 10 meters or 33 feet from the pile) (Caltrans 2012). Fish may avoid the area temporarily during vibratory and concrete impact pile driving, but this is unlikely to affect feeding and/or migratory activities significantly.

All pile installation and in-water work below the OHWM would be conducted within the approved in-water work period for the project. Confining this work to the approved work window would minimize potential impacts to native fish and other aquatic species, particularly to ESA-listed salmonids and Pacific eulachon. The approved in-water work window avoids the peak migratory periods for adult fish and outmigrating juveniles of most populations. Any elevated underwater noise levels associated with the proposed project would be temporary and would not result in significant adverse impacts on any fish species, fish habitat, or any primary constituent elements of designated or proposed critical habitat for ESA-listed fish species.

Marine Terminal Alternative 2

Marine Terminal Alternative 2 would require nearly twice as many piles (637 total piles in Marine Terminal 2) and would result in nearly three times more overwater coverage (127,200 total square feet) as compared to Marine Terminal Alternative 1. Direct aquatic habitat impacts would be proportionally greater under Marine Terminal 2.

Temporary water quality impacts associated with construction of Marine Terminal Alternative 2 would be similar to those described above for Marine Terminal Alternative 1. Marine Terminal Alternative 2 would implement similar BMPs and impact minimization measures to reduce the potential for spills and for temporary turbidity generation during pile installation and dredging. Marine Terminal Alternative 2 would have a similarly sized dredge prism for the proposed berth extension, and impacts associated with dredging would be similar to those described for Marine Alternative 1.

Temporary construction noise associated with construction of Marine Terminal Alternative 2 would also be similar to those described above for Marine Terminal Alternative 1. Both alternatives would require impact installation of concrete piles, which would temporarily elevate underwater noise levels, but would not exceed injury thresholds for fish or other wildlife species.

Marine Terminal Alternative 2 would implement the same BMPs and impact minimization measures as the proposed project. It is expected that additional pile removal, ELJs, and riparian restoration activities would be required as aquatic habitat enhancement for the increased pile and overwater coverage as part of the permitting process for Marine Terminal Alternative 2.

For the reasons listed above, the overall impact to plant and animal species associated with the construction of Marine Terminal Alternative 2 would be greater than that associated with construction of Marine Terminal Alternative 1. However, the impact minimization measures

and compensatory mitigation actions that would be implemented associated with Marine Terminal Alternative 2 (described in section 6.8) would avoid, minimize, and mitigate for unavoidable impacts, such that Marine Terminal Alternative 2 would not result in any unavoidable significant adverse impacts to any plant or animal resources.

6.6.2.2 Operational Impacts

This section discusses the impacts associated with the operation of the proposed project under either Marine Terminal Alternative. The potential impacts of operation of the proposed project on aquatic habitats under the two Technology Alternatives are discussed above in section 6.7.1. Impacts associated with the operation of the proposed project are the same under either Marine Terminal Alternative, and the two Marine Terminal Alternatives are therefore analyzed together in this section.

Operational impacts to plant and/or animal resources that could be associated with the proposed project under either Marine Terminal Alternative include an increased potential for spills or leaks, impacts associated with stormwater, and impacts associated with vessel traffic to and from the facility. Potential impacts associated with spills and leaks under either Marine Terminal Alternative are addressed in Chapter 8, Environmental Health and Safety. This section addressed potential impacts associated with stormwater and vessel traffic.

Stormwater

The proposed project under either Marine Terminal Alternative would generate stormwater runoff, which could affect water quality and quantity for plant and animal resources.

Stormwater runoff generated on the proposed dock and trestle would be collected and conveyed to a pumping station located at the platform to access trestle transition. The pump station would be fitted with a primary pump that would be capable of accommodating stormwater flows that would be subject to treatment requirements per Ecology's *Stormwater Management Manual for Western Washington*. A second pump at the pump station would pump flows in excess of that flow rate. All pumped flows would be conveyed upland in a single pipe to a flow separation structure.

Water quality storm flows from the dock would discharge to an oil-water separator prior to discharge to a water quality swale, designed in accordance with Ecology criteria. After passing through the swale, the runoff would be directed to a newly constructed infiltration ditch located upland. Flows exceeding the water quality storm flow rate would bypass the oil-water separator and water quality swale and be discharged to the infiltration area. This infiltration ditch would also accommodate stormwater flows from the existing North Port dock and yard area, as well as the new collector well pump house and surrounding area, and would infiltrate flows without discharge.

The proposed project, with either Marine Terminal Alternative, would require an individual industrial NPDES permit, which would minimize the potential for impacts to plant or animal resources associated with operational stormwater.

For these reasons, stormwater associated with the proposed Marine Terminal Alternatives would not result in significant adverse impacts to plant or animal species, including fish and aquatic species.

Vessel Traffic

The operation of the proposed project under either Marine Terminal Alternative would result in increased ship traffic along the Columbia River from the project site to the mouth of the river. The proposed project would result in approximately 36 to 72 entry transits per year. By comparison, the river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel entry transits in 2014 and historically has accommodated much higher numbers of vessels according to vessel entry and transit data (Ecology 2015). Marine traffic on the Columbia River has the potential to affect wildlife through increases in the potential for shoreline erosion associated with propeller wash and vessel wake, through the introduction of exotic species, through increased potential for direct mortality through ship strikes, through increased potential for wake stranding of certain species, and through increased potential for a vessel spill.

When not in use for loading methanol, the proposed marine terminal, under either Marine Terminal Alternative, would be made available for general use by the Port, for other cargo loading and unloading, for vessel supply operations, as a lay berth, for short- and long-term vessel moorage, and for topside vessel maintenance. This general use by the Port would result in additional vessel traffic to the marine terminal, but this traffic would still be within the typical historic levels for river traffic. Furthermore, in most cases it is expected that these vessels would already be transiting the Columbia River for other reasons.

Wake Stranding

The operation of the proposed project would result in an increase in ship traffic in the Lower Columbia River to the project site. Ship wakes produced by deep-draft vessels may cause stranding of juvenile salmonids and other fish species (Bauersfeld 1977; Pearson et al. 2006; Hinton and Emmett 1994). Stranding can occur when fish are caught in certain vessel wakes and are deposited on shore. Stranding typically results in mortality unless another wave carries the fish back into the water. Juvenile yearling Chinook salmon (typically fall Chinook) and juvenile chum salmon seem to be the most vulnerable to stranding (Pearson et al. 2006), primarily due to their preference for shallow nearshore habitats and relatively weak swimming abilities (Ackerman 2002; Hinton and Emmett 1994).

The shoreline conditions that appear to increase the potential for stranding include confined channel; distance from beach to sailing line; lack of shielding features; beach slope (less than 10 percent); presence of submerged, shallow water berms; and fine-scale beach features (Pearson et al. 2008). Not all vessels cause stranding waves. Deep-draft vessels are more likely to generate the type of wave that can result in stranding (Ackerman 2002). Vessel speed, vessel length, and hull configuration also affect the development of waves (Bauersfeld 1977; Pearson et al. 2006).

Hinton and Emmett (1994) concluded that juvenile salmonid stranding does not appear to be a "common event" though it can occur along the Lower Columbia River. Potential susceptibility to stranding is limited to about 33 miles of shoreline along the Lower Columbia River with about 8 miles of shoreline considered to be high risk for stranding (Pearson et al. 2008). High risk areas typically occur where specific high risk combinations of channel and beach characteristics occur. Generally, all shorelines downstream of Rice Island are considered to be low risk for stranding (Pearson et al. 2008).

The Pearson et al. (2008) study that evaluated areas of high stranding risk was completed prior to the recently completed channel deepening of the lower river (Oregonian 2010). The 2010 channel deepening likely changed the risk factors in at least some locations since the 2008

study was completed. Generally, larger waves form in shallower waters (Bauersfeld 1977; Ackerman 2002), so the deepening of the channel may have reduced the risk of stranding in at least some areas. Pearson (2011) estimated that deepening the Columbia River navigation channel would result in a small reduction in stranding risk for all ship types (assuming no changes in vessel size, draft, and speed). However, estimated stranding probability could increase by 6 percent with larger container ship traffic in the deepened channel.

The Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead (NMFS 2011) and the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010) describe recovery plans for salmon and steelhead within the estuary and in various subbasins within the lower river. Both documents indicate that wake stranding constitutes a potential threat to salmon and steelhead in the lower river and estuary. However, wake stranding was thought to pose a relatively low-level threat in relation to all of the threats to salmonid recovery that were identified in the 2011 estuary plan (NMFS 2011).

Recent studies on wake strandings on the Lower Columbia River (Pearson 2011, Entrix 2008, Pearson et al. 2006) conclude that the specific mechanisms of stranding are still not completely understood though research indicates that the potential for wake stranding appears to be related to the characteristics of the vessel and of the site (Bauersfeld 1977, Hinton and Emmett 1994, Ackerman 2002, Pearson et al. 2006). Known variables affecting the potential for stranding include tidal stage, tidal height, river flow, current velocity, ship type, ship direction, whether the ship is loaded or unloaded, ship speed, ship size (length, beam, draft), salmonid density, salmonid size, river width, river depth, bank slope, bank vegetation, and presence/absence of areas on the bank that could capture water (Bauersfeld 1977, Hinton and Emmett 1994, Ackerman 2002, Pearson et al. 2006). Pearson et al. (2006) prepared a spatial analysis based on existing reports in the Lower Columbia River and determined that channel/shoreline configuration-based susceptibility to stranding of juvenile salmonids by ship wakes is limited to a portion of the lower river where approximately 16 percent (about 33 miles) of the shorelines have beaches close to the channel, the beaches are not shielded from wave action, and where beach slopes are less than 10 percent.

The Columbia River Estuary ESA Recovery Plan (NMFS 2011) states that options for reducing the effects of vessel wake stranding are limited because ship traffic through the estuary would continue, ship hull design is unlikely to change, and the speed of ships traveling the estuary may be difficult to alter. Ship wake stranding is considered a low-priority limiting factor for the Columbia River (NMFS 2011).

Propeller Wash and Bank Erosion

Propeller wash from ships at berth or in transit, as well as from waves breaking on shore, could cause increased erosion along unarmored sections of shoreline. Erosion can resuspend eroded material within the water column, increasing turbidity, which can affect habitat suitability for fish and other aquatic organisms.

Special-status fisheries and aquatic species within the project site, vicinity, and shipping route may be affected by an increased potential for bank erosion that could result from increased ship traffic. Streambanks that are unarmored could be susceptible to increased erosion from prop wash and vessel wake, which could result in temporary degradation of aquatic habitat suitability and could affect special-status aquatic plant and animal species. However, the risk of adverse effects to plants and animals from increased bank erosion is low.

Bank erosion is a natural process on the river, and represents a source of sediment that is a limiting factor in the lower river, due to the presence and operation of upstream dams. Present conditions of sand transport are one of net sand extraction from the river system, because the net supply of river sand has decreased by a factor of 3 over the historical period while the removal of sand has increased by a factor of 2.5 (Kaminsky 2002a). Susceptible sites on the Lower Columbia River are subject to existing bank erosion from current vessel traffic, as well as from waves generated by wind and tidal forces.

At a localized level, individual plants and animals occupying a terrestrial site that is susceptible to erosion could potentially be affected by an increased rate of erosion. Similarly individual fish or other aquatic species that occupy aquatic habitats in the vicinity of a site that is susceptible to bank erosion could potentially experience periodic increases in turbidity that could temporarily affect habitat suitability. However at the scale of the Lower Columbia River, bank erosion would not be expected to result in measurable effects to any plant or animal species.

Streambanks at the project site are largely unarmored, though proposed riparian plantings and ELJ installation would increase bank stability locally. Most of the streambanks in the project vicinity are armored, as are streambanks in other industrial reaches of the river. Dikes have also been established along much of the Lower River, which provide bank stability and protection from erosion. Streambanks in the project vicinity and shipping route that are unarmored could be susceptible to increased erosion from prop wash and ship wakes. Bank erosion is a natural process on the river, and effects associated with any potential increase in bank erosion would be localized and periodic. In addition, the additional wakes caused by vessels associated with the proposed project (approximately 3 to 6 ships per month) is not expected to result in a measurable increase in the rate of bank erosion along the shipping route, as compared to the baseline. A hydrodynamics assessment conducted by Coast & Harbor Engineering in February 2016 (CHE 2016) indicates that propeller wash from vessels berthed at the dock could result in increased scour in the lower portion of the berth slope (up to approximately 4 feet at -36 feet CRD), but would be negligible at water depths of -18 feet CRD and above. Effects associated with propeller wash and bank erosion, therefore, would not result in unavoidable adverse effects to plant or animal resources, including fisheries or aquatic habitat.

Exotic Species

Ships in transit could potentially import exotic and/or invasive species on their hulls and exterior equipment and/or in ballast water. Introduced species often can outcompete native species and have the potential to alter natural habitats by competing with native species. However, operators of commercial vessels have an economic interest in maintaining underwater body hull platings in a clean condition. Fouled bottom platings result in increased fuel costs and can reduce the vessel's maximum transit speed. Operators preserve and maintain the hulls of their ships aggressively to prevent fouling and higher costs (FERC 2008), greatly reducing the risk of the transport of exotic species.

The U.S. Coast Guard (USCG) has developed mandatory practices in 33 CFR 151 Subpart D, for ballast water management for control of nonindigenous species in waters of the United States. The USCG issued the new Ballast Water Discharge Standard effective in 2013. The new standards require the use of USCG-approved treatment systems (i.e., ballast water management system [BWMS]). Vessels calling on the proposed marine terminal would be required to have a Ballast Water Management Plan (BWMP) that meets the standards of the USCG, as well as those of the Vessel General Permit (VGP), which is an NPDES permit issued by the Environmental Protection Agency (EPA) for discharges incidental to operation of vessels within waters of the United States.

Ecology has issued a Water Quality Certification (WQC) under CWA Section 401 for the VGP. The conditions of the WQC are codified in WAC 220-150, and are administered by WDFW. These requirements include ballast water management practices that are intended to "ensure that the discharge of ballast water poses minimal risk of introducing nonindigenous species" (WAC 200-150-010(1)(b))".

Vessels calling on the facility from a port outside the U.S. Exclusive Economic Zone, would have to conduct an open sea exchange at least 200 nautical miles from any shore and in waters more than 2,000 meters deep, or would have to employ the use of a USCG-accepted or approved BWMS. Procedures for ballast water exchange and/or for treatment by a BWMS would be outlined in the vessel's BWMP. Instead of using a BWMS, vessels may also discharge to a shore-side facility if one is available.

Vessels calling on the facility would be required to comply with the requirements of the VGP and associated WQC and would, therefore, either perform an open-water exchange before entering Washington waters or discharge only ballast treated to water quality standards. For this reason, the proposed project would not result in increased risk of introduction of exotic species, and would not result in significant adverse impacts to aquatic species as a result of ballast water management.

Ship Strikes

The additional 36 to 72 vessel transits per year on the Lower Columbia River have the potential to result in collisions of ships with marine mammals that occur within the vessel shipping route on the Lower Columbia River. Propeller or collision injuries to marine mammals are most frequently caused by small, fast-moving vessels (FERC 2008). In contrast, the ships that would dock at the proposed project produce a bow wave because of their design and large displacement tonnage. This wave pushes in-water objects (including animals in the water) away from the vessel. Therefore, the proposed project would not result in significant adverse impacts to aquatic species as a result of ship strikes.

Vessel Spills

A discussion of the potential effects associated with spills and leaks associated with the proposed project under the two Marine Terminal Alternatives, including spills and leaks from project vessels, is provided in Chapter 8, Environmental Health and Safety.

Conclusions

In consideration of the above analysis, the additional vessel transits per year for the proposed project would not result in significant adverse impacts on plants or animal resources. Vessel transit on the river has the potential to affect plants and animal resources through the vectors described above (wake stranding of juvenile salmonids; bank erosion; introduction of exotic species; ship strikes; and vessel spills).

The operation of the proposed project would result in the introduction of approximately 3 to 6 ships per month (36 to 72 per year) to the Columbia River. The river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel calls in 2014 and historically has accommodated much higher numbers of vessels according to vessel entry and transit data (Ecology 2015). The small increase in vessel traffic associated with the proposed project operations would have the potential to contribute a minor increase to the baseline condition on the river that would not be expected to result in a significant adverse impact on any plant or animal resources.

6.6.3 Related Actions

6.6.3.1 Kalama Lateral Project

The proposed pipeline would consist of installing approximately 3.1 miles of 24-inch-diameter pipeline, metering facilities, and miscellaneous appurtenances extending from the Northwest Pipeline LLC (Northwest) mainline to the project site (FERC 2015). According to documentation filed with FERC (FERC 2015), the proposed pipeline would affect plant and animal resources near the proposed pipeline route. These effects include:

- direct loss of vegetation through construction and operation;
- mortality of wildlife species from construction machinery and vehicles;
- temporary and permanent impacts to native wildlife habitats; or
- temporary disturbance of wildlife during construction.

Construction and Operational Impacts

The construction of the proposed pipeline may result in minor, short-term impacts on plant and animal resources. These impacts could occur because of construction activities located within or adjacent to stream channels, forested habitats, and wetlands. Clearing and grading of stream banks, removal of riparian vegetation, in-stream trenching, trench dewatering, and backfilling could result in modification of aquatic habitat, increased sedimentation and turbidity, increases in temperature, decreased dissolved oxygen concentrations, releases of chemical and nutrient pollutants from sediments, and introduction of chemical contaminants such as fuel and lubricants. An increase in soil compaction and vegetation clearing could increase runoff and subsequent stream flow or peak flows. Human activity and noise could result in temporary displacement from habitats on and adjacent to the construction right-of-way. Inadvertent release of drilling fluid to surface waters could also negatively affect fish resources (FERC 2015). Standard construction BMPs for pipeline construction would be implemented as part of the proposed project to reduce impacts to plants and animals. As such, impacts to plants and animals are not expected to rise to the level of significance. Details of the proposed pipeline construction and operation impacts are described below.

General Habitat

The FERC documents for the proposed pipeline indicate that the pipeline project would result in 4 acres of temporary wetland impacts. Operating the pipeline project would permanently affect less than 1 acre of wetland. Wetland vegetation would be cleared, soils would be disturbed, and the hydrological characteristics of the affected wetlands could be altered. However, these affects should be temporary as soils and grades would be restored and vegetation allowed to regenerate naturally. Wetlands crossed by the horizontal directional drilling (HDD) would not be affected.

Construction and operation of the pipeline project would result in permanent and temporary impacts to vegetation. Forested vegetation (including the forested component of riparian vegetation) on lands used for operation would be permanently lost and converted to herbaceous vegetation. On lands only used for construction, the impacts of clearing forest would be long-term. The permanent and long-term loss and conversion of forested vegetation would impact wildlife by altering habitat characteristics, and could impact soil characteristics, contours, surface water flow, and rates of erosion (FERC 2015). The permanent and long-term loss of forest would also result in forest fragmentation, the creation of "edge effects," and an increase in the potential for the establishment and proliferation of noxious weeds. Approximately 30.7 acres of forest land would be affected during construction and 12.4 acres would be

affected by the permanent pipeline easement. Herbaceous, wetland, the non-wooded component of riparian vegetation, and agricultural vegetation would all be temporarily affected by the pipeline project. Similar to impacts resulting from the clearing of forested vegetation, the temporary clearing of vegetation could impact wildlife, soil characteristics, contours, surface water flow, and rates of erosion.

The proposed project includes seven riparian/stream crossings. Five of these riparian/stream crossings would include temporary impacts and two fish-bearing streams that would be avoided through the use of HDD. Impacts to aquatic habitat found within the proposed pipeline alignment are not expected to rise to the level of significance. By using a HDD to place the pipeline below the waterbodies, most impacts on these waterbodies and the fisheries contained within them would be avoided. However, the use of a HDD could result in an inadvertent release of drilling fluids (bentonite and other inert/non-toxic additives), commonly referred to as a "frac-out." A frac-out into a waterbody could temporarily impact water quality (turbidity), fish habitat (sedimentation), and the rates of stress, injury, and mortality experienced by fish and other aquatic wildlife (FERC 2015). Operating the pipeline project would not impact fisheries.

Terrestrial Plants and Animals

Constructing and operating the pipeline project would temporarily and permanently impact wildlife and wildlife habitat. Project related activities, including clearing and trenching and the general use of construction equipment, would temporarily decrease and permanently alter available wildlife habitat, change the characteristics of adjacent wildlife habitat, displace wildlife, and alter wildlife behavior, and could increase the rates of mortality, injury, and stress experienced by wildlife (FERC 2015). The temporary and permanent loss/conversion of forested habitat (including forested riparian habitat) would fragment existing habitat and would create "edge effects," which could further impact the mortality, injury, and stress experience by wildlife. Wetland, riparian, and non-forested/open habitat would only be temporarily affected by the construction of the project. Operating the project would permanently alter some habitats and could periodically disturb wildlife, which could also increase wildlife mortality, injury, and stress (FERC 2015).

Impacts on the Kalama Flats and associated priority waterfowl breeding areas would be minimized by the use of a HDD. As described previously, the use of a HDD could result in a frac-out; however, Northwest would implement minimization measures to avoid and minimize these impacts (FERC 2015).

Constructing and operating the project through the Carrolls Bluff Oaks priority habitat area would result in the loss of wildlife habitat (oaks). Similar to the loss of forested habitat on other lands, the rates of mortality, injury, and stress experienced by wildlife could increase; however, this impact could be measurably greater because of the unique characteristics of the oak woodlands. FERC has therefore recommended the implementation of an Oak Woodland Impact Minimization Plan. This plan would include botanical surveys between mileposts 2.1 and 2.4, and would address the WDFW's management recommendations pertaining to oak woodlands. This plan would also describe the measures would be implemented to avoid, minimize, and/or mitigate impacts on oak woodlands, including the reduction of construction workspace through oak woodlands (FERC 2015).

Habitat for several terrestrial and avian wildlife species would be permanently and temporarily affected by the pipeline project; however, given the mobility of species concerned and the availability of similar habitat nearby, this impact should be minimal (FERC 2015).

Impacts on migratory birds would be minimized through implementation of previously described measures. Northwest would also conduct a nesting bird survey prior to clearing to further reduce potential impacts to migratory birds. If nests are documented, Northwest would estimate fledging and delay clearing until fledging of nestlings has been confirmed (FERC 2015).

The measures that would be implemented to minimize impacts on vegetation would also serve to minimize impacts on wildlife, wildlife habitat, and priority habitats, species, and areas. Based on the analysis provided above, FERC has asserted that constructing and operating the pipeline project would not significantly impact wildlife habitats or species (FERC 2015).

Fisheries and Aquatic Species

The proposed pipeline project includes the crossing of seven streams, five of which are intermittent and are expected to be dry during installation. These streams do not provide habitat for any fisheries or other aquatic wildlife species and the construction and operation of the proposed pipeline would not affect fish or other aquatic resources in these water bodies.

The two perennial streams that include limited rearing, refugia, or potential foraging habitat for ESA-listed fish (coho and steelhead) would be crossed using HDD techniques. As stated previously, by using a HDD to place the pipeline below the waterbodies, most impacts on these waterbodies and the fisheries contained within them would be avoided. However, the use of a HDD could result in an inadvertent release of drilling fluids (bentonite and other inert/non-toxic additives), commonly referred to as a frac-out. A frac-out into a waterbody could temporarily impact water quality (turbidity), fish habitat (sedimentation), and the rates of stress, injury, and mortality experienced by fish and other aquatic wildlife (FERC 2015). Operating the pipeline project would not impact fisheries.

The ESA-listed bull trout is a cold-water-dependent species that requires stable stream channels, clean spawning and rearing gravel, complex and diverse cover, and unblocked migratory corridors. The waterbodies affected by the proposed project do not provide the habitat necessary for bull trout; therefore, FERC determined that construction and operation of the pipeline project would have no effect on bull trout (FERC 2015).

FERC also determined that the pipeline would not affect any designated EFH in either of the fish bearing streams (FERC 2015).

6.6.3.2 Electrical Service

It is expected that Cowlitz PUD would upgrade an existing transmission line from its existing Kalama Industrial Substation to the project site by installing new lines on existing towers within the existing transmission line corridor. New equipment (e.g., 115-kV breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility. Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing 115-kV transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. The new lines and improvements to the Kalama Industrial Substation would constitute a related action on the part of the Cowlitz PUD.

Construction of the new lines and improvements to the Kalama Industrial Substation could affect plant and/or animal resources near the location of the proposed new lines. These effects include:

- direct loss of vegetation through construction and operation;
- mortality of wildlife species from construction machinery and vehicles;
- temporary and permanent impacts to wetlands and/or other native wildlife habitats; or
- temporary disturbance of wildlife during construction.

The project area for the proposed public utility district transmission line and substation improvements provides limited habitat for plant and animal resources. Habitats within the area that could be affected by the proposed public utility district transmission line improvements mostly consist of developed industrial habitats and ruderal upland habitats but may also include some emergent wetland habitats.

The portion of the transmission line improvements that would be constructed west of I-5 would be conducted on unvegetated industrial habitat at the existing Kalama Industrial Substation. Improvements in this area would not result in any impacts to plant or animal resources.

The proposed transmission line improvements would cross over a narrow slough that is located east of the existing rail lines and west of I-5. The slough drains to the Kalama River, and may potentially be accessible to fish or other aquatic species. However, this habitat is of limited value, given its nature and constrained position on the landscape. Activities adjacent to this slough could temporarily affect water quality in the slough due to soil and/or vegetation disturbance. However the extent of impacts would be temporary and localized, and minimized through the use of typical construction BMPs including erosion control measures. No work would be conducted below the OHWM of the slough.

A review of the National Wetlands Inventory data for the proposed transmission line improvements site indicates that the area east of I-5 where the transmission lines would tie into the existing north-south line could potentially be emergent wetland, and work on the east side of I-5 could potentially result in direct wetland impacts. This area could potentially provide habitat for wetland adapted species including birds, small mammals, amphibians, and amphibians. Impacts to this area would be associated with utility pole footprints, and as such would have limited effect on habitat suitability. The area in which utility poles could be constructed would be within an existing utility right-of-way, in an area where an existing utility line is already established.

For the reasons provided above, the public utility district transmission line and substation improvements would not result in any unavoidable adverse effects to any plant or animal resources.

6.6.4 No-Action Alternative

The proposed project would not be constructed on the project site under the No-Action Alternative (as described in Chapter 2). However, if the proposed project were not constructed, it is anticipated that the Port would pursue future industrial and marine terminal development at the North Port site consistent with the Port's comprehensive scheme. Given the level of use of existing Port docks, and the limited availability of suitable locations for new marine terminals, the Port anticipates that any alternate development scenario for the project site would include a new marine terminal and berth.

Impacts from future industrial development under the No-Action Alternative could be similar to the proposed project because plants and animals and/or their habitat could be affected by redeveloping the project site. These effects could include impacts to mostly unvegetated

industrial and ruderal upland grass/forbs, and riparian and aquatic habitats depending on the project design. Because any future development scenario would be expected to require a new marine terminal and berth, it is anticipated that impacts to aquatic habitats at the site would generally be similar to those associated with the proposed Marine Terminal Alternatives.

6.7 Mitigation Measures

6.7.1 Project Mitigation

6.7.2 Impact Minimization and Avoidance

NWIW proposes to incorporate numerous design features and BMPs to avoid and/or minimize environmental impacts during construction, operations and maintenance, and decommissioning. These measures include construction BMPs, in-water work windows, and compensatory mitigation and habitat enhancement activities. This section describes the mitigation measures that would be incorporated into the proposed project to avoid significant adverse impacts to plants and animals. These measures apply to both technology alternatives and both marine terminal alternatives.

Proposed in-water work would be conducted only during the in-water work windows that are ultimately approved for this project. The windows that are proposed have been developed to accommodate the construction schedule, while simultaneously being cognizant of avoiding biologically sensitive time periods for given activities.

The size and configuration of the structures have been kept to the minimum capable of supporting their needed functions. The terminal has been designed such that (with the exception of the access trestle) the platforms, dolphins, and structures associated with the terminal would be located in water deeper than 20 feet below OHWM (11.6 feet CRD). This would minimize the effects to aquatic habitats by minimizing structure in and over shallow water habitats and placing the vessels away from shallow water, thus reducing impacts from vessel operations such as scour from prop and thrusters. Dredging would occur only in deep water and would not impact shallow water habitat. The dredged berth would be constructed with side slopes of 3:1, to avoid sloughing.

The Columbia River is a constitutionally designated area of commerce and the dock would be located in an existing harbor area and adjacent to the federal navigation channel. Ship traffic associated with the proposed project would result in a minor increase in vessel traffic and would be within historical trends. Walkways would be grated to minimize shading and stormwater would be collected and infiltrated upland, reducing the potential for pollutants to reach surface waters. Furthermore, the access trestle abutments have been designed and configured to eliminate the need for shoreline armoring along the riverbank.

The dock design uses precast concrete piles as structural support piles, which minimizes the potential for acoustic effects associated with impact pile driving (Caltrans 2012). The steel piles for walkway supports and fender systems would be installed with a vibratory hammer and are not expected to require impact proofing. If impact proofing is required for steel piles, a bubble curtain would be employed to attenuate underwater noise generated by the impact driving.

Stormwater from the dock would be collected and conveyed to upland treatment and an infiltration swale. In addition to stormwater from the project, the stormwater system would accommodate stormwater from the existing North Port dock; this stormwater is currently infiltrated in an upland swale that would be removed with the development.

The upland methanol manufacturing facility has also been designed to avoid and minimize impacts to plant and animal resources to the greatest extent practicable. The facility would be constructed on the portion of the site that has no wetlands or other waterbodies, has little substantial vegetation, has been slated for industrial development for years, and has been used as a dredge material placement site. Stormwater from impervious surfaces associated with the upland methanol manufacturing facility would be infiltrated through on-site stormwater pond(s).

The Port has owned the project site since 1979 and the site has been filled and useable since 1980. The Port has been actively pursuing development of the project site, and several projects have been previously proposed for the site (see Chapter 2, Proposed Project and Alternatives). The project site is well suited for an export facility, and several potential projects would have required the construction of a rail loop track that in turn would have required filling a portion of the high quality forested backwater wetland area to the north of the project site. An early conceptual design configuration for this project would also have required filling a portion of the backwater wetland. In order to minimize impacts to sensitive resources, however, both Technology Alternatives have been designed within the envelope of previously developed areas at the site, and would avoid direct impacts to the forested backwater wetland to the north.

Upland construction activities would be conducted to avoid direct impacts to streaked horned larks that could be present at the site during site preparation and construction. The project proponent proposes to conduct initial site preparation activities (clearing and grading) within potentially suitable streaked horned lark nesting habitat outside of the nesting season, consistent with the site preparation impact minimization measures described in the USACE's "Biological Assessment for the Continued Operations and Maintenance Dredging Program for the Columbia River Federal Navigation Channel" (USACE 2014) and the associated USFWS biological opinion (USFWS 2014).

6.7.2.1 Best Management Practices

The proposed project would include the following BMPs to minimize the extent of any effects to marine mammals or the aquatic environment.

General BMPs

General BMPs include those listed below.

- In-water work would be conducted only during the in-water work window that is ultimately approved for this project.
- Project construction would be completed in compliance with Washington water quality standards (173-201A WAC), including those listed below.
  - Petroleum products, fresh cement, lime, concrete, chemicals, or other toxic or deleterious materials would not be allowed to enter surface waters.
  - No oil, fuels, or chemicals would be discharged to surface waters, or onto land where there is a potential for re-entry into surface waters.
  - Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc., would be checked regularly for leaks, and materials would be maintained and stored properly to prevent spills.

- A SPCCP would be prepared by the contractor and used during all demolition and construction operations. A copy of the plan with any updates would be maintained at the work site.
  - The SPCCP would outline BMPs, responsive actions in the event of a spill or release, and notification and reporting procedures. The plan also would outline management elements such as personnel responsibilities, project site security, site inspections, and training.
  - The SPCCP would outline the measures to prevent the release or spread of hazardous materials found on site or encountered during construction but not identified in contract documents including any hazardous materials that are stored, used, or generated on site during construction activities. These items include, but are not limited to, gasoline, diesel fuel, oils, and chemicals.
- Applicable spill response equipment and material designated in the SPCCP would be maintained at the job site.
- A WQPMP would be prepared to reduce the potential for water quality impacts during construction.
  - The WQPMP would identify the protocol by which water quality conditions would be monitored during construction to document compliance with State water quality standards.
- A SWPPP would be prepared to reduce the potential for water quality impacts related to erosion or stormwater during construction
  - The SWPPP would contain BMPs specific to the project designed to reduce erosion and sediment delivery to surface waters.

Overwater Work BMPs

Typical construction BMPs for working in, over, and near water would be applied; these include activities such as the following.

- Checking equipment for leaks and other problems that could result in the discharge of petroleum-based products or other material into waters of the Columbia River.
- Taking corrective actions in the event of any discharge of oil, fuel, or chemicals into the water. These actions would include:
  - Excess or waste materials would not be disposed of or abandoned waterward of OHWM or allowed to enter waters of the state. Waste materials would be disposed of in an appropriate manner consistent with applicable local, state, and federal regulations.
  - Demolition and construction materials would not be stored where wave action or upland runoff can cause materials to enter surface waters.
  - Oil-absorbent materials would be present on site for use in the event of a spill or if any oil product is observed in the water.

Pile Installation BMPs

Pile installation BMPs to be applied would include the following.

- A vibratory hammer would be used to drive steel piles, to the extent practicable, to minimize underwater and terrestrial noise levels.

- If steel piles required impact installation or proofing, a bubble curtain would be used.
- Marine mammal monitoring would be conducted during pile installation activities to minimize impacts to marine mammals. The project proponent has applied for an Incidental Harassment Authorization with NOAA for the unavoidable incidental harassment of marine mammals that could occur during pile installation.

Overwater Concrete Placement Minimization and BMPs

On-site concrete placement would follow appropriate BMPs that include the following.

- Wet concrete would not come into contact with surface waters.
- Forms for any concrete structure would be constructed to prevent leakage of wet concrete.
- Concrete process water would not be allowed to enter the river. Any process water/contact water would be routed to a contained area for treatment and would be disposed of at an upland location.

Dredging BMPs

Dredging would be conducted during the in-water work window that is ultimately approved for this project.

- Dredging would be conducted to prevent impingement of juvenile salmonids by dredging equipment or clamshell or hydraulic dredge. Regular observation of sediment aboard the barge or at the placement areas would be conducted. If impingement occurs, clamshell operations would be adjusted (slowed) or modified to increase the opportunity for juveniles to avoid the bucket and/or suction head. The hydraulic dredge would be lowered deeper into the sand to reduce water entrainment.
- Construction activities would be conducted in compliance with surface water quality standards for Washington (173-201A WAC) or other conditions as specified in the water quality certification and/or construction stormwater permit.
- Appropriate BMPs would be employed to minimize sediment loss and turbidity generation during dredging. BMPs may include, but are not limited to, the following.
  - Smooth closure of the bucket when at the bottom.
  - No stockpiling of dredged material on the riverbed.
  - Maintaining suction head of hydraulic dredge in the river bed to the extent practicable.
  - Using a buffer plate or other means to reduce flow energy of the hydraulic dredge at the placement area.
  - Other conditions as specified in the water quality certification.
- Enhanced BMPs may also be implemented and may include, but are not limited to, the following.
  - Slowing the velocity (i.e., cycle time) of the ascending loaded clamshell bucket through the water column.
  - Pausing the dredge bucket near the bottom while descending, and near the water line while ascending.
  - Placing filter material over the barge scuppers to clear return water.

- If sediment is placed on a barge for delivery to the placement area, no spill of sediment from the barge would be allowed. The barge would be managed such that the dredged sediment load does not exceed the capacity of the barge. The load would be placed in the barge to maintain an even keel and avoid listing. Hay bales and/or filter fabric may be placed over the barge scuppers to help filter suspended sediment from the barge effluent, if needed, based on sediment testing results.

Dredge Material Placement BMPs

The following BMPs and conservation measures would be implemented to minimize environmental impacts during dredged material transport and placement.

- The contractor would be required to use a tightly sealing bucket and to monitor for spillage during transfer operations.
- Visual water quality monitoring and, if necessary, follow-up measurements would be conducted around the barge at the removal and upland transfer area to confirm that material is not being released.
- Sediment that is dredged by hydraulic dredge and placed in-water by hydraulic pipeline would be discharged at the riverbed to the extent practicable to minimize turbidity in the water column.
- Material used as beach nourishment would be placed within the limits of the boundaries and below OHWM.
- To prevent fish stranding, the slope for beach nourishment would be 3:1 horizontal to vertical (33 percent) without any swales.
- Sediment placement would use methods that minimize sediment loss and turbidity to the maximum extent possible.
- The placement activities would be monitored visually to ensure placed sediment is contained inside of the specified boundaries.
- Enhanced BMPs may be implemented to control sediment migration and turbidity and may include the following.
  - Selective sediment placement at areas with low dispersion.
  - Lowering the discharge pipeline toward the bottom elevation.
  - Placing sediment to build confinement dikes followed by placing the sediment into them.
  - Installing a silt curtain or similar equipment where appropriate.
- If upland stockpiling of dredged material becomes necessary, BMPs would be employed as appropriate to control runoff and erosion. Such BMPs may include: (1) installing silt fences, hay bales, and/or containment berms; (2) managing runoff and elutriate water; and (3) routine inspection of the stockpile areas to verify that BMPs are functioning properly.

6.7.2.2 In-Water Work Windows

Proposed in-water work would be conducted only during the in-water work window that is ultimately approved for this project. The currently published in-water work window for this reach of the Columbia River is 1 November–28 February. However, agencies, including the USACE, WDFW, USFWS, and NOAA Fisheries, have recently suggested modifying the

window to take into account the best available science and to address newly listed species. The following work windows are proposed for this project, as explained further below.

- Pile installation would be conducted between 1 September and 31 January.
- Dredging would be conducted between 1 August and 31 December.
- ELJ installation would be conducted between 1 August and 31 December.
- Pile removal may be conducted year-round.
- Work conducted below the OHWM, but outside the wetted perimeter of the river (in the dry) may be conducted year-round.

These work windows are necessary to accommodate the construction schedule, while simultaneously being cognizant of avoiding biologically sensitive time periods for given activities. One of the driving considerations for timing is the need to conduct all or most berth dredging prior to pile installation. The proposed dredging window is designed to begin early enough in the season to allow pile driving activities to begin on schedule, while avoiding the bulk of the peak juvenile salmonid outmigration in the spring/summer, and the peak run timing for Pacific eulachon in the late winter/early spring. An early pile installation window would minimize the need for pile installation to be extended into the late winter/early spring time frame. The project proposes to use impact-driven concrete structural piles, which are not known to result in injurious levels of underwater noise.

Steel piles, which would be used for fenders and walkway supports, would be driven with a vibratory hammer to the extent possible. If steel piles require impact installation or proofing, a bubble curtain would be used. For this reason, an early start to the pile installation window would not result in adverse effects to any fish or other aquatic species.

ELJ installation could be conducted during late summer, fall, or early winter to accommodate the range of times when Columbia River water levels could be low, to allow improved access to the shoreline, and to minimize disturbance to the aquatic environment.

Pile removal activities, and work conducted below the OHWM but outside the wetted perimeter of the river (i.e., in the dry), are not expected to result in significant impacts to aquatic species or resources, and these activities could be conducted year-round.

The proposed project would be developed in one or two phases. The construction duration would be approximately 26 to 48 months depending on whether it is built in one or two phases. Construction is expected to begin in mid-2016 and be completed as early as mid-2018 and as late as mid-2020.

Construction crews and methods would be influenced by weather, timing, and available equipment as well as this time frame.

It is anticipated that pile driving would be completed over approximately 120 days (not necessarily consecutive) during the 2016–2017 and/or 2017-2018 in-water work windows. Ordinarily, work would be conducted during standard daylight working hours, roughly 8 to 10 hours a day.

6.7.3 Proposed Compensatory Mitigation Activities

Project activities could affect the suitability of aquatic habitat function within the action area by increasing the quantity of nearshore overwater shading and by reducing the quantity and quality

of benthic habitats. Similarly, impacts to wetland and RHA buffers associated with the construction of the recreation access improvements and the dock trestle could negatively affect wetland and/or riparian habitat suitability and function. The regulatory reviews that would be conducted by USACE (for Section 10 and 404 permits), by WDFW (for HPA), and by Cowlitz County (for Critical Areas permit), would likely require compensatory mitigation for unavoidable impacts to aquatic and/or riparian habitats. Mitigation activities would, therefore, be incorporated as part of the proposed project. Specifically, three categories of activity are proposed: (1) pile removal; (2) ELJ installation; and (3) riparian restoration and wetland buffer enhancement.

6.7.3.1 Pile Removal

The proposed project would remove a portion of a row of existing timber piles now located in the freshwater intertidal backwater channel portion of the project site on Port property. The structure is a former trestle, and these piles may be treated with creosote. Piles are estimated to range between 12 and 14 inches in diameter at the mudline. A total of approximately 157 piles would be removed from the structure

The existing piles represent a direct loss of benthic habitat and reduce the quality of the habitat in the area. The tight spacing of the piles reduces the flow of water in and out of approximately 13 acres of the backwater channel. Field observations and aerial photographic interpretation show a buildup of sediment on the upstream side of the pile structures resulting in an acceleration of sedimentation in the channel and a reduction of flows. The piles are habitat for non-native species, including fish and bird species that prey on native salmonids, and may be a source of pollutants from chemicals used for treatment.

The removal of these piles would restore a minimum of 123 square feet of benthic habitat, within an area approximately 2.05 acres in size. These piles, in their current configuration, affect the movement of water and sediment into and out of approximately 13 acres of this backwater area (CHE 2015). The removal of the piles would facilitate sediment transport and seasonal flushing of this backwater area, which would help improve water quality and maintain this area as an off-channel refuge for juvenile salmonids in the long term. CHE has analyzed the hydraulic implications of removing these piles and determined that the proposed pile removal activities would not have any measurable or significant effect on the navigation channel (CHE 2015).

6.7.3.2 Engineered Log Jam Installation

The proposed project would install eight ELJs along the nearshore habitat along the Columbia River shoreline adjacent to the site. ELJs are a restoration and mitigation method that helps build high-quality fish habitat, develops scour pools, and provides complex cover (Cramer 2012).

Each ELJ would measure approximately 20 by 20 feet and be composed of large-diameter untreated logs, logs with rootwads attached, small woody debris, and boulders. Logs generally would have a minimum diameter of 24 inches and be 20 feet long. They would be anchored to untreated 16-inch wood piles driven a minimum of 20 feet into the stream bed and would be fastened to the piles by drilling holes in the wood and inserting 1-inch through-bolts for attaching chains to secure the wood to the piles. The logs that comprise the structure would be further bolted together to create a complex crib structure with 2- to 3-inch interstitial spaces. These spaces may be filled with smaller woody debris and/or boulders to enhance structural complexity and capture free-floating wood from the Columbia River.

These large wood structures would increase complex in-stream and overhead cover with interstitial spaces that would allow juvenile and adult salmonids to evade predation by marine mammals, birds, and fish. Each ELJ would be a minimum of approximately 400 square feet, and the six structures would represent a total of 3,200 square feet of new large woody material, installed along approximately 800 linear feet of Columbia River shoreline. The ELJs would provide refuge and foraging opportunities for outmigrating juvenile salmonids and resident fish.

6.7.3.3 Riparian Restoration and Wetland Buffer Enhancement

The proposed project would undertake riparian enhancement and invasive species management within an area approximately 1.41 acres in size along the Columbia River shoreline at the project site to further enhance riparian and shoreline habitat at the project site. Similarly, the proposed project would enhance approximately 0.58 acre of wetland buffer at the north end of the site to offset unavoidable wetland buffer impacts. The riparian and wetland buffer habitats would be enhanced by removing invasive species and planting native trees and shrubs that are common to this reach of the Columbia River shoreline. Native plantings proposed for the site include black cottonwood and a mix of native willow species, including Columbia River willow (*Salix fluviatilis*), Pacific willow (*Salix lasiandra*), and Sitka willow (*Salix sitchensis*). These species are common to the sandy riparian habitats and adjacent wetlands in this reach of the river.

Invasive species management at the project site would target locally common and aggressive invasive weed species, primarily Scotch broom and Himalayan blackberry. Weeds would be controlled by annual manual removal (hand pulling, cutting, and/or mowing). Appropriate herbicide treatments may also be applied if they are determined to be necessary by the project proponent. The invasive species management strategy would be an informal and evolving program, with the intent of limiting the spread of invasive species at the site. The details of the management program, including target species, frequency of removal activities, and specific treatments, would likely change and evolve over time as the sites are managed. The invasive species management that is proposed would limit the spread of these aggressive species, allowing native species assemblages to develop and thrive at the site, thereby enhancing the existing riparian and wetland buffer environments.

The proposed riparian restoration would improve both terrestrial and aquatic habitat by providing a biologically productive riparian habitat that would be a source of insect and invertebrate fauna, leaf litter, detritus, and woody debris to the aquatic system. The riparian enhancements (including both the ELJs and the riparian plantings) would provide natural streambank stability and minimize bank erosion and sedimentation. The establishment of native vegetation would improve habitat suitability for native birds and other terrestrial species that rely on these riparian habitats.

The proposed wetland buffer plantings and invasive species management would enhance the condition of the wetland buffer. The proposed plantings would replace native vegetation that is impacted as a result of the project and help establish a forest canopy where none currently exists. The invasive species management that is proposed would improve the habitat conditions within the buffer, and minimize the spread of aggressive species that could otherwise affect the quality of the adjacent wetland.

6.7.4 Related Actions

The proposed pipeline would adhere to the conditions described in the FERC EA (FERC 2015), which have been designed to avoid and minimize impacts to plants and animals. The pipeline

project would implement BMPs to avoid, minimize, and restore project-related effects to plant and animals. Additional mitigation measures developed in the FERC documents include the following.

- Restoration and vegetation of wetlands and waterbodies disturbed by construction.
- Consultation with the USACE, in accordance with the Clean Water Act, on impacts to wetlands and implement required minimization measures and mitigation.
- Minimizing and mitigating impacts to priority oak woodlands in accordance with WDFW oak woodland management requirements, and through implementation of an Oak Woodland Impact Minimization Plan.

FERC has determined that these measures would avoid, minimize, and/or mitigate for any otherwise unavoidable significant adverse impacts to plant and animal resources (FERC 2015).

The electrical service improvements would comply with all applicable laws, regulations, and permitting requirements that would be necessary for that related action. Cowlitz PUD would implement BMPs as required to avoid and/or minimize project-related effects to plant and animals.

6.7.5 Additional Mitigation

There are no significant adverse impacts; therefore, no additional mitigation measures have been identified.

6.8 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and with either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts to plant or animal resources.

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Chapter 7 Energy and Natural Resources

7.1 Introduction

This chapter evaluates the potential impacts of the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative, as well as the related actions, on energy and natural resources. The construction and operation of the proposed project and alternatives would create new demands for energy in the forms of electricity and natural gas, and would consume building materials, fuel, and other natural resources. This assessment describes the existing energy demand of the project site, identifies the current energy providers, estimates the projected energy demand of the proposed project and alternatives, and assesses whether the current service providers could accommodate the projected energy demand.

As discussed below, Cowlitz County Public Utility District No. 1 (Cowlitz PUD) can meet the electricity demand of either of the proposed project's Technology Alternatives with limited improvements to the existing PUD infrastructure. With construction of the Kalama Lateral Project (the proposed pipeline), assessed below as a related action, the existing supply and transmission capacity of the natural gas infrastructure is adequate to serve the proposed project with either Technology Alternative without affecting supply to other gas users. Thus, this analysis concludes that neither the proposed project nor the No-Action Alternative would result in significant adverse impacts to energy and natural resources.

7.2 Methodology

This assessment of energy and natural resources begins by characterizing existing energy supply and demand on the project site and then projects future conditions for the proposed project and each alternative. The estimated energy demand for the proposed project and alternatives is based on information provided by the project proponent. The assessment of whether the electric system would be able to accommodate the proposed project's demand is based on correspondence with Cowlitz PUD, the electric service provider for the project site. The assessment of potential impacts to the natural gas system is based on information provided in submittals to the Federal Energy Regulatory Commission (FERC) by Northwest Pipeline LLC (Northwest 2014) for the natural gas pipeline, the related action.

7.3 Affected Environment

The following section describes the affected environment for energy and natural resources. Electricity and natural gas are the primary forms of energy that would be consumed by the proposed project and alternatives, and this section focuses on those energy resources.

7.3.1 Electric Power Service

Within Cowlitz County, electric service is provided by the Cowlitz PUD, a municipal corporation incorporated in 1936 to serve the citizens of Cowlitz County, Washington. Today, the Cowlitz PUD manages and operates two systems—an electric transmission system and a distribution system.

The Cowlitz PUD electric system provides electric service – in year 2013, the PUD served approximately 48,500 residential, commercial, industrial, and street lighting customers countywide (Washington State Auditor's Office 2014). Electrical energy is drawn primarily

from wholesale power purchased from the Bonneville Power Administration (BPA), which comes primarily from Columbia River system hydroelectric sources, as well as a nuclear source (i.e., the Columbia Generating Station) and miscellaneous others. A small portion of the Cowlitz PUD's energy supply comes from the Swift No. 2 hydroelectric project on the Lewis River, which is operated by the Cowlitz PUD distribution system.

In year 2013, the Cowlitz PUD electric system had retail energy sales of approximately 5,195,417 megawatt-hours (Washington State Auditor's Office 2014). The project site, which is currently undeveloped and used as a dredged material disposal site, does not generate significant demand for electric power in existing conditions.

7.3.2 Natural Gas Service

The project site is not currently connected to the natural gas system and thus does not currently generate demand for natural gas. In general, Cascade Natural Gas (Cascade) provides residential and commercial natural gas service in Kalama. However, the use of the Cascade system to serve the proposed project would require construction of substantial new pipeline and appurtenant facilities to meet the delivery requirements of the proposed project while still meeting Cascade's existing customer demand.

7.4 Environmental Impacts

7.4.1 Proposed Project

7.4.1.1 Construction Impacts

The construction of the proposed project would result in the same types of overall construction activities with the same overall duration with either Technology Alternative and either Marine Terminal Alternative. Construction activities with either Technology Alternative and either Marine Terminal Alternative would have the same potential to impact energy and natural resources. Therefore, this assessment accounts for the potential construction impacts that could occur under either of the Technology Alternatives or either of the Marine Terminal Alternatives.

Construction of the proposed project would require fuel to power off-road construction vehicles and equipment, trucks, personal vehicles for construction workers, temporary construction lighting, dredging vessels, and vessels and barges delivering construction modules to the project site. However, the demand for diesel and gasoline needed to fuel construction equipment is anticipated to be met by existing supplies. Furthermore, the construction of the proposed project would consume traditional building materials and would use a maximum of approximately 5.4 megawatts per day of temporary grid electric power. The volume and use of these resources would be typical of other construction projects of this size and scope, and these resources are not expected to be in short supply. Overall, construction of the proposed project would not result in significant adverse impacts to energy and natural resources.

7.4.1.2 Operational Impacts

As described in Chapter 2, Proposed Project and Alternatives, the proposed project would develop the currently vacant industrial project site with a methanol manufacturing facility, marine terminal, and other supporting facilities. The proposed project would include a new substation on the project site to facilitate the provision of electric service to the project.

In order to provide electric service to the proposed project with the Ultra-Low Emissions (ULE) Alternative, it is expected that Cowlitz PUD would upgrade an existing transmission line from its existing Kalama Industrial Substation to the project site by installing new lines on existing towers within the existing transmission line corridor. New equipment (e.g., 115-kilovolt [kV] breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility. Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing 115-kV transmission line on the east side of Interstate 5 (I-5) to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. As discussed in Chapter 2, Proposed Project and Alternatives, the new lines and improvements to the Kalama Industrial Substation would constitute a related action on the part of the Cowlitz PUD.

Technology Alternatives

The Technology Alternatives would result in different demand for electricity and natural gas.[1] As discussed in Chapter 2, Proposed Project and Alternatives, the primary differences between the Combined Reformer (CR) and ULE Alternatives are energy consumption and the energy sources used for the natural gas reforming step in the methanol production process. With the CR Alternative, the waste heat from the reforming process is used to generate steam, and the steam is sent to turbines to drive rotating process equipment (such as pumps and compressors). ULE technology is designed to use process heat directly to provide energy for the reforming reaction. With the ULE reforming technology, rotating process equipment is driven by electricity instead of steam turbines. To power the processes, the CR Alternative would require electrical power of approximately 36 megawatts and natural gas with a power content of 60,000 dekatherms[2] per day; the ULE Alternative would require electrical power of approximately 101 megawatts and natural gas with a power content of 30,000 dekatherms per day.[3] Both alternatives also would consume a substantial amount of natural gas used as raw material to manufacture methanol.

Both the CR and ULE Alternatives would require substantial amounts of electricity and natural gas to power their processes and to produce methanol. The CR Alternative requires more energy input and relies more heavily on natural gas for that energy. The ULE Alternative uses natural gas to power boilers, but the reforming process is powered by process heat from the autothermal reformer. The ULE Alternative requires substantially more electricity because electricity is used to power compressors and pumps.

Overall, the ULE Alternative would have greater demand for electric power from the Cowlitz PUD than the CR Alternative (approximately 101 megawatts compared to approximately 36 megawatts with both methanol production lines in operation), while the CR Alternative would have greater demand for natural gas than the ULE Alternative (approximately 290,000 dekatherms per day compared to approximately 270,000 dekatherms per day with both

[1] All estimates of natural gas and electricity demand are based on preliminary engineering design calculations provided by Northwest Innovation Works, LLC – Kalama.
[2] A dekatherm is a unit of energy equal to 10 therms and one million British thermal units (MMBtu).
[3] This power consumption for the ULE Alternative includes natural gas consumption to fuel the onsite electric power generator. These values are for average power consumption over the life of the reforming catalyst.

methanol production lines in operation).[4] These estimates of natural gas usage includes natural gas that would be used as fuel for the production process, as well as natural gas used as raw material for methanol. The ULE Alternative, therefore, was assessed as the worst-case Technology Alternative for electricity demand and the CR Alternative was assessed as the worst-case Technology Alternative for natural gas demand.

Electricity Demand

Based on estimates provided by the project proponent, the electricity demand for the ULE Alternative would be approximately 201 megawatts with both methanol production lines in operation. The ULE Alternative would include an on-site natural gas-fired power generator to produce approximately 101 megawatts, and the remaining 100 megawatts of electricity demand would be provided by the Cowlitz PUD. The project proponent has discussed the provision of electrical service with the Cowlitz PUD. In a letter dated 12 June 2015, the Cowlitz PUD stated that it can support a connected load of 100 megawatts for the proposed project, although improvements to its system would be necessary (see **Appendix F**). These improvements would consist of upgrading an existing transmission line, improvements to the Kalama Industrial Substation, and the possible construction of a short transmission line across I-5, as described above. If in the future, Cowlitz PUD constructs transmission capacity adequate to supply all of the power needs for the ULE Alternative, the on-site power generation facility could be made obsolete. Cowlitz PUD currently has no plans to construct additional transmission capacity to the project site.

The CR Alternative would require approximately 36 megawatts of electricity. This demand could be met entirely by the Cowlitz PUD, and it would not require an on-site power generation facility.

Neither Technology Alternative would result in a significant adverse impact related to electricity demand.

Natural Gas Demand

The proposed project would manufacture methanol from natural gas transported on the Kalama Lateral Project (the proposed pipeline) to be constructed by Northwest (**Figure 2-19**). The methanol manufacturing process under the CR Alternative would generate demand for approximately 290,000[5] dekatherms of natural gas per day (including natural gas used for raw material and natural gas used for fuel). Under the ULE Alternative, the total natural gas demand would be approximately 270,000[6] dekatherm per day. The proposed pipeline has been designed to meet the higher demand of the CR Alternative. There are two primary factors to consider in assessing the potential for the proposed project to affect the availability of natural gas for other

[4] The estimated natural gas demand of the ULE Alternative includes gas that would be used to produce approximately 100 megawatts of electricity in the on-site power generation facility. At full operation, the ULE Alternative would use approximately 201 megawatts of electricity - 100 megawatts produced by the on-site power generation facility and 101 megawatts from the Cowlitz PUD. Inclusion of the power generation facility reduces the demand for electricity from the Cowlitz PUD and increases the natural gas consumption of the ULE Alternative.
[5] This is an estimate of the average natural gas consumption over the life of the reforming catalyst. This estimate is based on actual performance of combined reforming processes of similar design.
[6] This is also an estimated average over the life of the reforming catalyst. This is an estimate only; the actual natural gas usage may be lower or higher depending on the final engineering design and catalyst used and the heating value of the natural gas delivered to the project.

Northwest consumers. These factors are the availability of natural gas itself and the availability of pipeline transmission capacity to deliver the natural gas to consumers.

With respect to the supply of natural gas, the proposed pipeline would interconnect with Northwest's bi-directional mainline, which provides access to British Columbia, Alberta, Rocky Mountain, and San Juan Basin gas supplies. Overall, annual natural gas production in the United States has increased substantially in recent years as a result of the identification and development of shale gas supplies (American Petroleum Institute 2014). Historically, the United States consumed more natural gas than it produced and made up for the difference with imported natural gas, primarily from Canada. However, with the recent increase in domestic natural gas production, it has been forecast that the United States may become a net exporter of natural gas by 2020 (American Petroleum Institute 2014). Furthermore, the United States used approximately 26.13 trillion cubic feet (or 26.13 billion dekatherms) of natural gas in 2013 (U.S. Energy Information Administration 2014). The proposed project would use between approximately 270,000 and 290,000 dekatherms of natural gas per day (or between 0.098 and 0.105 billion dekatherms per year) depending on the technology selected. Given the increasing production of natural gas in the United States, the ability to import additional natural gas supplies when needed, and the small amount of natural gas used by the proposed project relative to the overall United States consumption, the proposed project would not adversely affect the supply of natural gas for other consumers.

With respect to the availability of pipeline transmission capacity for natural gas, Northwest's Section 7(c) application to FERC,[7] states that on a typical day more than 500,000 dekatherms of operationally available capacity on the mainline has been historically available for natural gas deliveries to the Kalama area. This figure represents available upstream transportation capacity and already accounts for capacity that has been subscribed to deliver gas to other Northwest consumers. The proposed project's demand is within this available upstream transmission capacity. As a result, the proposed project with either Technology Alternative would not adversely affect the availability of natural gas for other Northwest consumers.

Overall, the proposed project with either Technology Alternative would not result in significant adverse impacts to energy and natural resources.

Energy Conservation Measures

The proposed project would incorporate measures to conserve energy during construction and operation. Most notably, the methanol production process with either Technology Alternative would be designed to reuse and recycle waste products to reduce the overall energy required to operate the manufacturing process. With the CR Alternative, the waste heat from the reforming process is recovered and used to generate steam, and the steam is sent to turbines to drive rotating process equipment (such as pumps and compressors). With the ULE Alternative, process waste heat is used directly to provide energy for the reforming reaction. Another energy efficiency measure would be the reuse of hydrocarbon byproducts from the distillation process as fuel for the boilers to generate steam used in the process.

The proposed project would also use light-emitting diode (LED) light fixtures. LED light fixtures use substantially less energy than traditional high-intensity discharge lighting fixtures and have a much longer useful life.

[7] This application is FERC Docket CP15-8 and is available online at http://www.ferc.gov/docs-filing/elibrary.asp

Marine Terminal Alternatives

The Marine Terminal Alternatives would both result in the same potential impacts to energy and natural resources and are assessed together.

Both Marine Terminal Alternatives would generate demand for electricity for lighting, loading equipment, and the operations shack and dockworker shelter. They would also generate demand for electricity from the use of shore power (also known as "cold-ironing"). Both Marine Terminal Alternative would generate a peak electrical demand of approximately 3 megawatts (accounting for both methanol loading activities and the use of shore power by vessels serving the methanol manufacturing facility and layberth vessels), and an estimated annual electricity use of approximately 11,000 megawatt-hours based on preliminary engineering estimates. This electricity demand would be negligible compared to the approximately 5 million megawatt-hours of energy sales by the Cowlitz PUD in 2013. Therefore, the operation of the Marine Terminal Alternatives would not result in significant adverse impacts to energy and natural resources.

7.4.2 Related Actions

7.4.2.1 Kalama Lateral Project

The proposed pipeline would be made up of 3.1 miles of 24-inch-diameter pipeline, associated facilities and equipment extending from Northwest's mainline to the proposed project. During construction of the proposed pipeline, building materials and fuel would be consumed. Construction activities would be temporary, lasting approximately five months, and energy use during construction, which would primarily be diesel and gasoline fuel use, is expected to be negligible compared to the approximately 87 million barrels (with 42 gallons per barrel) of distillate fuel and motor gasoline consumed in 2012 in Washington (U.S. Energy Information Administration 2012). During operation, the proposed pipeline and associated aboveground facilities would require very little energy. Therefore, the proposed pipeline related action would not result in significant adverse impacts to regional energy or local natural resources.

7.4.2.2 Electrical Service

It is expected that electrical service improvements to the Kalama Industrial Substation and new transmission lines, primarily on existing towers within the existing power line corridor, may be run to the project site under the ULE Alternative. The new transmission lines and substation improvement would constitute a related action on the part of the Cowlitz PUD. They would provide electric service to the proposed project with the ULE Alternative but would not generate demand for energy or natural resources by themselves. Therefore, this related action would not result in significant adverse impacts to regional energy or local natural resources.

7.4.3 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed on the project site, but instead the Port of Kalama would pursue other future industrial or marine terminal development of the site. During construction, development under the No-Action Alternative would be expected to create demand for building materials and fuel. During operation, the No-Action Alternative would likely generate demand for electricity, natural gas, and other energy resources depending on the type of development that is ultimately pursued. The electrical demand for an alternative use of the site could be more or less than the project, depending on the use.

7.5 Mitigation Measures

There are no significant adverse impacts to energy and natural resources; therefore, no mitigation measures are identified.

7.6 Unavoidable Significant Adverse Impacts

Because the amount of energy resource consumption associated with the proposed project falls within the range of existing available capacity of the electricity and natural gas providers, neither the proposed project nor the No-Action Alternative would result in unavoidable significant adverse impacts to energy and natural resources.

7.7 References

American Petroleum Institute. 2014. Understanding Natural Gas Markets. Prepared by the Brattle Group. Prepared for the American Petroleum Institute. Available at http://www.api.org/~/media/files/oil-and-natural-gas/natural-gas-primer/understanding-natural-gas-markets-primer-low.pdf.

Northwest Pipeline LLC. 2014. Application for Certificate of Public Convenience and Necessity for the Kalama Lateral Project, submitted to Federal Energy Regulatory Commission on October 27, 2014. Docket No. CP15-8-000.

Washington State Auditor's Office (SAO). 2014. Financial Statements Audit Report Public Utility District No. 1 of Cowlitz County. Audit Period January 1, 2013 through December 31, 2013. Report No. 1011741. Washington State Auditor. Olympia, Washington. May 1, 2014. Available at: http://www.cowlitzpud.org/pdf/Cowlitz%20PUD%202013%20Financial%20Audit.pdf. Accessed March 5, 2015.

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Chapter 8 Environmental Health and Safety

8.1 Introduction

This chapter evaluates the impacts of the proposed project's Technology Alternatives, Marine Terminal Alternatives, No-Action Alternative, and related actions on environmental health and safety. The evaluation includes potential construction impacts and potential operational impacts, including impacts resulting from chemical release or spills, fire and explosion incidents at the proposed project methanol manufacturing facility and marine terminal, or during loading methanol on to ships used for transport.

8.2 Regulatory Context

Environmental health and safety issues are regulated at federal, state, and local levels. **Table 8-1** summarizes the laws and regulations applicable to the proposed project.

Table 8-1. Laws and Regulations Related to Environmental Health and Safety

Laws and Regulations	Description
Federal	
Anchorages under Ports and Waterways Safety Act (33 CFR 109)	Authorizes USCG to specify times of movement, restrict operations, and direct anchoring of vessels under hazardous conditions.
Navigable Water Regulations (33 CFR 126)	Regulates the handling of explosives or other dangerous cargoes within or contiguous to waterfront facilities.
Financial Responsibility for Water Pollution (Vessels) and Oil Pollution Act, Limits of Liability (Vessels and Deepwater Ports) (33 CFR 130, 138)	Establishes requirements for responsible parties to demonstrate financial ability to meet potential liability for costs and damages.
Facilities Transferring Oil or Hazardous Materials in Bulk (33 CFR 153-154)	Requires facilities transferring oil or other hazardous materials in bulk to submit an operations manual to USCG for approval.
Vessel Contingency and Response Plans (33 CFR 155)	Requires development, implementation, and annual review of a vessel response plan approved by USCG.
Shipping Regulations – Water Transportation (46 CFR 2, 10-12, 15, 30-40)	Regulates licensing and certification of personnel, manning requirements, vessel inspections, and tank vessels.
Shipping Regulations –Barges (46 CFR 151 Subchapter D- Tank Vessels)	Regulates tank vessels carrying bulk liquid hazardous materials cargoes.
Oil and Hazardous Material Transfer Operations (33 CFR 156)	Specifies procedures and requirements for transferring oil and other hazardous materials to/from vessels.
Navigable Water Regulations (33 CFR 160 – 167)	Ports and waterways safety regulations.
Pipeline and Hazardous Materials Safety Administration (PHMSA) (49 CFR 105–110, and 171–180, 190-195)	Regulates the movement of hazardous materials.
Clean Water Act (33 U.S.C. 1251 et seq., 40 CFR 109-112, 116-131, 133)	Establishes the basic structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the incidental release of oil and other hazardous substances into U.S. waters.

Laws and Regulations	Description
Clean Air Act (40 CFR 61, 68)	Establishes emissions limits and reporting requirements for air emissions of certain criteria pollutants and hazardous substances air pollutants.
Limits on Liability (33 U.S.C. 2704)	Establishes limits on liability of a responsible party to incur costs from certain types of incidents.
Hazardous Materials Transportation Act (49 U.S.C. 51)	Authorizing Act for all aspects of hazardous materials packaging, handling, and transportation for vessel, truck, and rail. Requirements enforced by PHMSA (listed above).
Comprehensive Environmental Response, Compensation and Liability Act (40 CFR 300-302)	Establishes authority for governmental response to hazardous substance releases to the environment and liability for responsible parties for response actions and damage to natural resources.
Emergency Planning and Community Right to Know Act/SARA Title III Reporting (40 CFR 302, 355, 370, 372, 373)	Establishes requirements for public notification and emergency planning at a facility that uses or manufactures hazardous substances.
Occupational Safety and Health (29 CFR 1904, 1910)	Regulates emergency planning and response, including air contaminant exposure limits for workers.
State: Washington	
Transportation Regulations (RCW 81)	Regulates transportation in Washington State and administers gas and hazardous liquid pipelines allowed under state law (RCW 81.88)
Pilotage Act (RCW 88.16)	Establishes requirements for compulsory pilotage provisions in certain waters of the state. Washington waters of Columbia River are subject to the pilotage laws and rules set by the state of Oregon (ORS 776).
Transport of Petroleum Products and Hazardous Substances– Financial Responsibility (RCW 88.40)	Defines and prescribes financial responsibility requirements for vessels that transport petroleum products across state waters and facilities that store, handle, or transfer oil or hazardous substances near navigable waters of the state.
Vessel Oil and Hazardous Substance Spill Prevention and Response (RCW 88.46)	Establishes rules and regulations for tank vessels that carry hazardous substances and enter navigable waters of the state.
Oil and Hazardous Substance Spill Prevention and Response (Oil Spill Act) (RCW 90.56)	Establishes programs to reduce the risk and develop an approach to respond to oil and hazardous substance spills; provides a simplified process to calculate damages from an oil spill; and holds responsible parties liable for damages resulting from injuries to public resources.
Hazardous Chemical Emergency Response Planning and Community Right-to-Know Act of 1986 (WAC 118-40)	Establishes requirements for federal, state, and local governments, and industry to improve hazardous chemical preparedness and response through coordination and planning; provisions include public notification about chemicals used at facilities.
Pollution Prevention Plan Requirements (WAC 173-307)	Requirements for Pollution Prevention Plans associated with hazardous substance users and waste generators.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of damages, and selecting the damage assessment method. Applies to the facility in the event of oil/fuel spills into the water related to equipment use and/or facility operations.
Washington Industrial Health and Safety Act (RCW-49.17)	Regulates emergency planning and response, including air contaminant exposure limits for workers.

Laws and Regulations	Description
State: Oregon	
Maritime Pilots and Pilotage (ORS 776.028)	Establishes requirements for compulsory pilotage; provisions in the Oregon and Washington waters of Columbia River.
Local	
Environmental Policy Kalama Municipal Code 15.04	City environmental policy adheres to State SEPA policy and Ecology rules and regulations.
Cowlitz County Code, Chapter 19.11	Cowlitz County is required under RCW 43.21C.120 to adopt rules pertaining to the integration of the policies and procedures of the State SEPA into programs within Cowlitz County's jurisdiction. Cowlitz County rules are consistent those of the Ecology, Chapter 197-11 WAC.

Notes:
CFR – Code of Federal Regulations; USCG – U.S. Coast Guard; USC – United States Code; RCW – Revised Code of Washington; WAC – Washington State Administrative Code; Ecology – Washington State Department of Ecology; ORS – Oregon Revised Statutes; City – City of Kalama; SEPA – State Environmental Policy Act; SARA – Superfund Amendments and Reauthorization Act of 1986

Table 8-2 summarizes the federal and state agencies that provide oversight for prevention, preparedness, and response.

Table 8-2. Agency Oversight of Prevention, Preparedness, and Response

	Federal		State	
Source of Spill/Release	**Prevention/ Preparedness**	**Response Action**	**Prevention/ Preparedness**	**Response Action**
Terminal (on site)				
Vessel Loading Facilities	USCG		Ecology	
Storage Tanks	EPA			
Off-site Transport				
Pipeline	PHMSA	EPA	Utilities and Transport Commission and Ecology	
Vessels	USCG		Ecology	

Notes: Adapted from Westway Draft Environmental Impact Statement (City of Hoquiam & Ecology, August 2015)
USCG- U.S. Coast Guard, Ecology – Washington State Department of Ecology; EPA – U.S. Environmental Protection Agency; PHMSA – Pipeline and Hazardous Materials Safety Administration

See **Appendix G**, Safety and Health Aspects report (AcuTech 2016) for additional codes, standards and regulations associated with the proposed project.

8.3 Methodology

The study area for this analysis is the project site, the areas of the Columbia River used for associated vessel transport, and the surrounding area including human populations and natural resources that could be affected by an incident during construction or operation at the project site.

The following documents and databases were reviewed for environmental health and safety risks associated with the construction and operation of a methanol plant, marine terminal, and pipeline.

- AcuTech Consulting Group (AcuTech), Northwest Innovation Works, LLC – Kalama (NWIW) - Quantitative Risk Assessment (QRA), February 2016
- AcuTech, NWIW - Safety and Health Aspects, February 2016
- Northwest Pipeline LLC, Kalama Lateral Project Reliability and Safety Resource Report, October 2014
- Northwest Pipeline LLC, Federal Energy Regulatory Commission (FERC), Kalama Lateral Project Environmental Assessment, July 2015

Table 8-3 provides a summary of additional information in other chapters of the environmental impact statement regarding discipline-specific construction and operation impacts to health and safety.

Table 8-3. Additional Information Regarding Potential Environmental Health and Safety Impacts

Chapter	Section	Activity or Hazard that May Create an Impact	Potential Impacts
Chapter 2 Proposed Project and Alternatives	2.6.1.5 2.6.2.5	Construction • Pile installation • Dredging • Stormwater • Upland construction	• Timing, noise, construction debris in-water, hazardous materials releases; turbidity increases • Releases, fires
	2.6.1.4	Operation • Emergency response • On-site features for fire suppression and response and control of fires	• Releases, fires, emergencies
Chapter 3 Earth	3.4.1.1	Construction • Hazardous materials releases • Soil disturbance • Dredging • Slope stability	• Contaminated soil, groundwater, or surface water • Soil erosion • Water quality/turbidity
	3.4.1.2	Operation • Geologic hazards (ground shaking, liquefaction, etc.), created by landslides, earthquakes, and tsunami	• Lateral movement, damage and/or destruction of structures
Chapter 4 Air	4.4.1.1 4.4.2.1	Construction • Site development	• Dust and particulate matter
	4.4.1.2 4.4.2.2	Operation • Methanol production air discharges	• Pollutant emissions
Chapter 5 Water Resources	5.5.1.1	Construction • Erosion • Hazardous materials releases • Ground Improvements • In-water work water quality impacts	• Stormwater, surface water, and ground water impacts
	5.5.1.2	Operation • Stormwater, process water and wastewater generation	• Surface and groundwater quality impacts
Chapter 6 Plants and Animals	6.6.1.1	Construction • Site disturbance • In-water work	• Erosion, habitat impacts, endangered species, noise
	6.6.1.2	Operation • Vessel traffic	• Wake stranding, erosion, collisions, invasive species

8.3.1 Operational Risk Evaluation

A range of possible incidents, such as spills, releases, fires, and explosions, was considered to evaluate risks posed by operation of the proposed project. A Quantitative Risk Analysis (QRA) (see **Appendix G**) was used to develop various incident scenarios and evaluate the potential consequences of those incidences to on- and off-site individuals and community/societal risks. The QRA used conservative hazard and process conditions (e.g., composition, temperature, pressure, wind speed) to develop and identify conservative hazard distances and zones of impacts as described below.

8.3.2 Quantitative Risk Analysis

AcuTech conducted a QRA to evaluate the spill, fire and explosion impacts of the proposed project. The QRA focuses on the safety and potential accidental releases that could occur at the proposed methanol plant and at the marine terminals while loading methanol onto the ships. The QRA includes modeling of the worst-case scenarios for spills, fires and explosions that could take place and looks at the risks to workers at the proposed facility as well as to the surrounding community.

One of the first steps in the QRA is to develop accidental release scenarios – how, when and where accidental releases could happen. AcuTech collected information specific to the site and proposed project operations to provide the basis for the assumptions applied in the QRA. AcuTech held a Hazard Identification (HAZID) workshop to develop the accidental release scenarios with representatives from NWIW, the Port, Northwest Pipeline LLC (Northwest) and the team assisting with the design of the facility. The HAZID considered how the methanol manufacturing process works, the hazards of the process, and safeguards used at the facility and marine terminals to reduce the hazards and risks to workers and the community. Specific accident scenarios for operations and activities at the methanol facility and marine terminals were developed based on information from the workshop.

The study also included analysis of explosion hazards to proposed project buildings and created a map of the facility that shows how far shock waves generated by an explosion would travel. The map identifies areas of vulnerable buildings that could be impacted by three levels of shock waves shown in **Appendix G**, QRA, Figure 15, as overpressure contours. The QRA concludes that an explosion at the facility would not produce a shock wave that could cause significant damage off site. An on-site explosion would not result in deformation or collapse of any off-site buildings and individuals off site would be protected from significant injury. For additional information on the analysis of explosion hazards and overpressure contours, see **Appendix G**, QRA Section 8.3.3, Overpressure.

The potential risk for fires, explosions and exposures to toxic materials were then evaluated and hazard zones identified for spills ranging in sizes from a leak to a rupture. The hazard zones are used to identify potential impacts to onsite and offsite people. The risks were calculated for any single individual on or near the site and also for groups of people on or near the site. Section 8.3.3, Individual and Societal Risk Evaluation, discusses how these risks were evaluated.

The QRA does not include assessment of the security at the methanol facility or of the safety and security of the ships transporting methanol. The security of the marine terminal and ships would be covered by the Maritime Transportation Security Act of 2002 (MSTA).

8.3.3 Individual and Societal Risk Evaluation

Accidental spill or release scenarios were developed, as explained above, to consider the potential for fire, explosion, and toxic exposure at the methanol manufacturing facility. Hazard zones were calculated to define the potential impacts from these scenarios to on-site and off-site people. The calculated risks were compared to risk criteria from the Health and Safety Executive of the United Kingdom (UK-HSE) to determine what is and is not an acceptable level of potential risk. (This source was used because the United States has not established prescribed risk criteria to support a quantitative risk assessment and it is the most conservative approach as discussed in **Appendix G**, QRA).

The UK-HSE criteria address on-site individual risk for workers, as well as risks to off-site people. Individual risk is defined as the risk to a single person exposed to a hazard. The hazard can be a single incident or a collection of incidents. The UK-HSE criteria for individual risk are classified as:

- Unacceptable (greater than or equal to one fatality in 1,000 years)
  - Level where further risk assessment or risk mitigation is required
- Broadly acceptable (less than or equal to one fatality in 1 million years)
  - Level where further risk reduction is not required
- Tolerable (one fatality in 1,000 to 1 million years)
  - Level where further, prudent risk reduction should be considered; region is typically referred as the "as low as reasonably practicable" zone

Societal risk evaluation builds on the individual risk results by considering the number of people at the proposed project site and groups of people in areas surrounding the proposed project. Societal risk is the risk to groups of people located in the hazard zone(s) affected during incidences such as fires, explosions and releases or spills. The societal calculation uses the same consequence and frequency results as the individual risk calculation, but also uses information about the number of individuals, their location, what type of building they are in and how long they are present to determine the risk.

See **Appendix G**, QRA for additional Individual and Societal Risks information and calculations.

8.4 Environmental Impacts

8.4.1 Proposed Project Alternatives

The two technology alternatives for the methanol manufacturing facility and two marine terminal alternatives, are assumed to generally pose the same potential for impacts to environmental health and safety. There is a difference between the air emissions of the two technology alternatives, as discussed in Chapter 4 (the ULE technology produces the least greenhouse gas emissions). The No-Action Alternative is discussed for comparison in the event that the proposed project is not completed.

The construction and operation of the proposed project has the potential to impact environmental health and safety. These include the potential impacts of construction of an industrial facility and potential operational impacts from the methanol manufacturing process and marine terminals. This section begins with a discussion of the chemicals used to

manufacture methanol and associated risks and then addresses potential health and safety and impacts related to construction and operation of the proposed project.

8.4.1.1 Chemical Risk Factors

The proposed project technology alternatives would use chemicals with varying risk factors. The risks associated with the use of these chemicals depend on the individual chemical characteristics, storage, volume used, the potential for release and factors such as the quantity and duration of release, weather conditions, and surrounding terrain that influences the outcome of a release of and the associated risks.

The primary chemical substances of concern are natural gas (methane) and methanol (AcuTech 2016). The following discussion provides a summary of risks associated with these chemicals. Additional detail is provided in **Appendix G**. Chemicals used during construction or operation that have lower potential risks, such as diesel fuel and various catalysts, are discussed in the Petroleum Products and Miscellaneous Substances section below.

Natural Gas

Natural gas (methane) is the raw material that would be used to produce methanol. It would be provided to the site by an underground pipeline lateral from Northwest.

Natural gas is not considered to be chemically toxic but is an asphyxiate[1] with an inhalation hazard; exposure to high concentrations can result in serious injury or death. Mixtures of natural gas in air in unconfined conditions are generally dilute and do not typically present an asphyxiate hazard. Natural gas diluted in air is not generally flammable or explosive in an open site, such as the planned facility and the related pipeline corridor.

Natural gas can become highly concentrated in confined spaces or enclosed spaces and can displace oxygen in the air causing asphyxiation. Natural gas is flammable, can be explosive at room temperature, and can be ignited with a static charge.

Petroleum Products and Miscellaneous Substances

Various petroleum products, including diesel or other fuels, lubricants, paint, solvents, or other miscellaneous chemicals would be used and stored on site during construction and operation of the proposed project (AcuTech 2016).

Petroleum products and various miscellaneous substances used on site during construction and operation of the proposed project are potentially hazardous when spilled or leaked outdoors. These products could threaten plant and animal species, particularly aquatic life, such as that found in the Columbia River. Spills of these products on the upland portion of the site could expose workers, soil, groundwater, plants, animals, and adjacent wetland resources to toxic substances.

Diesel Fuel

Diesel-powered generators would be used for emergency power on site during operation of the facility. Diesel fuel is a combustible petroleum product that must be handled, stored, and

[1] An asphyxiate is a substance that can cause death or unconsciousness by reducing or displacing normal oxygen concentrations leading to suffocation.

transported to avoid the risk of exposure to flame and sparks. Hazards include the risk of fire and explosion. A maximum volume of 500 gallons would be stored on site in an aboveground storage tank during operation.

Catalysts

The proposed project (both technology alternatives) would use catalytic process units to promote chemical reactions necessary for the reformation of natural gas to methanol. The catalytic processes would employ mixtures consisting primarily of oxides of aluminum, cobalt, copper, magnesium, molybdenum, nickel, zinc, and silicon and lower concentrations of other metallic compounds. The catalysts will be delivered to the facility in pellet form (2 to 17 millimeters in diameter). These pellets will be placed in fully contained process vessels. Neither the catalysts nor the catalytic process will be exposed to the environment or to occupational areas during normal operations.

A zinc oxide catalyst will be used to remove sulfur compounds from the incoming natural gas. Hydrogen sulfide, found in the incoming natural gas and also formed in the removal process, will react with the zinc oxide as the natural gas is passed through the catalyst bed. Hydrogen sulfide is a toxic gas, but it will be present only at very low concentrations in the natural gas, which will be fully contained in the catalytic process vessel. Eventually, the catalysts will lose effectiveness and must be replaced approximately once every 6 to 12 months. The spent desulfurization catalyst will consist primarily of zinc oxide and zinc sulfide. It will be disposed off site at a licensed waste disposal facility.

Catalysts used to reform natural gas to methanol will last three to five years. The metallic compounds in these spent catalysts generally will retain their original chemical composition and will be in the form of dust and larger particles. Some of these compounds may be toxic if inhaled and some may have potential to self-heat and combust when exposed to the atmosphere under certain circumstances. Therefore, they must be carefully managed when they are removed from the catalytic process vessels. These spent catalysts will be hauled off site to a facility that will recover valuable metals (depending on market conditions) or to a licensed disposal facility.

All spent catalysts must be removed and replaced by a specialty contractor to ensure the safety of the workers. Removal will entail first purging the catalytic process unit of all process gases with an inert gas, such as nitrogen. Once purged of process gases, the unit will be opened and the spent catalyst will be transferred to containers using appropriate dust control procedures. This work will be done by workers equipped with personal protective equipment to prevent inhalation of catalyst dust.

Aqueous Ammonia

To control nitrogen oxides (NO_x) emissions from the boilers, the proposed project would use an aqueous ammonia solution (ammonia diluted with water at a ratio of 19 percent ammonia to 81 percent water) as a reducing agent and a catalyst (metallic oxide) to yield nitrogen and water that would be vented to the atmosphere. This process is commonly used to control NO_x emissions from large natural gas combustion sources and is known as selective catalytic reduction (SCR).

Aqueous ammonia is stable under normal storage conditions. The ammonia solution would be delivered by tank truck and stored in an on-site tank. Aqueous ammonia can burn skin, eyes,

and lung tissue and could create a potential hazard to on-site workers if there were a spill or other significant release from the storage tank. The risk of injury, however, is low because the vaporization rate of ammonia from a 19 percent solution is low, and the hazard zone would be limited to the immediate spill area. Aqueous ammonia is much less hazardous than pure or anhydrous ammonia, which is a gas at room temperature.

The metallic catalysts used in the SCR will be similar to the catalysts used in the processes described above. The SCR process will be contained and catalyst replacement and disposal will be managed as described above for other catalytic processes.

Methanol

General Characteristics

Methanol is a clear, colorless, water-soluble liquid. It is flammable and considered a hazardous substance (40 CFR 302.4) under the Emergency Planning and Community Right-to-Know Act.

While methanol is a liquid at typical ambient temperature and pressure conditions, much of the proposed project methanol manufacturing process takes place at temperatures above methanol's boiling point; therefore, both vapor and liquid releases of methanol could occur. Methanol readily mixes with water and evaporates quickly into the atmosphere. Methanol releases to the environment present an inhalation risk in enclosed areas, explosion and fire risks, and potential toxicity to plants and animals located near the source of a release.

Humans can be exposed to methanol via ingestion and skin and/or eye contact. Methanol is oxidized in the liver by an enzyme and produces formaldehyde and formic acid, which is responsible for its toxicity. Chronic exposure to methanol, either orally or by inhalation, causes headaches, insomnia, gastrointestinal problems, and blindness. Methanol does not mutate nor cause cancer.

Methanol is less toxic to marine life than crude oil or gasoline and many effects of short-term exposure are temporary or reversible. The US EPA Office of Pollution and Prevention and Toxics indicates that methanol is essentially non-toxic to four aquatic fish species that were tested (EPA, OPPT, 1994). A methanol spill onto surface water would have some immediate effects to marine life in the direct vicinity of the spill. However, because its properties (i.e., methanol readily mixes with water and evaporates into the atmosphere), methanol would dissipate into the environment, and within fairly short distances from the spill would reach levels where biodegradation would rapidly occur (Malcom Prime, 1999).

The characteristics of methanol in air and water are used to predict the risks and potential impacts of a release or spill. These characteristics are discussed in detail in the QRA and summarized below. See **Appendix G**, QRA.

Methanol in Air

The quantity of methanol released into the air, its duration, weather conditions, and the nature of the surrounding terrain can influence the outcome of a release. Methanol vapor has nearly neutral buoyancy and would readily dissipate or disappear from locations with circulating air and in open-air areas. It may not dissipate from non-ventilated locations, such as sewers and enclosed spaces. Depending on the circumstances of a release, methanol liquid may pool and vapor may migrate near the ground and collect in confined spaces and low-lying areas. Methanol vapor can flash back to its source if ignited. These factors are discussed in detail in **Appendix G**, Safety and Health Aspects (AcuTech 2016).

Methanol in Water

Methanol retains its flammability in water but would be expected to dilute rapidly to a nonflammable concentration if released to a large body of water, such as the Columbia River. Other factors affecting the rate of dilution include wave, tides, and currents. Methanol is known to biodegrade rapidly once it is diluted and is not expected to persist in surface water (Jamali et al. 2002; Malcolm Pirnie, Inc. 1999).

8.4.2 Construction Impacts

Construction of the proposed project would have impacts similar to that of any large construction project and includes impacts to individual workers at the construction site and to the surrounding population. Risks that could result in a negative impact to on-site workers include, but are not limited to:

- Vehicle traffic
- Trips, slips, and falls
- Drowning (overwater and nearshore construction)
- Burns associated with welding or other hot equipment
- Blunt trauma associated with loose equipment impacts
- Overhead hazards, including cranes, excavators, and other equipment that has the potential to fall
- Exposure to spills or releases of hazardous materials used during construction (e.g., hot asphalt, fuel, oil, etc.)
- Encountering previously undiscovered contaminated soil or groundwater during excavations or other ground disturbing activities
- Construction risks/potential impacts to the environment related to hazardous materials releases

Hazardous materials would be used and stored on site during construction and may include fuel for heavy equipment and generators, hydraulic fluids, paints, and solvents. Releases on the upland portion of the site could expose workers, plants, animals, adjacent wetland resources, soil, and groundwater to hazardous materials.

Hazardous material spills into adjacent surface waters or onto the nearshore portion of the project site could contaminate Columbia River water and/or underlying groundwater. A release could expose plants, animals, aquatic habitats, shorelines, and people to contamination. The extent of the impacts from a release into surface water at the site would depend upon factors including the type and quantity of the spilled material, location of the release, physical and biological features of the affected environment, and the sensitivity of various species to the hazardous material.

Construction would include ground improvement, site grading for development and building activities typical to an industrial facility. These activities could result in temporary, localized increases in particulate matter, such as dust in the air.

Construction would require the use of heavy trucks, heavy equipment, and a range of smaller equipment, such as generators, pumps, and compressors. Emissions from diesel equipment could reduce ambient air quality, resulting in potential health risks.

Construction of the facility would include some activities such as asphalt paving that would generate odors. These odors may be perceptible for a short period during such activities. If oil-based paints were applied to structures or equipment at the site, paint odors may be perceptible nearby. These impacts are anticipated to be slight and of short duration within the area of the odor source. Construction contractor(s) would be required to comply with Southwest Clean Air Agency regulations, to use recognized best management practices (BMPs) to reduce such odors to a reasonable minimum.

Compliance with the applicable regulations, implementation of BMPs, and a spill prevention, control, and countermeasures plan (SPCCP) would avoid and minimize the potential for significant adverse impacts due to spills during construction activities. See section 8.7.1 for a discussion of upland and in-water spill safeguards, prevention measures, and response protocol.

The proposed project would not have significant adverse impacts during construction.

8.4.3 Operational Impacts

This section summarizes the potential environmental health and safety operational impacts from the operation of the proposed facility. The Health and Safety Aspects and QRA reports were used as resources in this evaluation. See **Appendix G** for additional detailed information included in these reports.

8.4.3.1 Methanol Fire, Explosion, and Overpressure

Methanol is classified as a flammable liquid that could result in fires. The potential methanol fire impacts include pool fires, jet fires and vapor cloud explosions. A spill of methanol forming a liquid pool may cause vapor generation at or below ambient temperatures. These vapors may result in a flammable concentration. If ignited, the vapors could flash back resulting in a pool fire or flash fire. A flash fire is the combustion of a gas/air mixture that produces relatively short-term thermal hazards with a subsonic shock wave.

If the flammable vapors are confined, the ignition could cause a vapor cloud explosion resulting in an overpressure hazard. The QRA did not develop fireball scenarios because the methanol storage tanks are all designed for atmospheric conditions (i.e., methanol will not be stored in pressurized tanks). If a tank failure were to occur, the result would be a large pool fire, not a fireball. A vapor cloud explosion in the methanol production area therefore was modeled as the worst-case incident at the proposed facility.

8.4.3.2 Large-Scale Emergency Incident Impacts

The QRA quantified the potential risk to the public and workers from a large-scale emergency incident such as a methanol release, fire or explosion. Accident release scenarios defined for the QRA were developed through an initial HAZID workshop (see section 8.3.2 QRA for a description of the workshop.)

The QRA developed the likelihood of potential impacts using a risk model. The risk model includes specific site information for the proposed methanol facility, including weather conditions, ignition sources, obstructed regions, on-site building construction and occupancy,

and off-site populations in close proximity to the proposed facility, as discussed in section 8.3.3.

Based on the risk model for the proposed project the potential risk and potential impacts were developed for individuals and groups of people, as follows:

For a single individual, the QRA concludes that the risk of one fatality in 100,000 years is maintained within the project site and that there is no measurable risk of fatalities outside the boundaries of the proposed facility. Therefore, under the HSE criteria, the individual risk is within the broadly acceptable (or negligible) risk level for public impacts. This conclusion applies to an individual present at any point or combination of points outside the facility boundary over an extended period of years.

The risk to people on site was calculated to be:

- 1 fatality in 100,000 years for people located in and around the methanol production lines, the shift tanks, and methanol pump pad; and
- 1 fatality in one million years in the bulk product storage area, periphery of the methanol production lines and pump pad and along the product piping between the bulk storage tanks and marine terminal.

This project risk level is lower than fatal injury rates than many other common industries such as logging, fishing, forestry, and structural workers. See the Worker Injury section below for statistics on worker injury and illness for all types of chemical manufacturers.

The QRA also calculated a broader societal risk, or risk to groups of people, that takes into account the number of individuals who may be present outside but near the facility boundaries at any given time and the duration of their presence. The evaluation of societal risks predicted that there is no measurable societal risk of offsite fatalities from operation of the proposed facility.

The QRA modeling of the worst-case scenario also indicated that an explosion at the proposed methanol facility would not result in deformation or collapse of any offsite buildings and individuals offsite would be protected from significant injury.

Worker Injury

Impacts to workers include injury due to accidents associated with day-to-day activities and accidents that are specific to operation of the proposed project. The risk of injury is relatively low for chemical manufacturing and water transportation in the United States and the proposed project is not expected to result in significant adverse impacts to on-site workers as discussed below.

The U.S. Bureau of Labor and Industries (BLS 2015) reports the following statistics for worker injuries or illness for all chemical manufacturers, of which methanol manufacturing is a subset, and for water transportation.

- Chemical manufacturing (North American Industry Classification System [NAICS] 325): The rate of injury and illness cases per 100 full-time workers ranged from 2.0 to 2.4 between 2011 and 2013 (the most recent year reported).

- Water Transportation (NAICS 483): The rate of injury and illness cases per 100 full-time workers ranged from 2.0 to 2.5 between 2011 and 2013 (the most recent year reported).
- Support Activities for Transportation (NAICS 488, includes ports as a subset): The rate of injury and illness cases per 100 full-time workers ranged from 3.6 to 3.7 between 2011 and 2013 (the most recent year reported).
- The American Chemistry Council tracks occupational incidence rates specific to chemistry businesses (ACC 2015). Their data includes the following:
  - The rate of recordable occupational injuries in the chemistry sector ranged from 2.0 (2013) to 5.5 (1995) per 100 employees between 1995 and 2013. This rate of injury is less than that recorded from the retail, agriculture, food store, and general merchandising business sectors for the years 2009 through 2013.
  - Total process safety incidents ranged from 225 to 281 reported incidents between 2008 and 2014 and resulted in 29 to 52 injuries to on-site personnel. One off-site injury was recorded in both 2008 and 2013.
  - The total number of reportable incidences associated with the transportation of hazardous materials ranged from 2,353 (1995) to 730 (2014) with the majority of the incidences reported as negligible with no associated injuries. The American Chemistry Council states that there are close to one million shipments of hazardous materials daily in the United States.
  - It is anticipated the worker injuries associated with vessels would be minimal. More than 20,000 tanker vessel called at U.S. ports in 2010 and 2011 (U.S. Department of Transportation Maritime Administration, 2013). The USCG tracks vessel-related injuries and reported between 15 and 28 injuries related to "tankship" vessels each year from 2010 to 2014, with the number of injuries decreasing over the years (USCG 2015).
- The Pacific Maritime Association (PMA) 2014 annual report (PMA, 2014) concluded that there were no fatalities recorded at West Coast seaports in 2014 and the lost-time injuries reported in 2014 had decreased by nearly 50 percent (Port of Oakland 2015).

Based on the individual and societal risk analysis conducted and the statistics stated above, the proposed project would not have a significant risk of injury to workers during operation.

8.4.3.3 In-water Accidental Release/Spill Impacts

The risks and impacts to human health and safety associated with loading methanol onto ships and transport would include potential incidents that could result in spills of methanol into the Columbia River.

The transport of chemicals in bulk is regulated by the International Convention for the Safety of Life at Sea and the International Convention for the Prevention of Pollution from Ships, as modified by the protocol of 1978 (MARPOL), as well as the regulations summarized in section 8.2. Methanol is categorized as MARPOL Annex II, Category Y; MARPOL Annex II are the regulations for the control of pollution by noxious liquid substances in bulk and Category Y is defined as a "noxious liquid substance, which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and, therefore, justify a limitation of the quality and quantity of the discharge into the marine environment" (International Maritime Organization [IMO] 2013).

The ships or vessels used to transport methanol would be double-hulled with segmented compartments for storing methanol during transport. The segmented compartments reduce the probability of a complete loss of vessel contents to a low potential. The methanol transport vessels would hold approximately 14 million gallons of methanol when fully loaded. Each portion of the segmented holds in these vessels would hold less than 3 million gallons of methanol when fully loaded.

8.4.3.4 Vessel Traffic, Collision, and Spill Impacts

Vessel incidents can occur from allisions (a moving vessel striking a stationary object, including another vessel), collisions (two moving vessels colliding), or groundings (moving vessel striking the bottom).Vessel incidents resulting in the accidental spills and releases of methanol are a risk from the proposed project along the Columbia River to its mouth and into the open ocean. The proposed project would not involve the transport of any chemicals via ship other than methanol except for the fuel that operates the ship.

Vessel Traffic

The proposed project would result in approximately 36 to 72 additional ship transits per year (depending on vessel size). The Columbia River accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel calls in 2014 and historically has accommodated much higher numbers according to vessel entry and transit data (Ecology 2015b). This increase in vessel traffic for the proposed project is minor and would be within historical trends.

Vessel Collisions

There is a risk of spills of onboard fuel used to operate vessels, either during fueling or accidents (e.g., collisions, allisions, groundings). There were 119 spill events of 25 gallons or more and 1,035 near-miss vessel incidents that could have resulted in spills between 1995 and 2008 according to a study completed for Ecology (ERC 2009). Spills from cargo vessels represented 30 spill events during this timeframe.

Environmental Research Consulting (ERC) evaluated cargo vessel spill risk relative to all spills from all methods of fuel/oil transport within Washington between 1995 and 2008. Based on historical records for Columbia River spills between 1995 and 2008, the ERC study concluded that there is a moderate relative risk of cargo vessel-related fuel/oil spills in the west portion of the Columbia River. However, the proposed project would not significantly increase the existing risk of fuel spills into surface waters because the vessel traffic associated with the project represents a minor increase to existing traffic, as discussed above.

The risk of a spill event associated with a project-related vessel in transit is considered to be low based on historical data discussed below regarding vessel spills on the Columbia River for the type of vessels that would be used for the proposed project. Although the data addresses oil spills, it is assumed to represent the potential risk for spills from vessels carrying other liquids, such as methanol. Historical information considered for this evaluation indicates:

- Ecology identifies five spills with a volume of oil greater than 10,000 gallons on the Columbia River and near its mouth between 1971 and 1996.
- The largest spill on the Columbia River was the SS Mobil Oil tanker spill in 1984 (Ecology 1997 rev. 2007; Ecology 2015a). This spill resulted when the loaded 618-foot tanker lost

steering because of an equipment malfunction and grounded on the riverbank approximately 1 mile upstream from Saint Helens, Oregon; approximately 200,000 gallons of oil were spilled.

- From 1995 to 2008, tanker vessels spilled a total of 13,709 gallons (326 barrels) of oil in the waters of Washington in 14 incidents (ERC 2009)

In-Water Spill Impacts

The fate and transport of methanol spilled to surface water and the potential toxic effects of such spills is presented in *Fate of Methanol Spills into Rivers of Varying Geometry* (Jamali, 2002). Jamali (et al. 2002) developed four conceptual models for waterways (small, medium, large, and very large rivers) to calculate the fate of a methanol spill to a river based on characteristics of discharge, width, depth, velocity, and length. The models included spill scenarios from piping during ship loading and from failure of a ship compartment due to internal or external causes. The Columbia River would fall between the large and very large river categories Jamali modeled. The results from Jamali's large river model are assumed to be conservative estimates for the Columbia River.

The Jamali study used three concentrations of methanol in drinking water as a benchmark for human health impacts. The benchmark concentrations were:

- One-day Drinking Water Health Advisory Limit (DWHAL) for methanol of 200 mg/l for children and 350 mg/l for adults.
- Ten-day (DWHAL) for methanol of 100 mg/l for children and 350 mg/l for adults.
- Lifetime (DWHAL) for methanol concentration of 3.5 mg/l as the lifetime DWHAL.

The Jamali model used methanol concentrations of 200 mg/L as a drinking water advisory limit and modeled the length a spill of methanol could travel downstream before diluting to this level.[2] Modeled spill sizes ranged from 1,000 (e.g., holding tank) to 30,000 gallons (fully loaded rail car). Jamali modeled a 300,000-gallon methanol spill on a very large river was as a worst-case scenario. Jamali based this model scenario on an assumption of a large vessel transporting methanol withstanding a puncture resulting in a large magnitude (300,000-gallon) release or spill. The potential of a spill of this magnitude is extremely low but was used by Jamali for comparison purposes.[3] The study assumed this and all of the releases shown in Table 8-4 take place at riverbank on the water surface. The models show that the size of the river and the amount of methanol spilled influence the distance and time it takes to degrade to concentrations that would not pose an adverse impact to drinking water supplies. The study found that the larger the river the greater the reduction in downstream concentrations of methanol. The worst-case scenario – 300,000 gallons on a very large river – would travel slightly more than 2 miles (3.6 kilometers) downstream and require 36 minutes before degrading to less than 200 mg/L. From the analysis, the study concluded the human health and

[2] This limit is based on research discussed in "Methanol: drinking water health advisory, Office of Drinking Water, U.S. Environmental Protection Agency" by W.L. Marcus. The article also includes 1- and 10-day limits for adults and children, as well as a lifetime concentration. The EPA does not publish recommended limits for methanol in water supplies (EPA 2012). Methanol is included on the Draft Chemical Contaminant List, for which there is no published limit (EPA 2015). Therefore, this analysis uses the 1-day concentration limit of 200 mg/L for children as surrogate for evaluating impacts to downstream water supplies.

[3] Jamali performed his study in 2002 and referred to a generic shipping vessel typical at the time. The proposed project expects to use ships with segregated tanks for which the largest potential spill would be less than 300,000 gallons.

environmental risks associated with the accidental release of methanol into a river appears to be low. The short-lived duration of the methanol release is not only due to the speed of dilution but also to the rapid rate of methanol biodegradation (Jamali 2002). The results of the Jamali study are summarized in **Table 8-4**.

Table 8-4. Fate of Methanol Resulting from Spills of Various Sizes

River Size	Spill Size			
	Distance in miles (kilometers) and time to degrade to 200 mg/L			
	1,000 Gallons	10,000 Gallons	30,000 Gallons	300,000 Gallons
Large	0.124 mi (0.2 km)/ 0.1 hr.	0.62 mi (1 km)/ 0.2 hr.	1.24 mi (2 km)/ 0.5 hr.	n/a
Very Large	n/a	n/a	n/a	2.24 mi (3.6 km)/ 0.6 hr.

Source: Adapted from Jamali et al.2002

The proposed project worst-case scenario for a release during loading was calculated in the Health and Safety Aspects report (see **Appendix G**) to be 15,000 gallons based on detection and isolation within 30 minutes of the start of a release. This volume is in between the medium (10,000 gallons) and large (30,000 gallons) release size ranges from the Jamali study. By comparison, the Jamali model data in Table 8-4 indicates by inference that 15,000 gallons would dissipate to concentrations below the 200 mg/L drinking water benchmark between 0.2 to 0.5 hour and would travel 0.62 to 1.24 miles downriver.

Other computer modeling simulated a release of 10,000 tons (approximately 3,300,000 gallons) of methanol in the open ocean (Malcom Pirnie, Inc. 1999). The results indicate that the concentration of methanol would be reduced to a concentration of 0.36 percent within an hour of the event. Modeling at a coastal pier simulated a release of 10,000 liters per hour, which was reduced to a concentration of less than 1 percent within 2 hours and 0.13 percent within 3 hours of stopping the release (Malcom Pirnie, Inc. 1999).

The assumed worst-case scenario is an accident with a spill or release from a vessel including a breach into one of the segmented product compartments containing methanol. This partial load loss would likely be less than 3.0 million gallons, so the volume used for the open-sea model (3.3 million gallons) is comparable. In a flowing body of water like the Columbia River, the dilution rate would be similarly rapid and the biodegradation rate similar to that shown for the open-sea release because of the constant flow and mixing increased water currents.

Additional potential impacts associated with these release scenarios applied to the proposed project are assessed in Resources Impacts below and discussed in detail in additional detail in **Appendix G**, Safety and Health Aspects and QRA reports.

Based on the above analysis and the Jamali study, a potential methanol release into the Columbia River from ship loading or an accident involving a vessel in transport would have minor to no human health impact due to the very large size of the river and the short-lived duration of methanol in the environment. Complying with regulatory requirements and implementing BMPs and mitigation measures at the facility during vessel loading and transport

as discussed below would reduce the chance of a release occurring and would improve emergency response in the event of a release.

8.4.4 Resource Impacts

The following sections address the potential impacts of a hazardous materials release on the human and natural environment and include the risks identified by the QRA: methanol releases and fires or explosions. Other potential operational impacts were screened out in the QRA because of their low potential of occurrence or low risk of impacts to human health and the environment. Environmental health and safety impacts to soil, groundwater, and recreation are summarized below. Impacts to other resources are discussed in the resource reports as indicated in **Table 8-3**.

8.4.4.1 Upland Spill Impacts

The largest potential source of a spill from the upland portions of the proposed project site would be from a full methanol storage tank, with a volume of approximately 2,275,000 gallons. See section 8.7 Mitigation, Upland Area Spill Prevention and for design features for storage tanks that would avoid or minimize environmental impacts.

Upland methanol releases could potentially occur as a result of damage to the on-site piping systems. These releases would likely be localized and temporary due to safeguards such as leak detection systems, the presence of pavement at the site that would prevent the release from entering soil or groundwater.

Methanol, has a half-life of one to seven days in soil, depending on soil characteristics (e.g., chemical and microbiological characteristics), and is highly soluble in water (Malcolm Pirnie, Inc. 1999). Surface spills of methanol to soil may enter groundwater depending on the size of the spill and depth to groundwater, but would likely dissolve and/or degrade rapidly. Large methanol plumes would not likely form or persist in the subsurface because of the rapid rate methanol disappears in soil and groundwater and its ability to vaporize from dry soils.

A laboratory study (Novak et al. 1985) investigated methanol biodegradation, or its ability to decompose, in three soil sites. The study indicated that methanol contamination in groundwater is unlikely to remain for lengthy periods because of its ability to biodegrade under both aerobic and anaerobic conditions. Biodegradation would eventually destroy the methanol present in the soil and/or groundwater assuming the presence of three factors: (1) indigenous methanol-degrading microbial populations; (2) electron acceptors and nutrients; and (3) adequate pH and temperature levels.

There may be localized areas close to the release source where the methanol concentration would be at a level that it is toxic to the microbiota needed for biodegradation. This situation would be avoided by spill response, and cleanup and is not anticipated to be a potential impact.

Petroleum-based spills (i.e., fuel or oils) are not readily dissolvable and tend to bind to soil particles. Petroleum products or other hazardous materials are not expected to be stored on site in large quantities. Any of these materials would be stored on site in designated areas and close to spill response kits. The implementation of an operational SPCCP would trigger a rapid cleanup response.

The proposed project, would not result in significant adverse impacts to soil or groundwater from accidental spills of methanol or petroleum-based products due to all methanol storage

tanks meeting regulatory requirements, leak detection systems, site paving, the small volume of petroleum based products stored on the site, and methanol's ability to biodegrade and vaporize.

8.4.4.2 Recreation Impacts

The Columbia River is used by recreational boaters and there are numerous parks and recreation facilities located along the river from the project site to the Pacific Ocean. An informal recreation area is located immediately north of the project site. A spill or release on the upland portion of the project site would not likely extend off-site and impact the recreational area due to on-site controls such as containment structures around the storage tanks.

A vessel spill or release during vessel loading and transport could temporarily affect the public's recreational use of the Columbia River or other park and recreation facilities along the river. The impact to recreation use would be temporary and localized based on the characteristics of methanol and the availability of rapid spill response. In the event of a spill, the area affected by the spill would be closed and any human exposure to the spill material minimized.

The proposed project would not result in a significant adverse impact to recreation due to the temporary and localized characteristics of methanol after a release or spill.

8.4.4.3 Fire Protection and Emergency Services

The proposed project would include emergency response capabilities for incidents within the proposed manufacturing facility (NWIW 2015). NWIW met with Cowlitz County Fire District No. 5 on 15 January 2015 to discuss the proposed project and general emergency response protocols. The proposed project response planning reflects the results of that meeting, including the concept that the manufacturing facility operator would be the primary responder to all incidents in the methanol manufacturing facility with Cowlitz County Fire District No. 5 providing support

The proposed project would have trained emergency personnel to respond to plant emergencies, including fires, explosions, and injury. Personnel would be certified in compliance with OHSA standards, Process Safety Management guidelines, and National Fire Protection Association (NFPA) requirements. In addition, emergency responders would maintain training and certification in all required areas. The manufacturing facility operators, Port of Kalama, and Cowlitz County Fire District would participate in emergency response drills at the project site (NWIW 2015).

As described in Chapter 2, Proposed Project and Alternatives, an extensive fire suppression system and on-site fire brigade, made up of staff trained in appropriate firefighting response procedures, would be housed at the proposed project to address fires in the methanol production facility (see **Figures 2-5 and 2-6** in Chapter 2). The brigade would be housed in an on-site fire station, which would also house the emergency response vehicle used by the brigade. The fire station would also house other required supplies and would be used as a secondary command post during an emergency at the proposed project (NWIW 2015).

Other fire protection measures at the proposed project would include an emergency alarm system, a fixed foam fire suppression system designed to meet NFPA 11 standards, a portable foam generator, a 5-million-gallon fire water pond with hydrants and monitors throughout the facility, a deluge system, and fire extinguishers located throughout the facility (NWIW 2015).

The on-site fire brigade would act as the primary responder to a fire in the methanol production facility because it would be equipped and trained to fight this specific type of fire. Cowlitz County Fire District No. 5 would provide assistance. NWIW would conduct emergency response drills with the Cowlitz County Fire District and the Port of Kalama. Cowlitz County Fire District No. 5 would serve as the primary responder to a fire in the proposed project area outside of the methanol production facility (such as in the administrative building) and the on-site fire brigade would provide assistance.

On-site emergency responders would also have the capabilities to respond to non-fire incidents including hazardous materials leaks or spills, injuries, and bomb threats. A summary of response procedures and capabilities at the plant for each type of incident follows:

- Hazardous material leak or spill: The facility would have a hazardous material pre-plan in place to ensure all emergency response equipment is on site. Local and state authorities would be informed if a hazardous material release above reporting thresholds occurs per Washington Administrative Code (WAC), RCW 90.56.
- Injuries: On-site responder would be trained in the use of first aid equipment, including first aid kits, Water-Jel blanket (for burns), 40-minute oxygen kits, backboards, neck braces, and Zephiran solution to address injuries. The on-site incident commander would contact 911 to inform them of the type of injury that needs medical attention. Safety data sheets addressing procedures for treating persons with chemical exposure would be distributed to local hospitals and would accompany injured persons transported by ambulance to the hospital.
- Security threats: All involved employees would be notified of reliable threats and the plant would be evacuated. Local police and fire personnel would be notified (NWIW 2015).

Peace Health St. John's Medical Center is the nearest hospital to the project site and is located approximately 9 miles away in Longview. St. John's has a fully functional emergency department and is a certified Level 3 Trauma Center by the American Trauma Society with 24-hour coverage by emergency medicine physicians and prompt availability of surgeons and anesthesiologists. Ground transport ambulance services to St. Johns are provided by Cowlitz County Fire District No 5. The hospital also has air transport ambulance with a Life Flight helicopter located on the hospital's parking structure. Response times are approximately 9 minutes for ground transport to arrive at the project site from the hospital and 15 to 20 minutes by helicopter. Severely traumatized patients would be transferred from St. John's to Legacy Health Emanuel Hospital in Portland, which is a full-status Level 1 Trauma Center. However, if a severe injury occurred at the plant, a more likely scenario is that the patients would be taken directly to Legacy Emanuel Hospital via Life Flight according to a St. John's Medical Center Emergency Department representative (Peace Health 2015a and Legacy Health 2015).

The Maritime Fire and Safety Association (MFSA), an association of ports and private facilities, would provide fire safety and response, oil spill response and communication coordination for fire and spill incidents occurring on member commercial shipping vessels on the Lower Columbia and Willamette Rivers. MFSA only provides response to participating members and enrolled vessels. Members pay a per-vessel assessment to MFSA that funds equipment, operations, and programs. MFSA strives to provide a comprehensive system that ensures fast, well-coordinated, and effective response to ship fire and spill incidents on the Lower Columbia and Willamette Rivers. The Port of Kalama is an MFSA member and NWIW vessels calling at their marine terminals are expected to be covered by the MFSA for fire and

spill incidents. MFSA provides response as outlined in the Lower Columbia Maritime Fire Safety Plan and the MSFA Vessel Response Plan – Master Oil Spill Contingency Plan for Covered Vessels. Additional information is located at http://www.mfsa.com/mfsa-vessel-response-plan.

The proposed project would introduce up to six shipping vessels per month to the Columbia River (up to 72 per year). This increase would be relatively small compared to the typical historical levels for river traffic. According to vessel entry and transit data, the river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge transits in 2014 (Ecology 2015b). Historically, the Columbia River has supported even higher levels of ship traffic, with a recent peak of 2,269 vessel, tank ship, and barge vessel calls in 1999 (Ecology 2014).Therefore, the vessel traffic associated with the proposed project would not have the potential to result in substantial new demands on the MFSA for fire and spill response. See above discussion related to MFSA for additional information on the association.

In addition to publicly provided services, the proposed project would provide process-specific on-site fire suppression and emergency response capabilities with substantial response coverage in the event of a fire or explosion. These capabilities would reduce the new demands on fire protection and emergency service providers. Therefore, the proposed project would not result in a significant adverse impact to fire protection and emergency service providers.

8.5 Related Actions

Two related actions would be completed in association with the proposed project: substation and associated electrical transmission improvements and Kalama Lateral Project. The risks associated with the construction and operation of the substation are considered to be low and are representative of risks associated with small construction projects and typical substation operation. As a result the substation is not addressed further. The Kalama Lateral Project is discussed below.

8.5.1 Construction: Kalama Lateral Project

Northwest is proposing to construct and operate a 3.1-mile, 24-inch-diameter natural gas (methane) pipeline. The proposed pipeline would connect to an existing 30-inch-diameter mainline and provide methane to the proposed project's facilities. The pipeline would be constructed within a 50-foot-wide permanent pipeline easement. Facilities that are used during testing operations to allow the pipeline to be filled with water without entrapping air would be installed at the connection to the existing pipeline and at the new delivery meter station. The facilities would be located at the proposed project's site within an approximate 150-foot by 200-foot fenced area.

The construction impacts associated with the pipeline project are considered to be similar to the construction impacts of the proposed project. The pipeline project is discussed in detail in Kalama Lateral Project EA (FERC, July 2015). Section 7.1, Safety Standards of the EA, discusses the minimum safety standards required for the project to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601.

Construction impacts would be mitigated by implementing BMPs and standard construction mitigation measures summarized in section 8.8.1.

8.5.2 Operation: Kalama Lateral Project

The impacts associated with transporting methane through pipelines are historically related to releases resulting from external forces that are not associated with the normal operations of the pipeline, line breaks or leaks due to material defects, or corrosion. These external forces include seismic forces, damage to the pipeline from third-party digging near the pipeline, geologic hazards, hydraulic hazards, and other natural occurrences. These impacts can be minimized with proper signage, monitoring programs, and public officials' education programs for landowners, the public, contractors, and emergency responders. A One-Call notification to utilities would be required prior to any excavations within the pipeline vicinity. Any digging, blading, grading, or similar activity that results in the removal of ground cover of the pipeline are not permitted without express consent and on-site observation/direction from Northwest's field operations personnel (Williams 2014).

The restrictions prohibiting permanent structures in the pipeline right-of-way and educational measures would minimize the impacts of potential methane releases from the proposed pipeline as a result digging or excavation activities. Northwest has emergency response plans in place for its entire system and would coordinate potential needs with emergency responders. Northwest would also comply with all safety standards set forth by the PHMSA, the federal safety authority for ensuring the safe, reliable, and an environmentally sound operation of the nation's pipeline transportation system (Williams 2014).

The pipeline project is discussed in detail in the Kalama Lateral Project EA (FERC 2015). Section 7.1 Safety Standards discusses the minimum safety standards required for the project to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601. The EA concludes that available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation, the risk is low for an incident at any given location along the pipeline and the operation of the gas line would represent only a slight increase in risk to the nearby public (FERC 2015).

8.6 No-Action Alternative

The proposed project is not constructed on the project site under the No-Action Alternative. However, the Port of Kalama would pursue future industrial or marine terminal development at this site, consistent with the Port's *Comprehensive Scheme for Harbor Improvements.* Until such improvements take place the proposed project site would remain a dredged material disposal site with the same exiting conditions and impacts as currently found on the site. There are no new impacts to environmental health and safety anticipated under the No-Action Alternative.

8.7 Mitigation Measures

8.7.1 Project Mitigation

The design features and BMPs the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits would be assumed to be part of the Project and have been considered in assessing the environmental impacts to environmental health and safety.

It is also important to note, if a large scale release of methanol to surface water were to occur, the potential exists for temporary adverse impacts to surface water quality and plants and animals near the source of the spill. Similarly, a large scale fire or explosion could result in adverse impacts to people within the facility boundaries. For these reasons, the project design

has been refined to include mitigation measures to further reduce these risks. The following section discusses the measures that would be used during construction and operation of the proposed project to avoid, minimize and mitigate impacts associated with environmental health and safety.

Construction

The contractor(s) for the proposed project would follow all required state and federal safety regulations (e.g., the Washington Industrial Safety and Health Act of 1973 [WISHA] and Occupational Safety and Health Administration [OSHA]) to ensure worker safety and would develop a SPCCP to protect human health and the environment from accidental spills and releases of toxic substances. The plan would include, but not be limited to, such items as the following:

- Notification to applicable regulatory state and federal agencies as needed when working with hazardous materials.
- Management, storage and disposal of hazardous materials (such as paint, solvents, asphalt, landscaping chemicals) and/or petroleum products.
- Safety precautions to control airborne particulates during excavation.
- Soil management to minimize adverse impacts to construction workers and or the environment during the excavation of potentially contaminated soils.
- Work stoppage due to potential exposure of construction workers to hazardous materials.

Chapters 2, 3, 5, and 6 provide specific mitigation measures for environmental impacts.

General Incident Response

NWIW would have full emergency response capabilities to respond to all incidents within the plant site or at the marine terminal. The MFSA and Cowlitz County would have primary responsibility if an event involves a ship, but would be supported by NWIW. Details of incident response are presented in **Appendix G** and are summarized here.

The plant operations and risk management system would meet or exceed local, state and federal codes and regulations and the insurance underwriter requirements. A process hazard analysis (PHA) would be conducted during detailed design and as part of the process safety management (PSM) guidelines regulated by WISHA and OSHA.

The project proponent would prepare an emergency response plan specific to the facility and operations and provide the plan to local and state agencies for review and approval. Cowlitz County Fire District No. 5 has agreed that NWIW would manage the response to any incident with the Fire District providing support.

Spill Prevention and Response

The facility would be required to prepare and maintain a SPCCP. The SPCCP would guide response procedures in the event of a spill. Response procedures would likely involve containing the spill and allowing it to degrade or evaporate naturally. Pumps may be used to a release pools in an impervious surface location. The facility would also maintain an Integrated Contingency Plan or a HAZWOPER-compliant spill response plan.

Specific details about spill prevention and response at the facility and during vessel loading are discussed below.

Representative Safeguards

The proposed project would be designed and constructed with comprehensive safeguards to prevent accidental spills, releases and leaks, detect releases, and contain and minimize the impacts of spills and releases should they occur. A preliminary list of safeguards, including key engineering and administrative controls, has been identified for the proposed project. These safeguards listed in **Table 8-5** includes those identified in **Appendix G**, Health and Safety Aspects (AcuTech 2016).

Table 8-5. Proposed Project Safeguards

Safeguard	Type	Purpose
Pipelines, Vessels, and Equipment Designed to Current Codes and Standards	Engineering	Ensures adequate vessel/ equipment strength for intended service.
Preventive Maintenance Program	Engineering Administrative PSM element	Ensures ongoing integrity of equipment and training/ certification of maintenance personnel.
Corrosion Control Program	Engineering Administrative	Ensures equipment is sufficiently robust to minimize releases due to corrosion.
Process Plant Control Systems (Monitoring, Alarm and Communications)	Engineering	Ensures ongoing control of regular plant operations.
Process Hazard Analyses	Administrative PSM element	Reviews design and operating procedures in detail to identify and address deviations from normal operation.
Management of Change	Administrative PSM element	Ensures any changes to equipment, procedures or personnel are adequately reviewed and potential impacts on operation are addressed prior to change implementation.
Operating Procedures	Administrative PSM element	Ensures plant operations are conducted per approved and effective processes.
Training	Administrative PSM element	Ensures personnel are capable of performing all regular and emergency tasks.
Isolatable Inventories	Engineering	Ensures hazardous material equipment contains means to quickly stop leaks/releases.
Relief, Blowdown, and Flare Systems	Engineering	Ensures high pressure events can be safety controlled by safe disposal of released materials. Ensures startup/shutdown events do not result in releases of hazardous materials to the atmosphere.

Safeguard	Type	Purpose
Ignition Source Control Program	Engineering Administrative	Ensures installed electrical equipment is designed to minimize ignition sources. Ensures sources of ignition (vehicles, hot work, etc.) are controlled in areas where hazardous materials are located.
Fire and Gas Detection Systems	Engineering	Ensures incipient fires or hazardous material releases can be detected quickly to allow automatic response (i.e., isolation valves) or emergency response.
Equipment Spacing and Layout	Engineering	Ensures equipment layout minimizes the risk of domino or knock-on effects in the event of fire/explosion.
Fire Protection System	Engineering	Ensures firewater/foam can be delivered to suppress/extinguish fires.
Emergency Response Plan	Administrative PSM element	Ensures that plant emergency response activities are managed. Addresses responder training, procedures, drills, emergency response equipment, etc.
Safety Instrumented Systems (Interlocks and Emergency Shutdown)	Engineering	Identifies deviations from normal via automated systems independent of routine plant controls and then returns system to a safe state by means of process interlocks.
Fixed Foam Systems within Dikes	Engineering	Ensures releases of methanol to diked areas can be suppressed by covering the spill with a fire suppression foam layer.
Fixed-Roof Methanol Tanks, Internal Floating Roofs	Engineering	Ensures tank integrity per national standards for tank construction
Closed-Circuit TV System	Engineering Administrative	Provides operations and emergency response with overview of site activities. Fixed cameras for specific locations. Also provides site security.
Earthquake Valves	Engineering	Designed to interrupt flow of hazardous material in the event of: (a) an earthquake of sufficient magnitude, or (b) low pressure due to a line leak or rupture.
NW Pipeline Remotely Actuated Shutdown Valve at Takeoff Point to Plant Lateral; Activation from NW Pipeline Gas Control	Engineering	Provides ability to interrupt flow of natural gas in the event of a line leak/rupture (indicated by low line pressure) or if manual activation is required.
Barricades around Tanks and Equipment	Passive	Minimizes the likelihood of vehicles impacting tanks/equipment causing releases of hazardous material.
Drainage and Berms To Control Releases	Passive	Provides means to control releases and route to a contained area.

Additional Safeguards

A number of additional safety and environmental protection systems would be included in the facility design for the proposed project. They are as follows:

The proposed project design would feature fixed gas detection systems to warn of a release of natural gas or syngas (depending upon the production area) and to automatically take the process to a safe state by closing automatic isolation valves. Pressure monitors within the pipeline itself would be able to sense potential loss of containment and shut the isolation valves automatically.

Firefighting systems in the proposed project would be designed to address a potential methanol fire. Methanol does not present any unique hazards from a firefighting perspective, given its characteristics. Fixed analyzers throughout the processing and storage areas would continuously monitor for the presence of organic vapors and provide warnings to personnel and take automatic actions if concentrations approach flammability limits.

The proposed project design would include fixed ammonia monitors in the vicinity of the aqueous ammonia system to provide personnel warning of ammonia leaks.

Upland Area Spill Prevention and Response

The largest potential upland source of a spill would be from a full storage tank, with a volume of approximately 2.275 million gallons. Secondary containment berms around storage tanks have been designed to capture 110 percent of the tank contents plus precipitation from a 24-hour, 100-year event. Berm construction includes an impervious liner that would prevent infiltration. Spilled product would gravity drain to a sump where it would be pumped through a treatment system and reintroduced into the methanol production process.

The risk of release from storage and use of hazardous materials on site during operations would be minimized through implementation of a project-specific response plan and hazardous materials response training for workers on site in addition to the safety in addition to safety infrastructure designed as part of the facility. Spill kits would be stationed throughout the site so that trained workers could respond rapidly to releases that may occur.

Releases that may occur on the upland portion of the property would be contained and cleaned up as soon as they are observed. The type of material and duration of the release may impact the amount of cleanup required in response to a spill. Soil impacted by a release, if any, would need to be evaluated for treatment or removal based on Model Toxic Control Act requirements. Rapid spill response on the upland portion of the site would minimize related impacts to the groundwater and adjacent surface waters of the Columbia River.

In-Water Spill Prevention and Response

The MFSA is an association of ports and private facilities along the Lower Columbia and Willamette Rivers that provides fire safety, oil spill response, and communication coordination for fire and spill incidents involving commercial vessels along the two rivers from the Portland/Vancouver area to Astoria. The MFSA would provide fire safety and oil spill response for incidents for participating members and enrolled commercial vessels. The Port of Kalama is an MFSA member and NWIW vessels calling at their marine terminals are covered by the MFSA for fire and spill incidents. Additional information is located at http://www.mfsa.com/mfsa-vessel-response-plan.

The marine terminal infrastructure includes shut-off valves on product lines and stormwater systems. Product lines would be shut off to prevent additional product from spilling in the event of a spill during loading. Stormwater lines would be shut off and stormwater would be redirected to a return line to the methanol plant. Contaminated water on the dock would be pumped to the plant for treatment and reuse in the methanol production process.

Accidental Release, Fire and Explosion Response

The federal Department of Transportation (DOT) has exclusive authority for enforcing federal safety standards for natural gas pipelines. DOT prescribes the minimum standards for operating and maintaining natural gas pipeline facilities including requiring each pipeline operator to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. According to the FERC, "the DOT requires pipeline operators to establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance." Prior to beginning pipeline operations, Northwest would provide training to local emergency service personnel (FERC 2015).

The proposed pipeline and aboveground facilities must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are as follows:

- Class 1 – Location with 10 or fewer buildings intended for human occupancy.
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

The proposed pipeline would be a Class 1 designation for its entire length based on the population density in the vicinity. However, Northwest has committed to building the pipeline to meet more stringent Class 3 standards in several categories including depth of cover over the pipeline (at least 36 inches in all areas), pipe wall thickness (0.375 inch), 100 percent weld testing and the use of an automated shut-off valve at the proposed pipeline's starting point.

Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;

- Establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- Emergency system shutdown and safe restoration of service;
- Making personnel, equipment, tools, and materials available at the scene of an emergency; and
- Protecting people first and then property, and making them safe from actual or potential hazards.

The DOT also requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Northwest would provide the appropriate training to local emergency service personnel before the proposed pipeline is placed in service (FERC 2015).

Flare System

A flare system would be provided as part of the safety systems to dispose of flammable gases and vapors that are released from the methanol. See **Appendix G**, Safety and Health Aspects (AcuTech 2016), for more detailed information on the methanol production process. The flare system would be used during a process interruption or an emergency.

Fire Suppression

The proposed project would include an emergency alarm system and a comprehensive fire suppression system with features discussed in Chapter 2 and **Appendix G** that would provide 100 percent coverage to the plant. The features would include a fixed foam system, portable foam generators, and a 5.0-million-gallon water supply stored in the fire water pond located at the northwest end of the plant. The system also would include two fire water pumps, one driven by a diesel engine and the second by an electric motor, a deluge system, and fire extinguishers throughout the facility.

The following measures would be implemented to avoid and reduce potential impacts to public services and utilities:

- To address risks related to a chemical release or fire, NWIW would conduct a PHA to identify the various incidents that could occur and to help design the on-site systems to prevent spills or fires, to warn of operating conditions that could lead to an incident, or to identify if an incident has occurred.
- To respond to incidents within the project site, including fire, explosion, injuries, bomb threats, security emergencies, and hazardous materials leaks or spills, the following measures would be implemented.
  - NWIW would prepare a written emergency response plan, which would be reviewed and approved by local and state agencies before the first production of methanol.
  - NWIW would have all necessary emergency equipment on site, including an on-site fire station, an emergency alarm system, an emergency response vehicle, and a

comprehensive fire suppression system including a fixed foam system, portable foam generators, fire water system, deluge system, and fire extinguishers.

- NWIW would provide emergency response training and certification to emergency responders at the proposed facility in compliance with OSHA, PSM, and NFPA requirements. In addition, emergency responders would maintain training and certification in first aid, emergency alarm system, evacuation and vapor cloud monitoring, respiratory emergencies, rescue from electrical contact, self-contained breathing apparatus, bunker gear inspection/cleaning, fire water system, fire hose handling, vapor suppression system, confined space rescue, hazmat, fire extinguisher, and incident command.
- NWIW, Port of Kalama, and Cowlitz County would conduct emergency response drills at the proposed facility.

NWIW would secure the project site with a perimeter fence and entry gate with security guards and would employ a private security contractor. Employees would be required to obtain the transportation worker identification credential. In addition, there would be security cameras throughout the facility.

Training

Emergency responders would be stationed on site during all operating hours, and the facility would include an on-site fire house and fire brigade. The plant emergency response team would be trained and certified in compliance with OSHA, WISHA, PSM, and NFPA requirements and would be required to pass a medical examination and written and hands-on testing and maintain appropriate certifications. Selected management and supervisory staff would be trained at a facility certified by the Federal Emergency Management Agency.

Emergency Response Mandates and Agreements

The National Contingency Plan (NCP) is the federally mandated comprehensive system for responding to oil spills and releases of hazardous substances. The NCP was designed to develop a national response capability and to promote coordination among the hierarchy of responders and contingency plans. Area committees have been established for each area of the United States (40 CFR Part 300). The NCP establishes the National Response Team and 13 Regional Response Teams; they are responsible for national and regional planning and preparedness activities before a response action.

The Region 10 Regional Response Team and the Northwest Area Committee are responsible for implementing the NCP in the Northwest area. Their mission is to protect public health and safety and the environment by ensuring coordinated, efficient, and effective support of the federal, state, tribal, local, and international responses to significant oil and hazardous substance incidents within the Pacific Northwest Region as mandated by the NCP. Together, these agencies have published the Northwest Area Contingency Plan (NWACP). The purpose of the NWACP is:

- To provide for orderly and effective implementation of response actions to protect the people, natural resources, and property of the coastal and inland zones of the Northwest area, including the states of Washington, Oregon, and Idaho, from the impacts of a discharge or substantial threat of discharge of oil or a release or substantial threat of a release of a hazardous substance from inland and marine sources.

- To promote the coordination of and describe the strategy for a unified and coordinated federal, state, tribal, local, potential responsible party, response contractor, response cooperative, and community response to a discharge or substantial threat of discharge of oil or a release or substantial threat of a release of a hazardous substance from inland and marine sources.
- To be consistent with the NCP and to be adopted as the Regional Contingency Plan and Area Contingency Plan for the Northwest.
- To provide guidance to all facility and vessel response plan reviewers and Plan holders to ensure consistency with the NWACP.

The NWACP has been adopted as Washington's oil spill and hazardous substance release response per the requirements of RCW 90.56.060. This plan applies to the activities of all state and local agencies involved in managing oil and hazardous substance spills where federal, state, and local agencies respond to a spill or potential spill of oil or hazardous substances (NWACP 2015).

Federal requirements mandate all spills of hazardous substances into navigable waters, as defined by the Clean Water Act, must be reported to the National Response Center. The National Response Center would than then notify USCG or EPA offices as appropriate. State requirements mandate all spills of hazardous materials to notify the nearest Ecology regional office. The USCG Sector Columbia must be notified for spills occurring in the coastal navigable waters of the Columbia River.

Cooperative Agreements

Ecology and Oregon Department of Environmental Quality have entered into an interagency agreement (Ecology 2010) in a cooperative effort to protect the water and resources of the Columbia River. Both agencies would provide personnel and equipment to implement spill prevention, preparedness, and response efforts on the Columbia River. These efforts include a cooperative unified command for incident response; joint investigation of maritime incidents; and coordinated drill schedules and planning efforts.

Industry Partnerships

The MFSA and the Clean Rivers Cooperative (CRC) provide emergency spill response services on the Lower Columbia River. The proposed facility would become a member of both the MFSA and CRC.

Marine Fire and Safety Association

The MFSA has tasked themselves with developing a system to ensure an adequate, timely, and well-coordinated response to ship fires along the Lower Columbia River shipping channel. MFSA's shipboard fire program is directed by the Fire Protection Agencies Advisory Council, made up of 12 participating public fire agencies.

The Lower Columbia Marine Fire Safety Plan, originally developed in 1984 and revised in 1991, provides for building a marine fire response capability along the Columbia and Willamette rivers from the Portland/Vancouver harbor area to Astoria, near the mouth of the river, and extending 3 miles into the Pacific Ocean. Members pay a per-vessel assessment to MFSA that funds the equipment and operations of the program. The purpose of the plan is to set forth a comprehensive system that ensures fast, well-coordinated, and effective response to ship fire incidents in the Lower Columbia region.

Clean Rivers Cooperative

CRC is a nonprofit oil spill response organization that was created to provide mutual aid to companies with a vested interest in maintaining an efficient and rapid response to marine spills (CRC 2015). CRC has become the region's foremost marine spill solution, with over $3 million of equipment dedicated to members and their operations in Oregon and Washington. The CRC is the preferred contractor for spill response through the MFSA, and is equipped to respond to spills between River Mile 0 and the Glen Jackson Bridge in Portland, Oregon.

Cleanup Actions

Fuel or oil releases are expected to be managed at the site of the release through rapid spill response, containment, and cleanup enabled by implementing the facility's SPCCP and by ready access to spill kits, cleanup training, and response vessels.

The high rate of methanol biodegradation makes natural cleanup processes an inexpensive and effective strategy to remediate soil and/or water impacted by residual methanol. Natural cleanup times for methanol releases would be faster than time required for active cleanup.

Surface Water Cleanup

Surface water cleanup actions would vary depending upon the type of hazardous material that is spilled into the aquatic environment.

A release of fuel or oil would be contained with absorbent booms deployed from the vessel or terminal, depending on location, as soon as it is discovered. Absorbent material and or oil skimmers would be used to remove as much fuel or oil as possible from the water surface.

The source of a methanol release or spill would be identified and contained as soon as the release is discovered. Methanol spilled into surface water would be difficult to contain due to its solubility. Cleanup of methanol could include pumping the methanol water mixture from the area of highest concentration, near the release source, into a tank pending treatment. Natural cleanup (i.e., mixing and biodegradation) times are likely to be faster than active cleanup times for methanol releases due to methanol's characteristics.

Design

Johnson Matthey, the project design firm, has developed a list of codes and standards that would be used during the detailed design phase of the project. These codes and standards are developed by internationally recognized authorities and would be used to ensure the facility meets environmental health and safety standards. See **Appendix G**, Safety and Health Aspects report, for the list.

Process Safety Management

The processes at the proposed project facility that produces and handles methanol would be designed, operated, maintained, and monitored under the principles of Process Safety Management (PSM). The requirements for PSM in Washington are found at WAC 296-67 Process Safety Management of Highly Hazardous Chemicals. Highlights of the protective measures include, but are not limited to, the following:

- Employee participation in PSM;
- Process safety information maintained up-to-date;

- PHA to determine where hazards may occur and whether controls detailed in the design are sufficient to prevent and/or mitigate these hazards;
- Operating procedures for all reasonably foreseeable situations including startup, shutdown and operation during normal and emergency conditions;
- Training for all affected personnel – initial and ongoing;
- Contractors working on or near a covered process would be verified as appropriately trained and qualified to do the work being performed;
- Pre-startup safety review to provide a methodical, detailed approach to ensure that construction of the facility is in accordance with design and that all requirements for safe operation have been completed before start up or restart of the process;
- Maintain all equipment to recognized and generally accepted good engineering practices;
- Due to the potential flammable nature of chemicals used in the process, any work that can produce sparks, heat, flames or other ignition sources would be managed to prevent ignition;
- Use of management of change to determine if changes to the design process can negatively impact plant safety and if so what can be done to eliminate or mitigate the impact;
- Investigation of all safety incidents and near misses, injuries and illnesses to identify casual factors leading to the incident and make appropriate recommendations for lessons learned;
- A comprehensive emergency response plan to address a broad range of contingencies and the appropriate response measures; and
- Compliance audits to ensure that the principles and practices of PSM are properly followed and effective.

8.7.2 Additional Mitigation

There are no significant impacts identified for environmental health and safety and therefore no additional mitigation measures are identified.

8.8 Unavoidable Significant Adverse Impacts

The proposed project is not expected to result in unavoidable significant adverse impacts to environmental health and safety. Given the nature of the chemicals used at the facility and the process taking place the possibility of a spill to land or water or a fire or other emergency event at the facility cannot be eliminated. Such an emergency event could result in:

- Injuries or fatalities within the boundaries of the facility from a catastrophic release of methanol that is ignited and produces a large pool fire, flash fire, or vapor cloud explosion; or
- Temporary/localized significant adverse impacts to surface water quality and aquatic species (plants and animals) in the high concentration areas near the source of a large methanol spill.

No mitigation measures would completely eliminate the possibility of a large methanol spill, nor would mitigation measures eliminate the adverse impacts associated with a large methanol spill or a methanol-related fire or explosion. However, the potential impacts associated with a large spill of methanol to the Columbia River are expected to be temporary and localized because of methanol's characteristics and because of monitoring and rapid containment and

cleanup (oil/fuel release). The risk of such release events is considered low based on the information reviewed. The planned monitoring, training, and response programs that would be implemented as part of the project would further minimize the risk of significant adverse impacts to human health and the environment.

8.9 References

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Chapter 9 Land Use and Shoreline Use, Housing, and Employment

9.1 Introduction

This chapter addresses the potential impacts of the proposed Kalama Manufacturing and Marine Export Facility (the proposed project) on land and shoreline uses, zoning, public policy and land use plans, and the population and housing characteristics of the area. The proposed project would redevelop a currently undeveloped site with a new waterfront industrial use and, therefore, would directly affect land use on the project site. The sections below describe the regulatory setting of the proposed project and the existing conditions within the affected environment, and assess whether the proposed project would result in significant adverse impacts on land and shoreline use or population and housing characteristics. This chapter also addresses the consistency of the proposed project with zoning and other adopted land use plans and policies.

This chapter evaluates the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative, in which the proposed project would not be constructed on the project site. The Technology Alternatives include a Combined Reformer (CR) Alternative and an Ultra-Low Emissions (ULE) Alternative. The primary differences between the CR and ULE Alternatives are energy efficiency, energy source, and the technology used for the natural gas reforming step in the methanol production process. The Marine Terminal Alternatives include Marine Terminal Alternative 1, in which the proposed marine terminal would be separate from the existing North Port dock, and Marine Terminal Alternative 2, in which the existing North Port dock would be extended. These alternatives are described in greater detail in Chapter 2, Proposed Project and Alternatives. This chapter also addresses the Kalama Lateral Project (the proposed pipeline) and new power lines to the project site as related actions.

The assessment concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would be consistent with surrounding land and shoreline uses, applicable zoning regulations, and public policies, and would not result in significant adverse impacts to land and shoreline use or population and housing. It is also expected that activities under the No-Action Alternative would be consistent with land and shoreline uses and public policy and land use plans.

9.2 Methodology

9.2.1 Study Areas

The study areas for this assessment have been defined to encompass the areas where the proposed project, with either Technology Alternative and either Marine Terminal Alternative, and the No-Action Alternative would have the potential to affect land and shoreline use, zoning and land use public policy, and population and housing characteristics. Different study areas were defined to represent the areas where the proposed project and No-Action Alternative may have the potential to affect land and shoreline use, zoning and land use public policies, and population and housing characteristics.

The study area for land and shoreline use is the project site and the area within a 1-mile radius of it. The 1-mile radius for the project site includes properties in Cowlitz County, Washington,

and Columbia County, Oregon, including the City of Kalama, Washington, and the City of Prescott, Oregon (see **Figure 9-1**).

The study area for consistency with zoning regulations and other public plans and policies is the project site and the immediately adjacent area, as those are the areas where these plans and policies would most directly apply to the proposed project.

The study area for potential impacts related to population and housing characteristics is based on the area where employees of the proposed project and their families would be likely to reside based on typical commute characteristics. Workers at the proposed facility are expected to live in Southwest Washington and the Portland-Vancouver-Hillsboro metropolitan statistical area according to the *Economic Impact Analysis of the Proposed Kalama Manufacturing and Marine Export Facility* (ECONorthwest 2015). This area covers the major towns and cities within a less than 90-minute driving radius of the project site and includes seven counties in Washington (Cowlitz, Clark, Lewis, Pacific, Skamania, Thurston, and Wahkiakum) and five counties in Oregon (Clackamas, Columbia, Multnomah, Washington, and Yamhill).

9.2.2 Land Use and Shoreline Use, Zoning Analysis

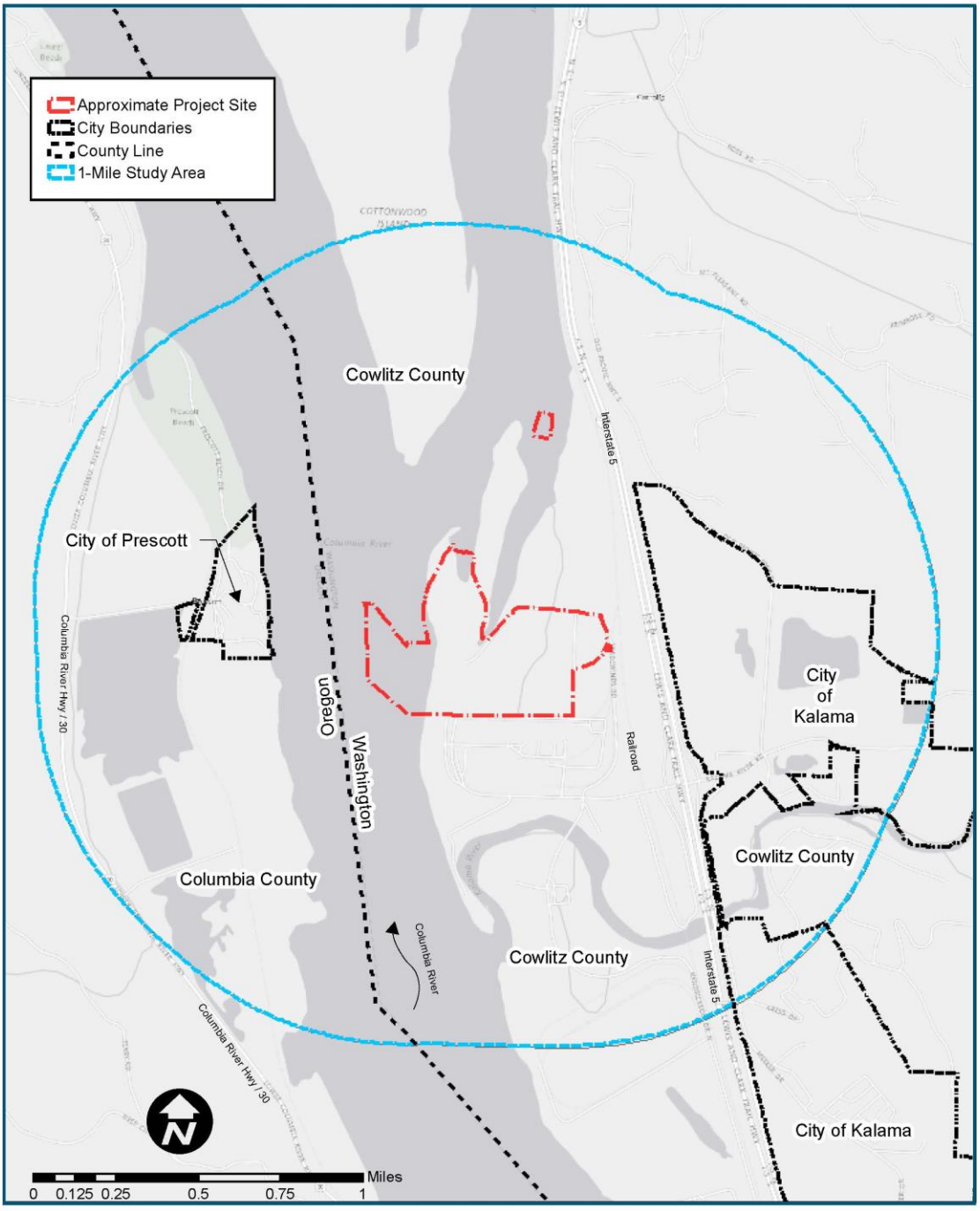
Baseline data for the discussion in the affected environment section of current land and shoreline uses, current comprehensive plan and shoreline designations, current zoning information, and other public land use policies that apply to the project site were developed based on a review of aerial photography, site reconnaissance, and land use data obtained from the states of Washington and Oregon. The analyses also drew on a review of applicable zoning ordinances, comprehensive plans, and Port policy documents.

This assessment describes potential changes to land use conditions for the proposed project and the No-Action Alternative during construction and operation. The analysis assesses whether the changes to land and shoreline use would be compatible with surrounding land and shoreline uses and whether the changes would be consistent with applicable comprehensive plans and land use policies, zoning ordinances, and shoreline regulations. The assessment of land and shoreline use compatibility is based on the types of uses, their intensities, and their proximity to one another. The analysis of the proposed pipeline related action relies on the land use assessment provided in the Kalama Lateral Project Environmental Assessment issued by the Federal Energy Regulatory Commission (FERC) in July 2015 in connection with the Northwest Pipeline LLC (Northwest) Section 7(c) application.

9.2.3 Population and Housing Analysis

The affected environment section describes the existing population and housing characteristics within the study area using data from the U.S. Census Bureau's 2013 American Community Survey (ACS) five-year estimates (2009-2013), including total population, housing units, and vacancy. Employment within the study area is based on the analysis included in the *Economic Impact Analysis of the Proposed Kalama Manufacturing and Marine Export Facility*.

The population and housing impact analysis considers potential changes in population as a result of the employees of the proposed project, as well as the number of expected construction jobs. The analysis then assesses whether the change in population would impact housing characteristics and population projections for the study area. This assessment is based primarily on the size of the new population introduced by the proposed project relative to the size of the residential and employment population within the study area.



Land Use Study Area
Figure 9-1

KALAMA SEPA
Manufacturing & Marine Export Facility

9.3 Affected Environment

This section describes existing conditions in the study areas as they pertain to land and shoreline uses (including park and recreation uses), existing zoning ordinances, and applicable land and shoreline master plans, policies, and regulations. This section also describes the population and housing characteristics of the study areas. The existing conditions are described for the project site and the related action.

9.3.1 Project Site

9.3.1.1 Land Use

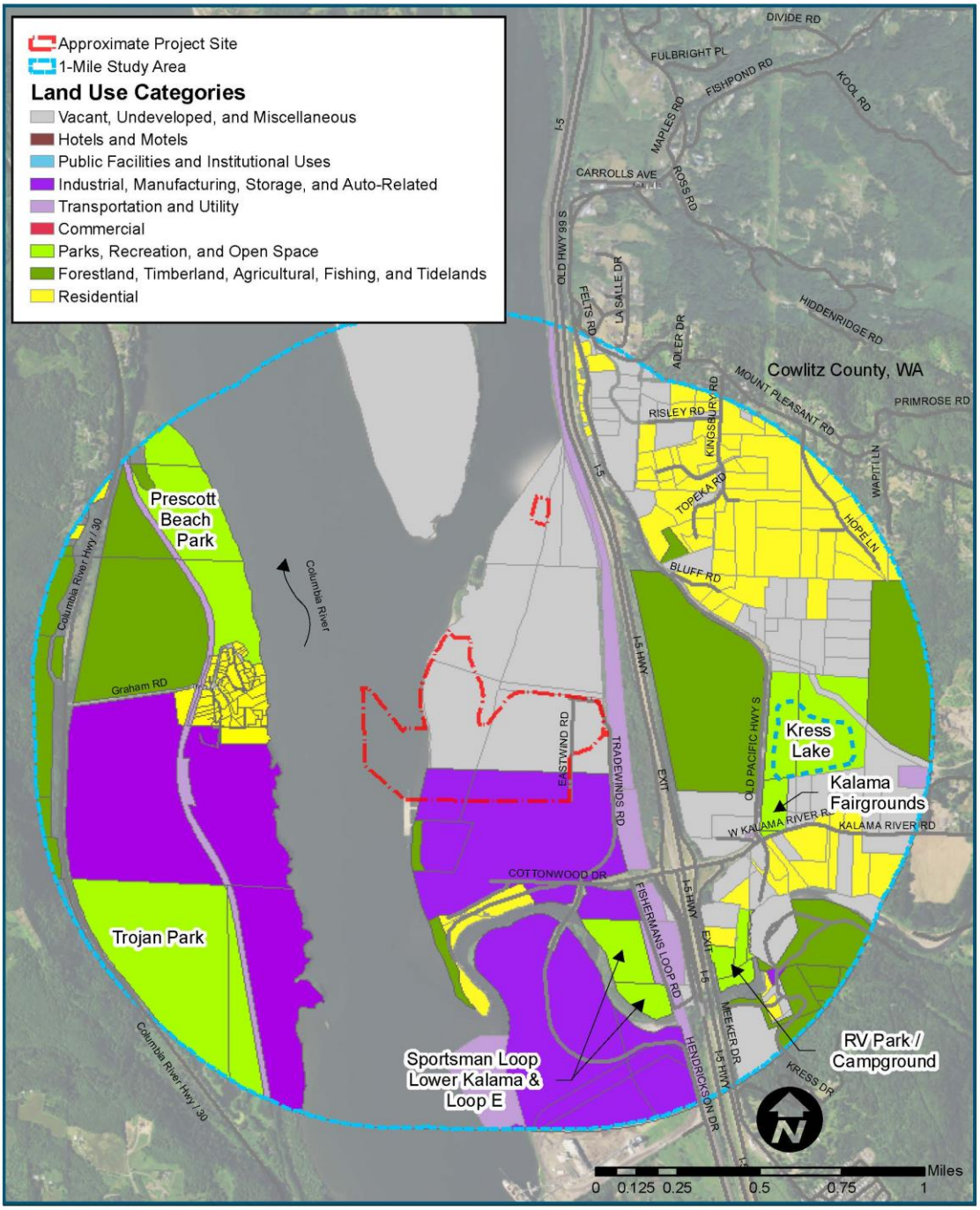
The proposed project would be located on the Port's North Port site in unincorporated Cowlitz County, Washington. The project site is largely unvegetated. A large portion of the project site has been used for approximately 37 years as a dredge material disposal site and has been graded in anticipation of future industrial development. The project site also includes two rows of existing treated timber piles now located in the freshwater intertidal backwater channel north of the majority of the project site. These piles are proposed for removal as part of the proposed project's mitigation activities.

Immediately adjacent land uses include the Columbia River and a mix of industrial, transportation, utility, open space and recreation uses (see **Figure 9-2**). The project site is bounded on the east by Tradewinds Road, the Air Liquide industrial facility, and the Port's industrial wastewater treatment plant. BNSF tracks and Interstate 5 (I-5) lie just beyond Tradewinds Road. The area north of the project site contains undeveloped Port property primarily used for open space, recreation, and wetland mitigation. The Steelscape manufacturing facility is located south of the project site and uses the existing North Port dock. The Columbia River flows along the western boundary of the project site, and the confluence of the Kalama and Columbia rivers is located approximately 3,600 feet south of the project site. The project site and surrounding properties are owned by the Port and some are leased to tenants.

Land uses at the three potential temporary construction parking locations consist of vacant land cleared in anticipation of future industrial development. Adjacent land uses to all three areas are industrial and open space.

Land uses within the surrounding 1-mile study area include a mix of industrial uses along the Columbia River waterfront, forest and agricultural uses, residential uses, and some recreational facilities (see **Figure 9-2**). The nearest residential type activities in Washington are located approximately 1,800 feet south of the site along Sportsmens Club Road near the confluence of the Columbia and Kalama rivers.[1] The Sportsmens Club is seasonally occupied for recreational activities, such as camping, but for the purposes of this analysis are considered residential activities. Other nearby residential uses include scattered single-family dwellings on the hillsides approximately 2,700 feet northeast of the project site and southeast of the project site along Meeker Drive and Kalama River Road. These residential uses are separated from the project site by I-5. The residential uses along Meeker Drive and Kalama River Road begin approximately 3,100 feet southeast from the project site and extend to the edge of the study

[1] All distances are measured from the nearest project site boundary, unless otherwise noted.



Land Use Map
Figure 9-2

KALAMA SEPA
Manufacturing & Marine Export Facility

area. Residential uses in the Oregon portion of the study area include single-family residences located approximately 2,500 feet west of the shoreline of the project site, across the Columbia River. Industrial uses within the surrounding 1-mile study area include the Kalama River Industrial Park, operated by the Port, located approximately 2,500 feet south of the project site. Interim agricultural uses occur on the Port's East Port site, directly east of I-5 and approximately 1,100 feet from the project site. Forest uses are located along the eastern edge of the study area and a sand and gravel quarry is located just outside the study area.

Parks and Recreation

There are several parks and recreational uses within the 1-mile study area (see **Figure 9-2**). Most notably, there is an informal recreation area adjacent to the project site to the north and pedestrian trails and beach access at the Port's Industrial Park south of the project site. The informal recreation area adjacent to the project site to the north is managed by the Port, which issues permits for access, and includes informal trails and water access but no built recreation facilities. This informal recreation area is accessed by passing through and along the project site. Other park and recreation uses include the Kalama Fair Grounds (approximately 3,200 feet southeast of the project site), which is used annually for the Kalama Community Fair. The grounds include permanent warehouse and pavilion structures. The Washington State Department of Fish and Wildlife (WDFW) operates three recreation areas within the study area, including Kress Lake (a manmade lake approximately 2,800 feet east of the project site), Sportman Loop Lower Kalama (a water access site with a concrete boat launch located approximately 1,900 feet south of the project site), and Sportman Loop E (a water access site also located south of the project site that lacks a formal boat launch) (WDFW 2015). Camp Kalama, a private campground and RV park, is located approximately 3,500 feet southeast of the project site. Trails within the study area include a constructed pedestrian trail at the Port's Industrial Park (approximately 2,500 feet south of the project site), a trail around Kress Lake, a trail adjacent to and south of the Kalama River to the west of I-5, and an informal trail at the eastern extent of the study area, southeast of the project site and adjacent to Haydu Park.[2] The Columbia River, immediately west of the project site, is also used for recreation.

Recreation uses in the Oregon portion of the study area include Prescott Beach Park located approximately 3,500 feet northwest of the shoreline of the project site and Trojan Park located approximately 4,000 feet southwest of the shoreline of the project site. Prescott Beach Park is a day-use park that provides access to the Columbia River and features a covered picnic shelter, playground equipment, a gazebo, a horse shoe pit, and sand volleyball courts (Columbia County 2015). The 75-acre Trojan Park is located adjacent to the now-demolished Trojan Nuclear Power Plant and includes a 29-acre lake that can be used for fishing. Park facilities include trails for hiking and biking, a disc golf course, restrooms, picnic tables and shelters (Portland General Electric 2015).

9.3.1.2 Zoning

The project site is located in an unincorporated portion of the County. The project site, temporary off-site parking areas, and the parcels immediately adjacent to the project site are unzoned and, therefore, are not subject to the County zoning regulations established in the Land Use and Development Code, Chapter 18.10 of the Cowlitz County Code (CCC). Dimensional standards and use restrictions are not established for unzoned property.

[2] Haydu Park is located outside the 1-mile study area.

9.3.1.3 Land Use Plans

Development within the project site and surrounding study area is guided by a variety of land use plans and public policies. These plans and policies, which are discussed below, include comprehensive plans, shoreline management master programs (SMMPs), critical area regulations, and the Port of Kalama Comprehensive Plan and Scheme of Harbor Improvements.

Cowlitz County Comprehensive Plan

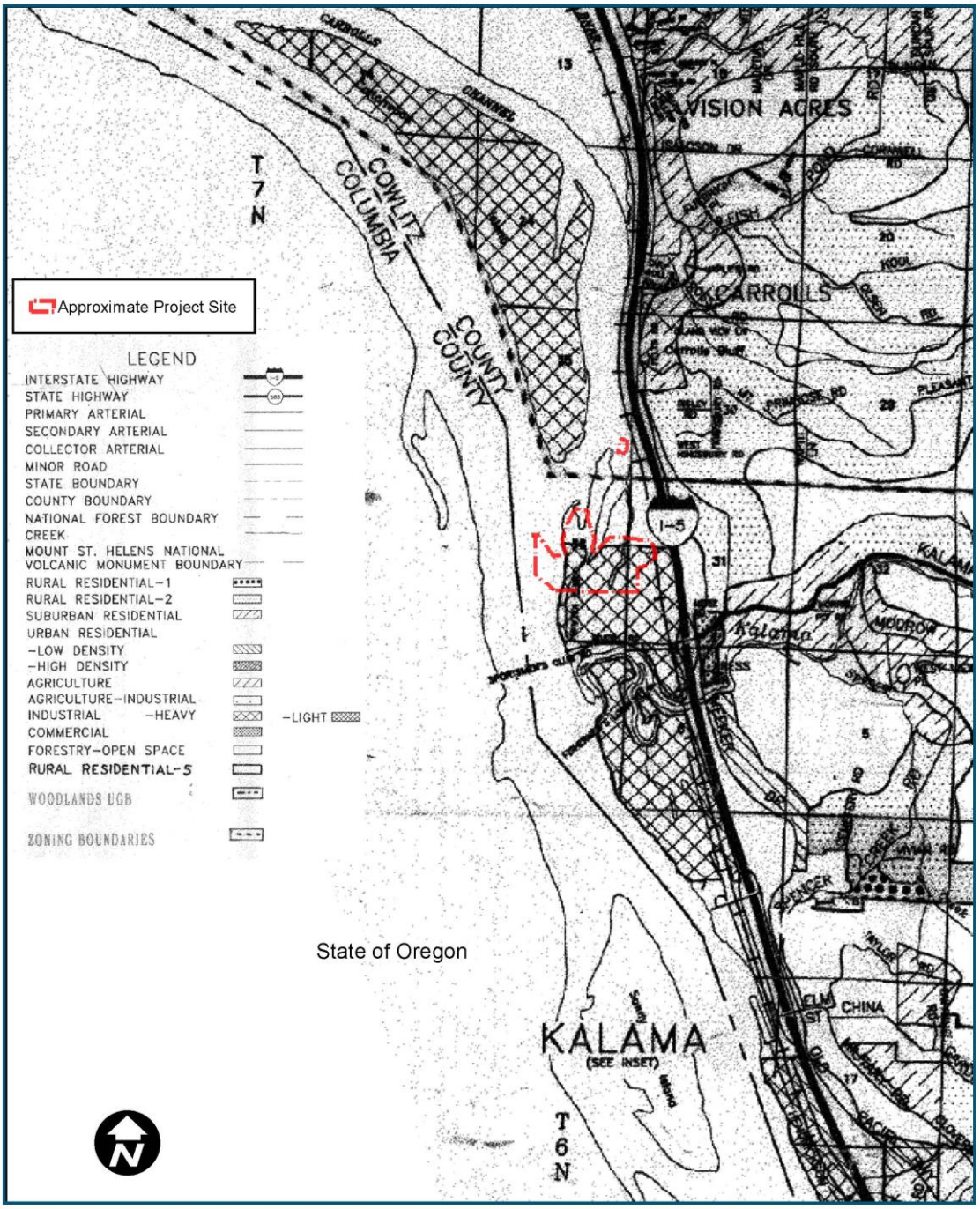
According to Washington's Growth Management Act (GMA), counties and cities meeting specific population and growth criteria are required to fully plan under GMA, which includes the duty to prepare comprehensive plans in accordance with the goals of the GMA as identified in Chapter 36.70A RCW. As confirmed by the Washington State Department of Commerce, Cowlitz County is not required to fully plan under the GMA, but the County is required to designate and protect critical areas (Washington State Department of Commerce 2013). Counties that do not fully plan under GMA are required to prepare comprehensive plans in accordance with the Planning Enabling Act (RCW 36.70). The County adopted a comprehensive plan in 1976, updated it in 1981, and is preparing another update. The update is in draft form and is expected to be completed in 2016.

The County's current comprehensive plan designates the majority of the project site and the three potential temporary construction parking areas as Heavy Industrial. A small area in the northwest portion of the project site is (Parcel No. 63305 see **Figure 2-2**) designated as Forestry – Open Space (Cowlitz County 1976) (see **Figure 9-3**). The plan states that the purpose of the industrial classification is to "assure the presence of adequate amounts of land for industrial growth in the County." Appropriate uses in the Heavy Industrial designation are identified as "heavy industrial uses, for example lumber and plywood mills, metal manufacturing, sand and gravel operations, foundry or iron works, quarries" (Cowlitz County 1976). For the Forestry – Open Space classification the plan states that the purpose of the classification is for "the growing and harvesting of trees" with the open space portion is for "to conserve unique wildlife habitats, natural features, and recreation areas." Appropriate uses in the Foresty – Open Space classification are identified as timber management, agriculture, residential and outdoor recreation complimentary to other encouraged uses (Cowlitz County 1976).

A section of the County's current comprehensive plan lists policies and goals related to shoreline management. These are the same goals articulated in the Cowlitz County SMMP, and are discussed in the section below.

Cowlitz County Shorelines Management Master Program

The Shoreline Management Act (SMA) applies to all counties and cities that have "shorelines of the state," as defined in the Revised Code of Washington (RCW) 90.58.030. The SMA requires that these jurisdictions prepare and adopt shoreline master programs that protect natural resources along regulated shorelines and give priority and preference to public access and water-oriented uses within shoreline environments. Each jurisdiction with shorelines of the state must develop a master program that establishes shoreline "environment designations" based on physical, biological, and development characteristics (Washington State Department of Ecology [Ecology] 2014a). The current SMMP for Cowlitz County (referred to in this



Cowlitz County Comprehensive Plan Map
Figure 9-3

KALAMA SEPA
Manufacturing & Marine Export Facility

document as Cowlitz County SMMP) was approved in 1977 and includes four basic shoreline designations (Natural, Conservancy, Rural, and Urban).

The Columbia River, which borders the project site to the west, is a shoreline of statewide significance. The areas of the site under shoreline jurisdiction include the Columbia River and all areas within 200 feet of the ordinary high water mark.

The County SMMP designates the shoreline environment at the project site as Urban and Conservancy (Cowlitz County 1977) (see **Figure 9-4**). The project site is designated as Urban; and Conservancy. The SMMP states that the Urban designation is suitable for intensive recreation, residential, industrial, and commercial development. The objective of the Urban designation is to identify defined areas, which are currently in such uses and potentially capable of such uses to satisfy the socioeconomic needs of the present and future population of the county.

The Conservancy district designates those areas endowed with resources, which may be harvested and naturally replenished. The Conservancy district also designates areas that, because of flooding, slide prone soils, or other natural conditions, are not suitable for intensive agriculture or high-density human activity. The objective of the Conservancy designation is to maintain those defined areas for a sustained yield philosophy of resource management and to establish suitable areas for non-intensive agriculture uses, non-intensive recreation uses, and limited intensive public access.

The County SMMP establishes use regulations for 21 shoreline use activities. These use regulations supplement other land use regulations and speak to the shoreline management issues that must be addressed to implement the goals of the SMMP. According to the shoreline use activity regulations of the County's SMMP, ports and water-related industries are permitted uses on urban shorelines and conditional uses on conservancy shorelines.

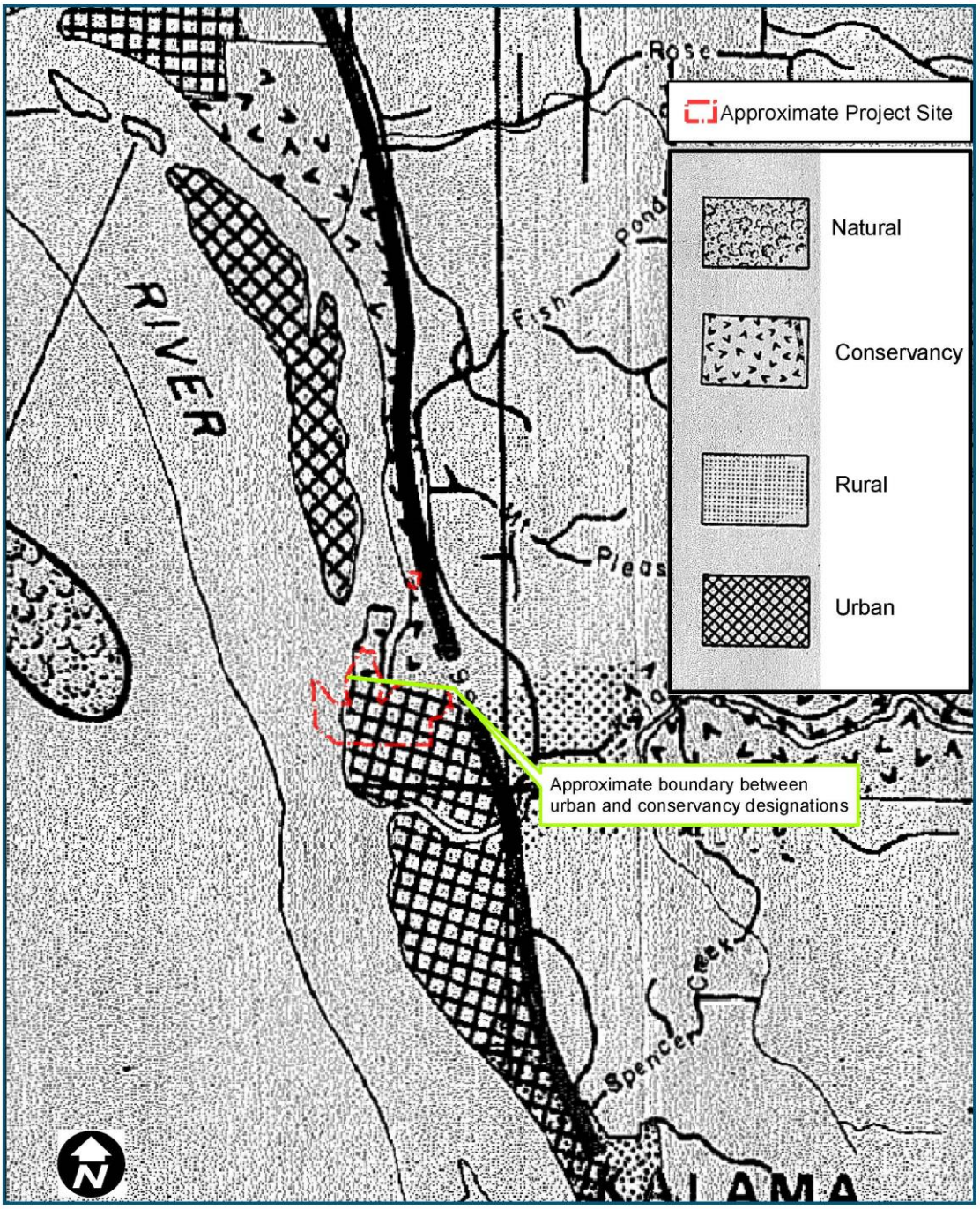
The County SMMP also outlines a series of specific goals related to circulation, conservation, economic development, historical/cultural, recreation, residential, public access, and shoreline uses to achieve the overall goals of the SMA. Policies related to ports and water-related industries are identified under the economic development goal of the County SMMP and include the following:

a. *Port facilities shall be designed to permit viewing of harbor areas from viewpoints, waterfront restaurants and similar public facilities which would not interfere with port operations or endanger public health and safety.*

b. *Sewage treatment, water reclamation, desalinization and power plants shall be located where they do not interfere with, and are compatible with recreational, residential, or other public uses of the water and shorelands. Waste treatment ponds for water-related industry shall occupy as little shoreline as possible.*

c. *The cooperative use of dock parking, cargo handling, and storage facilities shall be strongly encouraged in waterfront industrial areas.*

d. *Land transportation and utility corridors serving ports and water-related industry in the shoreline area shall follow the guidelines provided under the sections dealing with utilities and road and railroad design and construction. Where feasible, transportation and utility corridors shall be located upland to reduce pressures for the use of waterfront sites.*



Cowlitz County Shorelines Designation Map
Figure 9-4

KALAMA SEPA
Manufacturing & Marine Export Facility

e. Prior to allocating shorelines for port uses, local government shall consider statewide needs and coordinate planning with other jurisdictions to avoid wasteful duplication of port services within port-service regions.

f. Since industrial docks and piers are often longer and greater in bulk than recreational or residential piers, careful planning must be undertaken to reduce the adverse impact of such facilities on other water-dependent uses, aesthetics, and shoreline resources. Because heavy industrial activities are associated with industrial piers and docks, the location of these facilities must be considered a major factor in determining the environmental and aesthetic compatibility of such facilities.

g. Because a large impact cannot be avoided due to ports and port-related uses, preference will be given to develop and redevelopment of existing port areas.

h. Ports and water-related industries are encouraged to locate in urban environments, but in exceptional cases may locate under natural, conservancy, and rural environments, subject to conditional use and specific performance standards. An exception is log storage and rafting which may be permitted in conservancy, rural, urban, and is considered as a conditional use on natural shorelines.

The County SMMP also outlines specific use regulations for each of the shoreline districts. Ports and water-related industries are specifically addressed for both the Urban and Conservancy Shoreline Districts as follows:

Conservancy District

1. Deep-draft ports or water-related industries other than those activities covered in other sections of this program shall be considered as conditional uses on conservancy shorelines.

Urban District

1. Port facilities and water-related industries shall be permitted on urban shorelines.

The Cowlitz County SMMP is implemented by the regulations of CCC 19.20. This section of the CCC identifies the submittal requirements and the approval process for development activities in a designated shoreline.

The SMA requires each county and city to update its SMMP periodically. Cowlitz County is currently preparing an updated SMMP with local adoption anticipated in summer 2016.

Historic shoreline permitting at the project site includes a shoreline conditional use permit and a shoreline substantial development permit issued for dredging activities at the project site in 1996 and extended in 2001. The permits allowed for the placement, redistribution, grading, or mining of approximately 500,000 cubic yards of dredge material (Ecology 2001). Cowlitz County also approved a shoreline substantial development permit, shoreline conditional use permit, and a shoreline variance for the construction of an aggregate distribution facility and a concrete ready-mix batch plant with associated structures and infrastructure at the project site in 2009 (Cowlitz County 2009). The aggregate plant was not constructed. In addition, a shoreline substantial development permit was approved for the North Port Dock Extension (a project similar to Marine Terminal Alternative 2) in 2004.

Cowlitz County Critical Areas Protection

As mandated by the GMA (RCW 36.70A.060), the County is required to develop and adopt a critical areas protection ordinance that designates critical areas in the County and sets out development regulations to ensure their conservation. CCC Chapter 19.15 provides protection for five designated critical areas: critical aquifer recharge areas (CARAs), frequently flooded areas, geologic hazard areas, wetland areas, and fish and wildlife habitat conservation areas. Development within or adjacent to designated critical areas require compliance with CCC 19.15 in order to ensure no net loss of the functions or value of the impacted critical area(s). A critical areas permit is required for development following a County determination that critical areas are present on a project site.

The five types of critical areas identified on the upland portions of the project site include geologic hazard areas, frequently flooded areas, fish and wildlife habitat conservation areas, CARAs, and wetland buffers, which extend onto a portion of the project site. Although the project site is within a CARA, the County has published a critical areas determination documenting several Port parcels, including the project site, that are not subject to CARA permitting requirements (Cowlitz County 2012).

Port of Kalama Comprehensive Plan and Scheme of Harbor Improvements

Ports in Washington are required to adopt a comprehensive scheme of harbor improvements under RCW 53.20.010. Land holdings and properties owned by the Port are subject to the Port of Kalama Comprehensive Plan and Scheme of Harbor Improvements. This comprehensive scheme sets goals, objectives, and strategies to fulfill the Port's mission and identifies opportunities to attract economic development, provide capital facilities, and manage properties and leases (Port of Kalama 2015).

The comprehensive scheme identifies the highest and best use of the North Port site as an expansion of marine terminal and water-dependent industry. The comprehensive scheme states that the northern portion of the North Port site is leased to Northwest Innovation Works, LLC - Kalama for the development of a methanol production plant (Port of Kalama 2015).

9.3.1.4 Population and Housing Characteristics

The study area for the assessment of population and housing characteristics is a 12-county area covering major cities and towns within a less than 90-minute driving radius of the project site. Based on an analysis conducted by ECONorthwest, this is the area where employees of the proposed project and their families are most likely to reside (ECONorthwest 2015). According to the U.S. Census Bureau's 2013 ACS five-year estimates, the population of the study area was 2,718,987 residents (see **Table 9-1**).

The table below provides an overview of the most recent population and housing characteristics for the study area.

Table 9-1. Population and Housing

Study Area	2009-2013 Population[1]	2009-2013 Total Housing Units	2009-2013 Vacant Housing Units	Vacancy Rate (%)
Clark County. WA	432,549	168,178	9,323	5.5%
Cowlitz County, WA	102,110	43,356	3,754	8.7%
Lewis County, WA	75,419	33,968	4,441	13.1%

Study Area	2009-2013 Population[1]	2009-2013 Total Housing Units	2009-2013 Vacant Housing Units	Vacancy Rate (%)
Pacific County, WA	20,781	15,575	6,209	39.9%
Skamania County, WA	11,126	5,614	1,162	20.7%
Thurston County, WA	256,080	108,968	8,167	7.5%
Wahkiakum County, WA	4,006	2,008	293	14.6%
Clackamas County, OR	380,532	157,541	11,014	7.0%
Columbia County, OR	49,333	20,614	1,545	7.5%
Multnomah County, OR	747,641	325,163	19,224	5.9%
Washington County, OR	539,608	213,520	11,749	5.5%
Yamhill County, OR	99,802	37,137	2,999	8.1%
Total	**2,718,987**	**1,131,642**	**79,880**	**7.1%**

Notes:
1 The ACS collects data throughout a given period on an ongoing, monthly basis. The 2009-2013 ACS reflects population data over the period from 2009 to 2013.
Sources:
U.S. Census Bureau 2013 ACS 5-year estimates (2009-2013).

9.3.2 Related Actions

As described in Kalama Lateral Project Environmental Assessment, issued by FERC in July 2015, land uses along the proposed pipeline route primarily consist of forest land, developed commercial and industrial properties, and residential developments (see **Figure 9-5** and **Appendix B**). The construction of the proposed pipeline is subject to applicable policies and provisions in the Cowlitz County Comprehensive Plan, Cowlitz County Code, and Cowlitz County Critical Areas Ordinance. Land uses along the proposed new transmission line and upgraded transmission line are industrial, open space, and transportation.

9.4 Environmental Impacts

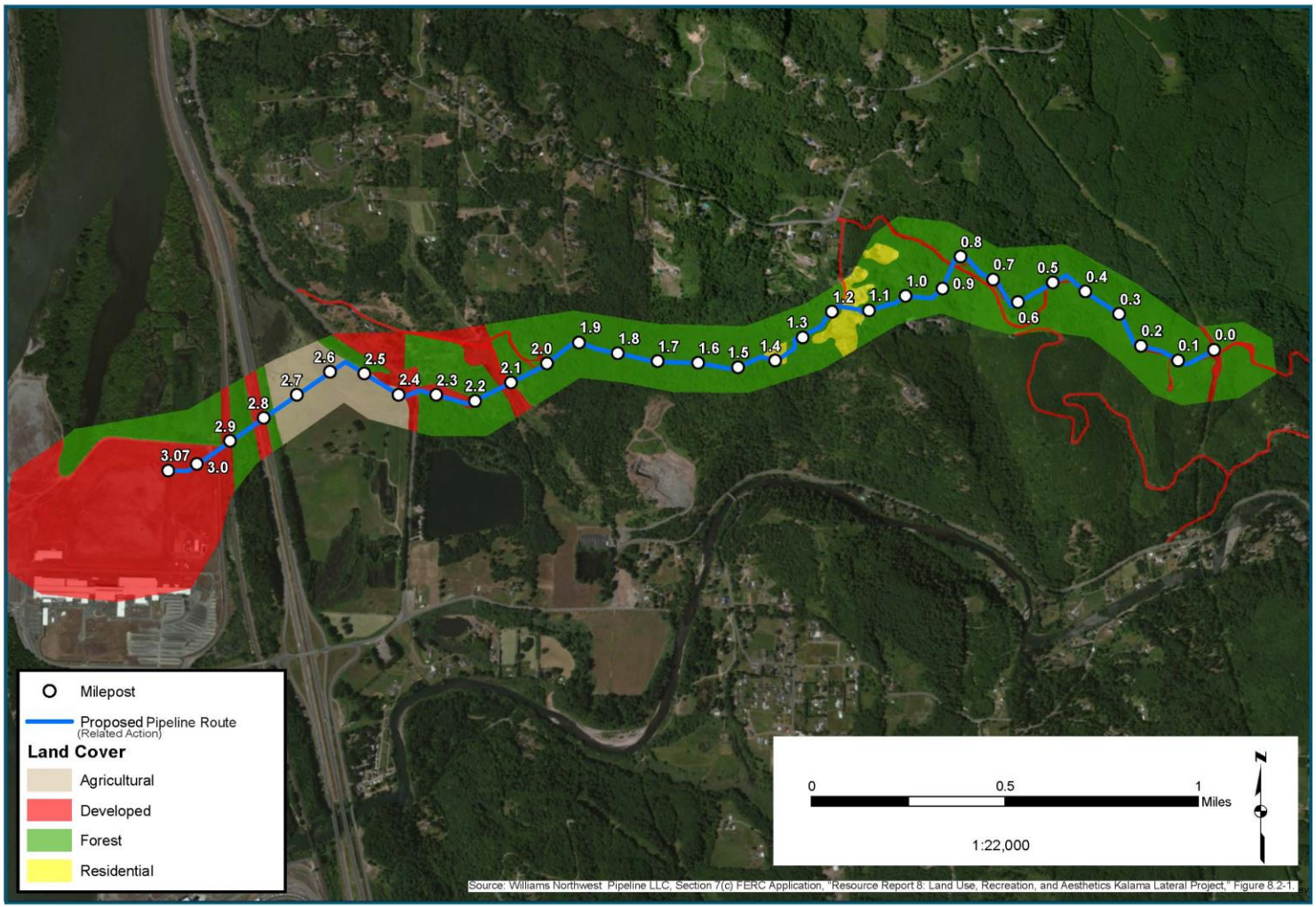
The following sections describe the direct and indirect impacts on land and shoreline use that could result from the construction and operation of the proposed project and No-Action Alternative. The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would result in the same types of land uses on the project site, the same overall construction duration and tasks, and the same employment during construction and operation. Therefore, the proposed project with either Technology Alternative and either Marine Terminal Alternative would have the same potential impacts on land and shoreline use and housing and population characteristics, and this analysis focuses on the proposed project and only distinguishes among the Technology and Marine Terminal Alternatives where necessary, such as in the discussion of consistency with the Cowlitz County SMMP.

9.4.1 Proposed Project Alternatives

9.4.1.1 Construction Impacts

Land Use

The project site is currently used for dredged material disposal, which involves regular earth-moving activities that use heavy machinery and require access to the site by construction-related vehicles, including large trucks.



Proposed Pipeline - Existing Land Use
Figure 9-5

KALAMA SEPA
Manufacturing & Marine Export Facility

Construction of the proposed project would introduce a new industrial activity to the project site, which would change the land use character of the site as compared to the existing dredged material disposal use. The proposed project would also result in construction activities in proximity to informal recreational uses. These recreational uses would remain available for public use throughout the construction period, except during the period when the recreation access improvements that are part of the proposed project would be under construction.

The project site, temporary construction parking areas, and surrounding properties are unzoned with a Heavy Industrial comprehensive plan designation. In general, industrial uses are expected to generate noise, dust, smoke, vibration, and other disruptive environmental conditions. Construction of the proposed project would be generally consistent with the existing industrial uses and comprehensive plan designation of the project site and surrounding area. Furthermore, disruptions due to construction activities would occur primarily within the project site, and would have limited effects on land uses within the 1-mile study area.

Other temporary disruptions and inconveniences during construction activities would be due to traffic congestion, noise and vibration, air pollutant emissions and fugitive dust. These potential impacts on nearby uses, including residential uses and recreational facilities within a mile of the project site, are addressed in Chapter 4, Air and Greenhouse Gas Emissions, Chapter 12, Transportation, and Chapter 14, Noise.

The proposed project would also result in construction activities in proximity to informal recreational uses. These recreational uses would remain available for public use throughout the construction period, except during the period when the recreation access improvements that are part of the proposed project would be under construction. Overall, construction activities would be temporary and would not alter surrounding land uses or otherwise affect land use patterns of the surrounding area during construction. Therefore, construction of the proposed project would not result in any significant adverse impacts on land use.

Population and Housing

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would employ approximately 1,000 workers at its peak during construction (ECONorthwest 2015). It is likely that many construction would already live in the area, and therefore would not have the potential to affect population and housing characteristics; however, this analysis conservatively assumes that all workers would be new to the population and housing study area.

The 12-county study area included approximately 1.4 million workers in 2014 (ECONorthwest 2015). The proposed project's construction employment would constitute approximately less than 0.1 percent of the total employment in these counties and available construction workers by trade exceed what is needed by the project by at least seven times. It is estimated that 10 percent of construction workers may come from areas beyond the 12-county study area. Given the number of people currently employed in the study area and the availability of construction labor, it is anticipated that the proposed project could predominately utilize the existing construction labor pool and construction laborers would not represent a significant increase in population or impact the housing characteristics of the study area.

9.4.1.2 Operational Impacts

Land Use

The proposed project would redevelop the project site with a methanol manufacturing facility that would include processing facilities, storage facilities, loading facilities, and a new marine terminal in the Columbia River. The proposed project would introduce a more active and intensive industrial land use to the project site as compared to the existing dredge material disposal use of the site. Although this would constitute a substantial change to the land use character of the project site, the proposed project would be located in an area that already contains industrial uses and would be generally compatible with other nearby land uses. Land use adjacent to the project site is already characterized by the presence of many industrial and transportation/utility uses. The proposed project would be consistent with these industrial and transportation/utility land uses including the existing Air Liquide industrial facility, the Port's industrial wastewater treatment plant, the BNSF tracks, the I-5 interchange, the existing dock adjacent to the proposed project site, and the Steelscape manufacturing facility. Use of the site for the proposed project is not expected to create any adjacent use compatibility impacts nor trigger any pressure for those adjacent land uses to change from their existing use.

Single-family residential uses are located within the 1-mile study area with the nearest residential-type uses occurring approximately 0.3 mile south of the project site along Sportsmens Club Road. These uses would be separated from the project site by intervening uses including the Steelscape facility and densely vegetated areas along Sportsmens Club Road. These uses already coexist with existing industrial uses in the area surrounding the project site. The proposed project would be further away than those uses and separated from the residential uses by the intervening industrial uses and densely vegetated areas and, therefore, would not significantly affect the residential uses with respect to land use compatibility.

The proposed project would improve the roadway used to access the informal recreation area located to the north of the project site and would provide a new parking area. This would directly affect the recreation area by creating improved access for users. The proposed project would be adjacent to, but would not eliminate, the existing informal recreational area located to the north of the project site. Users of the informal recreation area north of the project site would experience some change in user experience because of the increased activity and industrial facilities (e.g., the infiltration pond and wastewater treatment area), but the area would continue to be available for use by the surrounding community with increased accessibility from the improved roadway and new parking area. The proposed project would not have significant effects on the land use characteristics of other recreation uses in the 1-mile study area due to the distance between the project site and these uses. The proposed project, including improvements to the roadway used to access the informal recreation area, would not significantly affect recreational uses with respect to land use compatibility.

The proposed project would not affect the continued use of the Columbia River for recreational purposes. At completion, the proposed project would result in the introduction of approximately 3 to 6 vessels per month (36 to 72 per year) to the Columbia River. This increase would be relatively small compared to the typical historic levels for river traffic. According to vessel entry and transit data, the river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge transits in 2014 (Ecology 2015). Historically, the Columbia River has supported even higher levels of ship traffic, with a recent peak of 2,269 vessel, tank ship, and barge vessel calls in 1999 (Ecology 2014b). Recreational users already co-exist with and take account of commercial vessels within the river, including large oceangoing ships. These recreational users would similarly take account of the relatively small

increase in river traffic resulting from the proposed action. Therefore, the proposed project would not significantly affect the recreational use of the Columbia River.

When not in use for loading methanol, the proposed marine terminal, under either Marine Terminal Alternative, would be made available for general use by the Port, for other cargo loading and unloading, for vessel supply operations, as a lay berth, for short- and long-term vessel moorage, and for topside vessel maintenance. This general use by the Port would result in minor additional vessel traffic to the marine terminal, but this traffic would still be within the typical historic levels for river traffic. Furthermore, in most cases it is expected that these would be vessels that would already be transiting the Columbia River for other reasons.

Overall, the proposed project would not result in significant adverse impacts to land and shoreline use.

Consistency with Zoning

The project site and adjacent parcels are unzoned. Therefore, an assessment of zoning consistency is not warranted. The proposed project would not affect zoning designations in other portions of the study area. As a result, the proposed project would not result in significant adverse impacts to zoning.

Consistency with Land Use Plans and Public Policies

Cowlitz County Comprehensive Plan

The current Cowlitz County comprehensive plan designates the majority of the project site as Heavy Industrial. The purpose of this classification is to "assure the presence of adequate amounts of land for industrial growth in the County." A small portion of the project site is designated by the current Cowlitz County comprehensive plan as Forestry – Open Space. The purpose of this classification is to preserve "the growing and harvesting of trees" and "to conserve unique wildlife habitats, natural features, and recreation areas."

The proposed project would be consistent with the Cowlitz County comprehensive plan designation of Heavy Industrial because it would maintain and expand the industrial use of the project site and would be supportive of the plan's various policies related to industrial land uses.

The improved recreation access and portions of the stormwater infiltration pond and flare would be located within the Foresty – Open Space designation. The use of the site for recreational purposes is consistent with the Cowlitz County comprehensive plan because it would improve an existing recreation access point. While the use of the Forestry – Open Space designated areas of the site for the infiltration pond and flare is not consistent with the plan designation, it would not result in any land use or policy impacts because the the site is not currently used for timber production, there are no adjacent areas under timber production and the site does not represent unique wildlife habitat. As noted in Chapter 3, soils on site consist of modified or fill land and, according to the U.S. Department of Agriculture Natural Resource Conservation Service, are not suitable for timber production (Pringle 2006). In addition, Chapter 6, Plants and Animals, concludes that the site has only limited habitat qualities.

Cowlitz County Shoreline Management Master Program

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would result in development within the shoreline area regulated by the Cowlitz

County SMP, which designates the shoreline environment at the project site as Urban and Conservancy. According to the shoreline use activity regulations of the County's 1977 SMP, ports and water-related industries are permitted uses on Urban shorelines and conditional uses on Conservancy shorelines. In addition, some water-dependent uses, such as dredging in the Urban environment, are classified as a conditional use as well. The project proponent has prepared a shoreline substantial development permit (SSDP) and shoreline conditional use permit (SCUP) for the proposed project with the ULE Alternative and Marine Terminal Alternative 1 that demonstrates compliance with all applicable criteria contained in the County SMMP. Compliance with the goals and policies of the Cowlitz County SMMP are addressed in the shoreline narrative, attached as **Appendix H**. The CR Alternative and Marine Terminal Alternatives would involve the same general features and elements as the the ULE Alternative and would be expected to be in compliance with the SMMP. The southern half of the project site is located within the Urban District of the shoreline. For the proposed project with the ULE Alternative and Marine Terminal Alternative 1, the activities proposed within the Urban District would consist of the following:

- Dredging
- Ranney collector well and associated improvements
- Dock (for mooring and loading methanol onto ship's cargo operations, loading and unloading, vessel supply operations, layberthing, and for short- and long-term vessel moorage)
  - Dock structure (piles, caps, decking, etc.)
  - Operation shack
  - Longshore break shelter
  - Stormwater pump station
  - Security gate
  - Utilities
  - Hydraulic and electric utility boxes
  - Marine loading arms
- Electrical substation
- Methanol pipelines
- Pipe rack
- Methanol pump pad/ship scrubber
- Site process water and pump station
- Utilities serving site uses
- Security guard shack and parking
- Site grading and excavation
- Temporary falsework
- Stormwater weir and outfall removal
- Security fencing
- Tradewinds Road (part) (private)

Portions of the north side of project site are located in the Conservancy District of the shoreline. Activities proposed within the Conservancy District would consist of the following:

- Tradewinds Road (private)
- Parking for recreation
- Recreational access point
- Infiltration ponds
- First flush pond
- Foam buildings
- Portion of the bulk product storage
- Portion of the fire suppression water storage
- Habitat mitigation
- Loop Road
- Site grading and excavation
- Security fencing

The CR Alternative and Marine Terminal Alternative 2 would remove the air separation unit, ship scrubber, and Loop Road from the shoreline environment, but would introduce chemical storage and the cooling water system. As with Marine Terminal Alternative 1, Marine Terminal Alternative 2 would be located within the Urban District. In 2004, a SSDP was obtained for Marine Terminal Alternative 2, but the marine terminal was not constructed. It is anticipated that the shoreline impacts would be similar regardless of the Technology or Marine Terminal Alternative and through the submittal of the SSDP and SCUP and compliance with any permit conditions, the proposed project would be consistent with public policy related to the County SMMP.

Cowlitz County Critical Areas Protection (CCC 19.15)

The proposed project would result in development within five designated critical areas: frequently flooded areas, fish and wildlife habitat conservation areas, geologic hazard areas, CARAs, and wetland buffers that extend onto a portion of the project site. Potential impacts to these critical areas have been assessed in the relevant chapters of this environmental impact statement (Chapter 5, Water Resources, and Chapter 6, Plants and Animals). A critical areas report has also been prepared for the proposed project that describes mitigation measures that ensure there would be no net loss of critical area functions and values (see **Appendix H**). The proposed project, including the pile removal mitigation measures, would be consistent with public policy related to critical areas protection.

Port of Kalama Comprehensive Plan and Scheme of Harbor Improvements

The Port's comprehensive scheme describes the Port's plans for future investment, operation, and development of its properties including the North Port site. The proposed project would further the Port's strategy for continued industrial development of the North Port site and is consistent with the highest and best use of the North Port site, which has been identified as an expansion of the marine terminal and water-dependent industry. The proposed project would, therefore, be consistent with the Port's comprehensive scheme.

Population and Housing

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would employ 192 workers during operation (ECONorthwest 2015). It is likely that many operational workers would live in the area, and therefore would not have the potential to affect population and housing characteristics; however, this analysis conservatively assumes that all workers would be new to the population and housing study area.

According to the U.S. Census Bureau's 2013 ACS five-year estimates, the population of the study area was 2,718,987 residents. The proposed project is anticipated to add approximately 192 jobs, which could increase the population by approximately 492 people based on an average household size of 2.56[3] if all employees were new to the area. This would represent a negligible increase in the overall population of the study area (approximately 0.02 percent of the total 2013 population). Furthermore, with an areawide averaged 7 percent vacancy rate, it is anticipated that any increase in households could be absorbed into the current housing market. Therefore, there would be no significant adverse impacts to population or housing characteristics due to the proposed project.

9.4.2 Related Actions

The following assessment of the related actions is based on the Kalama Lateral Project Environmental Assessment issued by FERC in connection with Northwest's Section 7(c) application (Docket No. CP15-8-000) and an assessment of the electrical service improvements planned by Cowlitz County Public Utility District No. 1 to serve the project.

9.4.2.1 Kalama Lateral Project

The proposed pipelin would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the construction area, as well as the introduction of a new use to some areas of the proposed pipeline route. Construction of the proposed pipeline would require acquisition of temporary construction right-of-way (ROW) and temporary extra work areas, as well as the construction of permanent access roads and aboveground facilities. Construction disturbance would affect a total of 127.1 acres. 94.7 acres would be restored to pre-construction conditions and uses and 32.4 acres would be retained for operation of the project. The proposed pipeline would also require a new 50-foot wide permanent ROW for operation. This ROW would be maintained in a grassy state except where it is unnecessary, such as in actively managed agricultural fields and maintained residential properties. The related action would convert approximately 12.4 acres of forest land to maintained ROW for the life of the proposed pipeline (see **Appendix B**).

Most of the land disturbed by construction and operation of the proposed pipeline would be existing developed land and forest land. Existing land uses would be allowed to continue on the permanent ROW and the easement may be crossed by roads, fences, utilities, etc. However, uses that could hinder, conflict, or interfere with Northwest's surface or subsurface rights or disturb its ability to operate, maintain, and protect its facilities would be restricted. Prohibited activities on the permanent easement would include erecting structures or other buildings and constructing reservoirs and excavations that change the surface grade or obstruct Northwest's

[3] Household size based on an average of the average owner-occupied household size for all study area counties. Source: U.S. Census Bureau 2013 ACS 5-year estimates (2009-2013).

access along the easement. There are no existing structures that would require removal to allow for the permanent ROW and easement.

The Cowlitz County Comprehensive Plan's Community Facilities Element includes goals and policies related to the planning and development of major utility lines. The Kalama Lateral Project Environmental Assessment identifies the primary goal related to major utility lines is that they are "designed and constructed to minimize environmental impacts and that use of existing utility corridors should be maximized before new utilities are constructed in new or expanded corridors." The proposed pipeline does not parallel or co-locate with existing utilities. Northwest evaluated project alternatives that included substantial lengths of co-location, but it was found that these alternatives would have greater impacts to residential structures and environmental resources.

Utility facilities, including natural gas pipelines, are permitted to cross most designated critical areas if they comply with the requirements of CCC Chapter 19.15, including submittal of a critical areas permit. The Kalama Lateral Project Environmental Assessment states that Northwest would apply for all required permits in February 2016.

Overall, it is not anticipated that the natural gas supply would have significant adverse impacts on land use or public policy.

9.4.2.2 Electrical Service

The proposed electrical service improvements would have the potential to result in temporary disruption to activities or inconvenience to persons living or working near the construction area, as well as the introduction of a new overhead crossing of I-5, the BNSF rail road, and N. Hendrickson Drive within the city of Kalama. The upgrade to the existing transmission line would not involve additional clearing or other significant construction activities because it is located within an existing transmission corridor that has been maintained activity for this use. The new transmission line would be located primarily over existing maintained transportation corridors (road and rail) and would be designed to result in no impacts to these existing land uses. A small section (approximately 100 feet) would be located over vegetated areas of I-5 and may require removal of tall vegetation. There are no residential or other sensitive land uses within the area that could be impacted by the vegetation removal.

The Cowlitz County Comprehensive Plan's Community Facilities Element includes goals and policies related to the planning and development of major utility lines. The primary goal related to major utility lines is that they are "designed and constructed to minimize environmental impacts and that use of existing utility corridors should be maximized before new utilities are constructed in new or expanded corridors." The proposed electrical service improvements would be predominantly located in an existing corridor with a new corridor established in an area with minimal environmental impacts because of the limited nature of the corridor and its location over existing transportation corridors.

Utility facilities are permitted to cross most designated critical areas if they comply with the requirements of CCC Chapter 19.15, including submittal of a critical areas permit. Authorization would be obtained from Washington State Department of Transportation, the BNSF Railway, and Cowlitz County or the City of Kalama as necessary.

Overall, it is not anticipated that the electrical service improvements would have significant adverse impacts on land use or public policy.

9.4.3 No-Action Alternative

The proposed project would not be constructed on the project site under the No-Action Alternative. However, it is anticipated that the Port would pursue future industrial or marine terminal development at the North Port site, consistent with the Port's comprehensive scheme. Therefore, with the No-Action Alternative the project site is likely to be transformed from a dredged material disposal site into a more intensive industrial or marine terminal use. Public access sensitivities of any potential future alternative use are not known; therefore, the No-Action Alternative does not include on-site recreation access improvements like those contemplated under the proposed project. The No-Action Alternative, like the proposed project, would result in an increase in the worker population in the Port area, which could result in a small increase in the residential population and housing demand in the surrounding area. It is anticipated that the No-Action Alternative would not have a significant adverse impact on population or housing characteristics due to the size of the population and number of housing units within the study area.

It is expected that activities under the No-Action Alternative would be consistent with land and shoreline uses and public policy and land use plans. Expected land use and shoreline use impacts of the No-Action Alternative are expected to be similar to those of the proposed project.

9.5 Mitigation Measures

9.5.1 Project Mitigation

The design features and best management practices the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the Project and have been considered in assessing the environmental impacts to land use and shoreline resources. Overall, the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would be compatible with surrounding land and shoreline uses and consistent with zoning and applicable land use plans and public policies.

9.5.2 Additional Mitigation

There are no significant adverse impacts identified for public service and utility resources; therefore, no additional mitigation measures are identified.

9.6 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts to land and shoreline use, zoning, land use plans and public policy, population, or housing characteristics.

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Chapter 10 Aesthetics and Visual Resources

10.1 Introduction

This chapter assesses the potential impacts on aesthetics and visual resources of the proposed project's Technology Alternatives and Marine Terminal Alternatives and a No-Action Alternative. For the purposes of this assessment, aesthetics and visual resources refer to the overall visual character of the project site and the surrounding area. This chapter describes the regulatory setting and methodology used to conduct the aesthetic analysis, and describes the affected environment, including an identification of existing visual resources, such as key viewpoints in the study area. The report then assesses the proposed project's potential impacts on aesthetics and visual resources. This assessment also includes an evaluation of potential impacts due to light (i.e., man-made artificial nighttime light) and glare (i.e., a strong or dazzling lighting condition originating with sources of either direct or reflected light that causes visual discomfort) resulting from the proposed project.

In addition to the proposed project, this chapter evaluates the proposed project's related actions: the Kalama Lateral Project (the proposed pipeline) and the upgraded transmission lines and substation improvements.

This analysis concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in significant adverse impacts to aesthetics or visual resources.

10.2 Regulatory Setting and Guidance Context

This environmental impact statement has been prepared pursuant to the Washington State Environmental Policy Act (SEPA) (Revised Code of Washington [RCW] Chapter 43.21C) and the Cowlitz County (County) Environmental Policy (Cowlitz County Code [CCC] Chapter 19.11) implementing SEPA in the County. SEPA rules set forth in Washington Administrative Code (WAC) Chapter 197-11 and adopted by Cowlitz County require the consideration of aesthetics as an element of the environment in SEPA review.

State and County SEPA regulations and supporting materials, such as the Washington State Department of Ecology SEPA Handbook, do not provide specific guidance for conducting assessments of aesthetics and visual resources. However, such guidance is provided by various federal agencies and addresses appropriate methods, considerations, and procedures for aesthetics and visual resources assessments. This assessment of aesthetics and visual resources draws on the guidance provided by these agencies. For the purposes of this aesthetics and visual resources assessment, guidance provided by resource managers in various federal agencies has been used to develop the assessment methodology. The most widely known of these methodologies are those developed by U.S. Department of Agriculture and U.S. Forest Service (Landscape Aesthetics, A Handbook for Scenery Management), the U.S. Department of Transportation, Federal Highways Administration (Visual Impact Assessment for Highway Projects), and U.S. Department of Interior, Bureau of Land Management (The Visual Resource Management System). These methodologies have been used in prior Northwest energy project assessments (most recently in analyzing the visual impacts of wind energy facilities); however, the landscape and land use setting of the proposed project are considerably different than those generally evaluated by these federal agencies. While none of these methodologies apply

directly to this project, each utilizes a process of conducting a visual inventory within the local landscape and visual context and identifying viewer sensitivity and response. This process forms a general framework for assessing a project's potential visual impacts.

Federal and state regulations also designate areas of scenic importance. These areas are considered in this assessment as appropriate. At the federal level, areas of outstanding natural and scenic value are designated as National Scenic Areas. There are no National Scenic Areas within the study area. At the state level, roadways of scenic and recreational value are designated as Washington State Scenic and Recreational Highways. As discussed below, Interstate 5 (I-5) in the vicinity of the project site is designated as part of the Lewis and Clark Trail Scenic Byway.

10.3 Methodology

The visual resource methodology used to inventory and assess the potential impacts of the proposed project and alternatives includes the following steps:

- Define the study area;
- Prepare a viewshed determination;
- Identify and evaluate potentially sensitive viewers and viewpoints within the landscape context of the development;
- Use visual simulations to describe the visual changes introduced by the construction and operation of the proposed project and alternatives, as appropriate;
- Assess the visual impacts from potentially sensitive viewpoints within the visual context of the proposed project and alternatives; and
- Recommend mitigation measures, if necessary.

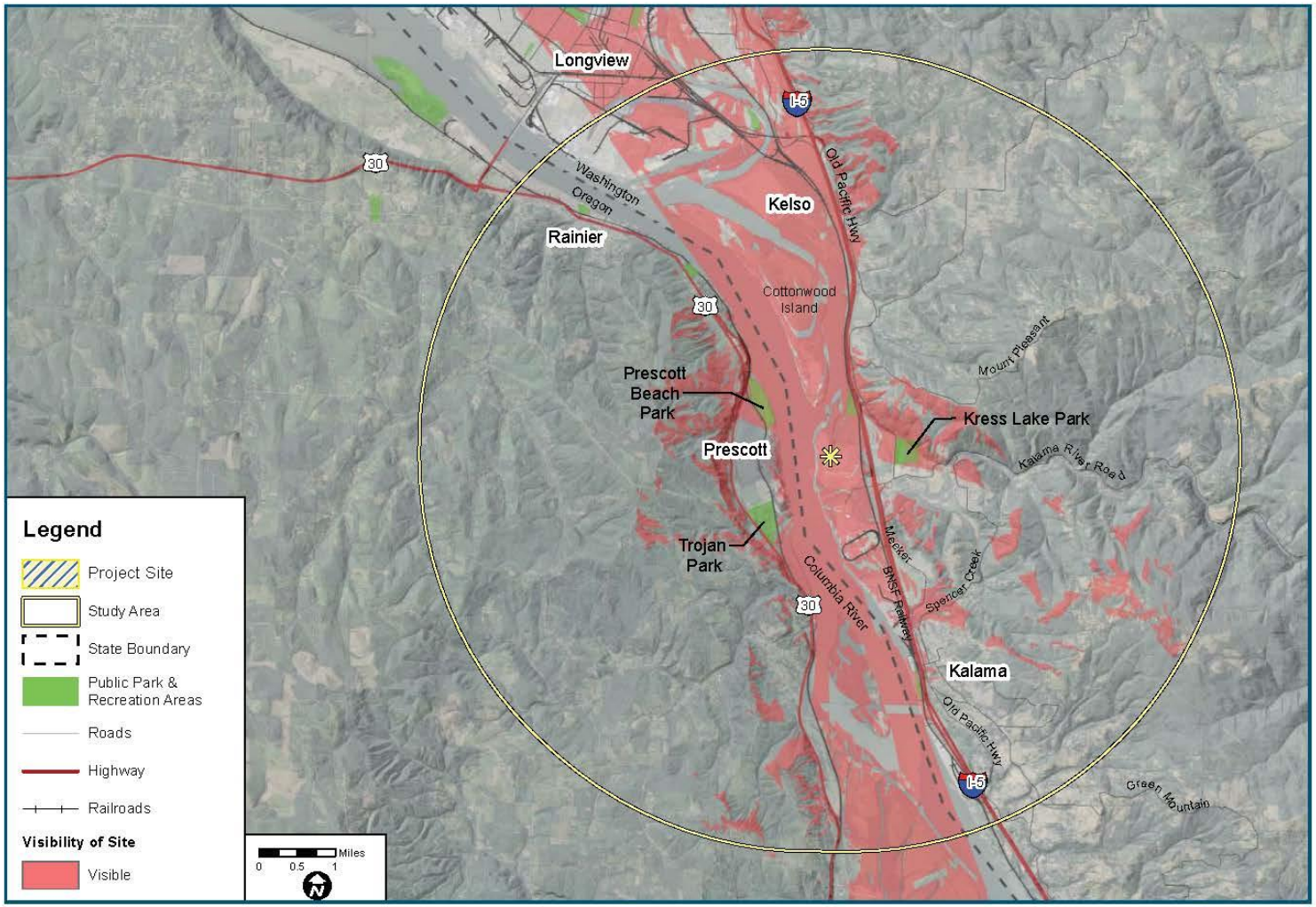
10.3.1 Define the Study Area

The study area for the affected environment for aesthetics and visual resources is generally defined as the area within visual range of the proposed project. This area should encompass ground-based locations from which a project could be appreciably observed in detail (Bureau of Land Management 1986). Given the regional physiography, vegetation, and built environment surrounding the project site, details of the proposed project would be appreciably observable for viewers at ground-based locations within approximately 5 miles of the project site. Beyond 5 miles, the proposed project would blend into the visual context of surrounding land uses and details would no longer be visually apparent. Therefore, a 5-mile radius, including areas on the west side of the Columbia River, has been defined as the study area.

10.3.2 Prepare a Viewshed Determination

A viewshed is the area within visual range of a given viewpoint, which is defined by the regional physiography, vegetation, and built environment. In order to determine the viewshed area from which aesthetic changes on the project site may be experienced, City and County maps, U.S. Geological Survey quadrangle maps, project maps, and aerial and site photographs were consulted to determine the physiographic features within the study area that influence views of the project site and define the visual environment. A digital elevation model of the area was then created using ESRI ArcGIS, a 3-D mapping software package. The digital model was used to create a viewshed determination that identifies locations based on topographic screening (excluding vegetation) that may have views of the project site. The viewshed determination defines the general area within the study area from which specific viewpoints will be selected.

As shown in **Figure 10-1**, the viewshed encompasses most areas within the Columbia River floodplain to the north, south, and west of the project site but is limited by the hills bordering the floodplain. Views from the east are obstructed by topography (e.g., Drays Mound, a prominent rock outcropping near the project site). The viewshed determination is a screening level assessment that only accounts for topography in determining which locations may have views of the project site. The next step in the analysis, viewpoint selection, accounts for vegetation and the built environment.



Viewshed Determination
Figure 10-1

KALAMA SEPA
Manufacturing & Marine Export Facility

10.3.3 Viewpoint Selection

Digital mapping software (ESRI ArcGIS, Google Earth, Google Maps, Map Quest, Bing Maps, etc.) and aerial and site photographs were used to identify built environments, public amenities, travel routes, urban areas, residential areas, and existing vegetation within the 5 mile study area. This information, in combination with the viewshed determination, was used to select viewpoint locations for this assessment.

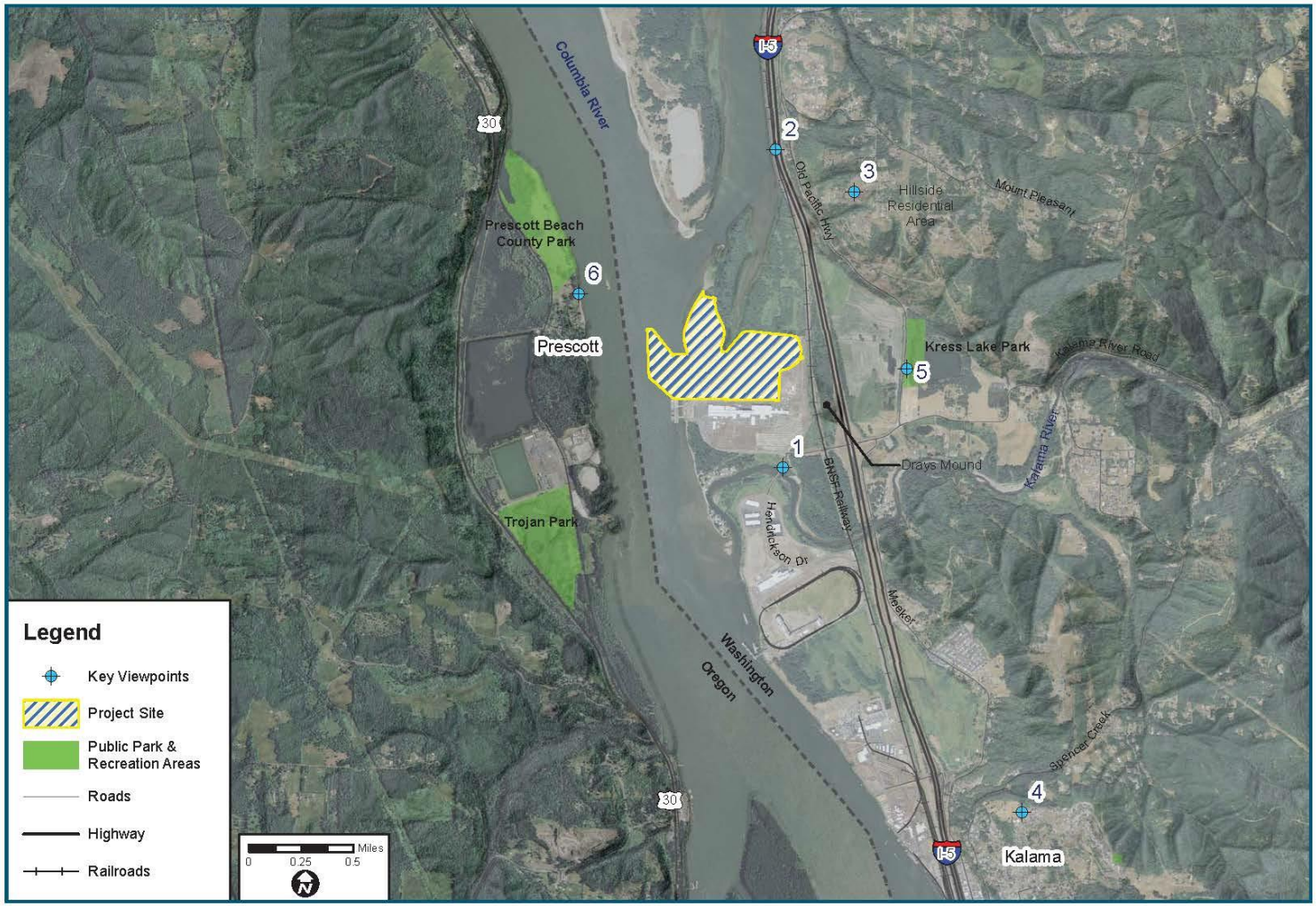
Natural landforms block views of the project site for viewers in portions of the study area. In addition, the built environment and existing vegetation obstruct views of the project site for many remaining viewers. However, six viewpoints were identified from which views of the project site could be altered by the proposed project. **Figure 10-2** shows the locations of these six viewpoints.

At each proposed viewpoint, general views were verified and photographs were taken using a high-resolution DSLR camera with a 50-mm lens. Daytime photos were taken on a clear sunny day with a high sun angle to show the most direct and brightest sunlight at each viewpoint. Although glare conditions would vary depending on sun angle, viewer location and glare surface, a high sun angle was used to provide a reasonably conservative and consistent baseline condition for light and glare at all of the viewpoints. Photographic inventory sheets, which include information on weather conditions, time of day, and technical specifications for the camera, are provided for each photograph in **Appendix I**.

To create photos as close as possible to what the human eye would see, photographs were taken at the height of an average viewer's eye (approximately 5 feet 5 inches above ground level). Because a single photograph cannot capture the field of vision of a human eye, a sequence of photographs was taken from each viewpoint. Using Adobe Photoshop, the photos were digitally stitched or "grouped" together to form panoramas; the photos were overlapped and their edges were cropped to reduce edge distortion and to fit print materials. No other photo manipulations were performed. Using the photographs, the extent of the view of the existing site from each viewpoint was identified and its existing visual character and the types of viewers using that viewpoint was assessed.

Based on the existing land uses and environmental conditions at the viewpoints, views of the project site were classified into three categories.

- **Urban/Industrial Views** – Viewers within this landscape view the site in the context of an existing built environment of urban industrial areas or travel corridors.
- **Rural/Residential Views** – Viewers within this landscape view the site in the context of a mixture of surrounding natural and man-made features/patterns, including land used for farming, mineral extraction, or forestry.
- **Natural Views** – Viewers within this landscape view the site in a context of surrounding natural features and a largely undisturbed recreational or open space setting. Few man-made developments or disturbances are present.



Key Viewpoints
Figure 10-2

KALAMA SEPA
Manufacturing & Marine Export Facility

10.3.4 Viewer Sensitivity

Viewer sensitivity is the measure of concern for visual quality and the response to changes to the elements of the natural and constructed environments the viewer experiences through sight. Viewer sensitivity is related to changes in available views of the landscape, buildings, construction and demolition of structures, operational equipment, and emissions. The effects of those changes on viewers depends on the types of users, the amount of use (number of viewers and view frequency), and adjacent land uses, as described below.

- **Types of Users** – Based on the viewpoint locations, the general types of viewers who see the site can be characterized as residents, workers, travelers, and recreationalists. Visual perception and sensitivity vary with the type of user. Residential or recreational sightseers may be highly sensitive to changes, while those in a work setting, such as industrial, manufacturing, or warehouse workers, tend to have a low sensitivity. A working viewer's activity, awareness, and sensitivity are typically limited to the visual setting immediately outside the workplace and do not extend to surrounding views.
- **Amount of Use** – The number of viewers varies depending on activity and the location, but areas used by large numbers of people are potentially considered to have a higher exposure, or sensitivity, because more viewers could be affected. Impacts to visual quality usually become more likely as the number of viewers and the duration of views increase.
- **Adjacent Land Uses** – Proposed changes may or may not affect the visual quality or other aspects of land uses in adjacent lands directly. The visual elements of adjacent landscapes and natural areas, buildings, structures, and operations define a visual character or context with which the proposed uses and facilities are compatible or in conflict.

10.3.5 Visual Impact Assessment Methodology

Visual impact assessments are based on the evaluation of the visual quality and viewer sensitivity. Viewer sensitivity is considered within the context of reasonable expectations of those experiencing views of a heavily industrialized area. The degree of effect depends on both the magnitude of change to the visual resource and the potential viewer response to and concern for those changes. The levels of effect are identified as high, moderate, low, and no effect.

- **High Level of Effect (H)** – Assigned in situations in which operations, buildings, or other structures would be highly visible to a large number of sensitive viewers and would impact the visual quality of the landscape setting negatively. Mitigation measures may or may not provide benefit to this level of impact.
- **Moderate Level of Effect (M)** – Assigned in situations in which the operations, buildings, or other structures could be visible to high numbers of viewers with a low sensitivity or a low number of highly sensitive viewers. Moderate impacts may be generally consistent with adjacent land uses and some mitigation may be required to minimize impacts to sensitive viewers.
- **Low Level of Effect (L)** – Assigned in situations in which there are a low number of viewers or the proposed operations, buildings, or other structures would be minimally visible. Impacts would also be low if distance and/or visual compatibility with other existing land uses make impacts difficult to perceive.
- **No Effect** – Assigned in situations in which the proposed operations, buildings, or other structures would not be visible.

The assessment of potential impacts also accounts for measures included in the proposed project that would be intended to minimize effects to aesthetics and visual resources, such as lighting controls. This assessment uses the levels of effect to identify potential significant adverse impacts. Potential significant adverse impacts may be identified for high levels of adverse effect on visual resources, depending on the specific circumstances of the view and viewer sensitivity.

In order to assess potential impacts on aesthetics and visual quality, visual simulations were prepared illustrating the fully constructed condition of the proposed project. The visual simulations were developed using existing conditions photographs from each of the viewpoints discussed below. A combination of AutoCAD files and Google SketchUp Pro were used to create an overall 3-D model of the project site and the surrounding area. The 3-D models were then geo-referenced and placed in Google Earth Pro. Perspective views of the 3-D models were generated using the existing viewpoint locations. Images from the 3-D model were then superimposed over the high-resolution digital photographs in Adobe Photoshop to simulate the constructed condition of the proposed project. The digital photographs and the simulations represent before and after images and help describe the visual change that would be associated with this project. No other photo editing or touchup work was done to the simulations. The visual simulation task and analysis provided the basis for the visual assessment.

The visual simulations in this assessment are of the Ultra-Low Emissions (ULE) Alternative and Marine Terminal Alternative 1, but these views are representative of the potential visual impacts of the proposed project with either Technology Alternative and with either Marine Terminal Alternative. The size, layout, and appearance of the proposed project would vary slightly depending on which Technology Alternative and which Marine Terminal Alternative was selected. But in either case, the proposed project would result in the development of a methanol manufacturing facility and a new marine terminal. The aesthetic, light, and glare differences between the alternatives would be minor for viewers within the context of the larger viewshed and would not affect the overall perception of the proposed project.

10.3.6 Data Sources

The evaluation uses the following sources of information to evaluate the visual characteristics of the study area.

- Cowlitz County GIS data
- Guidance documents prepared by the U.S. Department of Interior Bureau of Land Management, U.S. Department of Agriculture, and U.S. Department of Transportation Federal Highways Administration
- AutoCAD files of the proposed project provided by Northwest Innovation Works, LLC
- Field surveys conducted in February and March 2015
- Resource Report 8, Land Use, Recreation, and Aesthetics, prepared for the proposed pipeline (the related action as discussed in this assessment) for Northwest Pipeline LLC (Northwest) Section 7(c) application to the Federal Energy Regulatory Commission (FERC)
- Environmental assessment prepared by FERC for the proposed pipeline

10.4 Affected Environment

This section describes the affected environment for visual resources for the project site. The project site and most areas within the viewshed determination lie in the Columbia River valley, including rural areas on both sides of the Columbia River. This floodplain is the defining feature of the affected viewshed and affords wide views of the river and surrounding hillsides because of its relatively flat topography and limited landform interruptions. The width of the floodplain varies based on the proximity of hillsides east and west of the river. At the project site, the floodplain extends approximately 2.5 miles perpendicular to the river.

With the exception of Drays Mound directly east of the project site between the BNSF railway and I-5 (approximate elevation 265 feet), the elevation of the floodplain generally ranges from approximately 5 to 30 feet in the study area. The hillsides east and west of the floodplain rise steeply and are generally heavily forested and in a natural or semi/natural condition. The native vegetation of the floodplain is a complex landscape composed of riparian and lowland deciduous and conifer forests but, in many areas, depending on the level of existing development, the vegetation has been highly modified. The built environment and existing vegetation across the relatively flat floodplain block most views of the project site. The viewshed is also influenced by the floodplain and topography associated with the Kalama River (approximately 1,500 feet south of the project site) extending east of the Columbia River.

The urban areas nearest the project site are Kalama, Washington, and Prescott, Oregon. As shown in **Figure 10-1**, the project site is not visible from most of Kalama due to intervening topography and vegetation. Downtown Kalama is located approximately 2.5 miles south of the project site. The City of Prescott, Oregon, which consists of a small cluster of residential land uses along the Columbia River, lies west of the project site on the opposite shore of the river. Residences along the Columbia River in Prescott have views of the project site.

I-5 is the nearest major land transportation corridor. I-5 is part of the Washington State Department of Transportation Lewis and Clark Trail Scenic Byway. This scenic byway extends 572 miles between Clarkston on the Idaho border and Cape Disappointment on the Pacific Coast. Overall, the byway passes through a variety of terrains and visual landscapes, including transitions between urban and rural areas.

There are a number of residential areas located within unincorporated Cowlitz County that may have views of the project site. They are generally located at least 1 mile east of the project site on the hills and bluffs above the floodplains.

There are numerous recreational opportunities and sites within the viewshed area. The most notable for the purposes of this assessment include the Kress Lake property and Prescott Beach Park. The Kress Lake property is located approximately 0.5 mile east of the project site and is a popular fishing location with a small boat launch and hiking trail. This property is owned and managed by the Washington Department of Fish and Wildlife (WDFW). Prescott Beach Park is located on the west shore of the Columbia River, approximately 0.5 mile northwest of project site.

Both the Columbia River and the Kalama River are prominent recreational resources and support boating, fishing, and other forms of water recreation.

10.4.1 Viewer Groups and Associated Key Viewpoints for Proposed Project

As discussed above, digital mapping software (Google Earth, Google Maps, Map Quest, Bing Maps, etc.) and aerial and site photographs were used to identify built environments, public amenities, travel routes, urban areas, residential areas, and existing vegetation. This information, in combination with the viewshed determination, was used to select six key viewpoints from which views of the project site could be affected. Viewpoints are described individually below and are grouped by view type (i.e., Urban/Industrial Views, Rural/Residential Views, and Natural Views). The following sections describe the viewer sensitivity and associated key viewpoints.

10.4.1.1 Urban/Industrial Views

The typical viewers in this area are assumed to be industrial workers and commuters traveling on Kalama River Road, North Hendrickson Drive or Tradewinds Road. Visual sensitivity within the industrial use area along the Columbia River is expected to be low because of the existing industrial character. Existing industrial facilities appear large in scale and define the visual character of the area. Major visual lines are defined by large-scale, man-made buildings and structures, and thus are straight vertical, horizontal, and diagonal lines. The colors of the existing structures and surfaces vary but are primarily white, grey and other light colors. Artificial lighting is common throughout the industrial area along the Columbia River and along I-5.

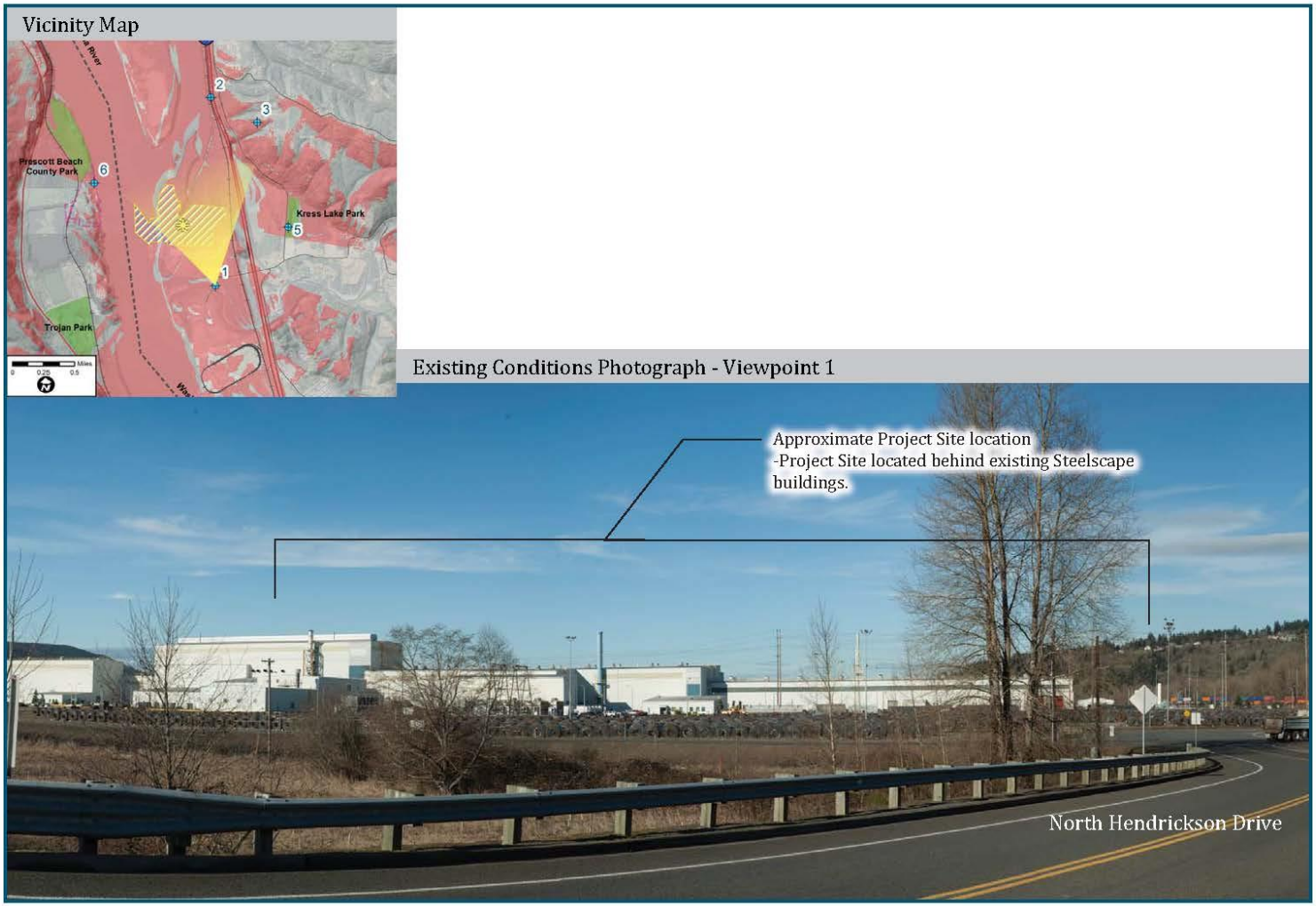
Viewers also include travelers along I-5. Movement resulting from vehicular traffic, personnel, and industrial emissions (i.e., water vapor plumes) is a common feature of views of the area. Although most facilities lack extensive windows or other highly reflective surfaces, glare from light-colored building surfaces can be common in bright sunlight conditions. The concentration of similar facilities and land uses can make potential changes in nighttime lighting difficult to discern within this industrial context. Additional viewpoints are available throughout the Urban/Industrial area but visual character would be comparable to the representative viewpoints discussed below and viewers would have similar visual sensitivities.

The following is a summary of the key urban/industrial viewpoints.

Key Urban/Industrial Viewpoints

Viewpoint 1 **–** North Hendrickson Drive (1,700 feet south of the nearest project limit line): This viewpoint represents views of the project site from nearby industrial areas. This view is from the edge of the Kalama River Bridge slightly above the elevation of the project site. The view is dominated by the numerous large-scale industrial facilities associated with the existing Steelscape manufacturing facility. North Hendrickson Drive runs nearly perpendicular the project site, illustrating some of the most direct views to the site (see **Figure 10-3**). Viewer sensitivity at this viewpoint is low.

Viewpoint 2 **–** Southbound I-5 (4,650 feet north of the nearest project limit line): Both north and southbound travelers on I-5 have views of the project site; however the most direct views are from southbound I-5 north of the site. **Figure 10-4** shows a view of the project site from I-5. Most views of the site are blocked for northbound I-5 travelers by existing vegetation, particularly during summer months when existing deciduous trees are leafed out. Views are also limited by the Kalama River Road interchange (Exit 32) ramps and bridge. Drays Mound blocks views for both northbound and southbound travelers from the east. Although I-5 is a scenic byway, these viewers tend to be focused on driving and have transitory views of short duration. Therefore, travelers have a low sensitivity to change.



Viewpoint 1 - North Hendrickson Drive

Figure 10-3

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Viewpoint 2 - I-5
Figure 10-4

10.4.1.2 Rural/Residential Views

The typical Rural/Residential viewer is a resident on the hillside to the east of the project site in low-density unincorporated Cowlitz County or the northern portion of Kalama. Viewpoints 3 and 4, discussed below, provide representative views for rural/residential viewers in these areas. There are also residential viewers west of the river in Prescott, Oregon. Their views would be similar to those described in viewpoint 6 below.

The visual character of Rural/Residential views consists of natural and man-made features and patterns. The more intensely developed large-scale industrial facilities, high voltage electrical transmission lines, electrical substations, and plumes of industrial emissions are less prominent in these views and may not be clearly visible. From these views, industrial emission plumes and artificial lighting in the industrial area along the Columbia River may be visible, but the concentration of emissions and light sources at similar facilities and land uses in this industrial area reduces the visual distinction of any single site or facility.

Public and semi-public locations within the hillside residential area, such as the Mount Pleasant Cemetery, were evaluated for affected views of the proposed project site. All direct views of the site were blocked by large-scale physiography and/or existing vegetation. Therefore, these areas were not included in the evaluations.

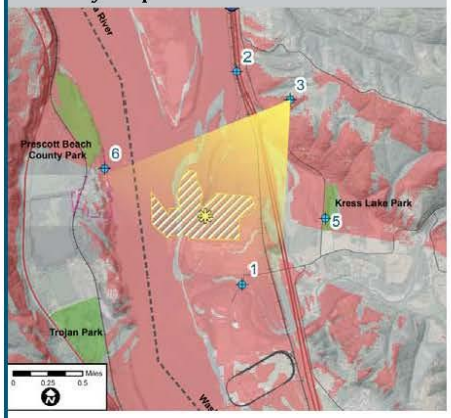
The following is a summary of the key Rural/Residential viewpoints.

Key Rural/Residential Viewpoints

Viewpoint 3 **–** West Kingsbury Road (3,900 feet northeast of the nearest project limit line): This viewpoint represents views of the project site from the rural residential areas in unincorporated Cowlitz County. The general character of the area is large residential lots on forested hillsides located northeast of the project site. Many residences have cleared trees and vegetation to open views of the Columbia River and surrounding areas which may include views of the project site. The viewshed determination shows that only the westernmost residential lots have the views of the project site (see **Figure 10-1**). Due to prolonged and frequent views from rural/residential locations, the overall viewer sensitivity to changes in aesthetic resources from this Rural/Residential viewpoint is assumed to be high. However, there are a low number of viewers from this area, and their views include existing industrial development, such as the Steelscape facility adjacent to the project site.

The West Kingsbury Road viewpoint illustrates the aesthetic and visual resource conditions a typical residential viewer would experience (see **Figure 10-5**). There may be additional views from public locations in the hills east of the project site, such as public roadways. These viewers would experience similar aesthetic conditions but views would be less frequent and of shorter duration; thus, viewer sensitivity would be lower.

Vicinity Map



Existing Conditions Photograph - Viewpoint 3



Viewpoint 3 - West Kingsbury Road

Figure 10-5

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Viewpoint 4 – North 5th Street (12,100 feet southeast of the nearest project limit line): Although access constraints to private residential lots within the City of Kalama prohibit the evaluation of most of this viewing area, viewpoint photos were available from an undeveloped lot on North Fifth Street (see **Figure 10-6**). These areas are generally characterized by contiguous neighborhoods on winding hillside streets and offer sweeping views of the Columbia River, its floodplain, and the surrounding hillsides. Existing vegetation and large-scale topographic features block most views to the north from residential neighborhoods, but some views may include the project site and industrial areas associated with the Port of Kalama. Urban areas in Longview and Kelso, including commercial and industrial areas and artificial lighting, may also be seen in the background of these views.

Residential viewers tend to have high sensitivity to potential changes. However, views from this residential area in Kalama are more than 2 miles from the project site. As a result, it is difficult to discern individual facilities within the context of the larger industrial area along the waterfront. Nighttime views would include commercial and industrial lighting of Kalama and the Port of Kalama; however, no single facility or light source dominates existing views. The overall viewer sensitivity to change in aesthetic and visual resources from this viewpoint is assumed to be moderate.

10.4.1.3 Natural Views

The typical viewers in natural areas are assumed to be recreationalists using public parks, natural areas, or the Columbia River and/or Kalama River. Prescott Beach and Trojan Park offer public beach and water access, hiking, biking, fishing, swimming, picnicking, sunbathing, and other passive recreation opportunities. Recreational opportunities also include Kress Lake to the east of the project site, which offers fishing, boating and hiking. The visual character of natural areas is formed by distinctive and memorable natural features (landforms, rock, outcrops, etc.) and patterns (vegetation and open space) with few man-made features. The visual texture consists of rough natural surfaces and colors, including browns, yellows, and greens, and smooth surfaces of river or lake water.

The Columbia River offers a variety of on-water recreational opportunities such as wind/kite surfing, boating, fishing, and other forms of water recreation. Views for a typical recreationalist are assumed to be infrequent and of short to moderate duration; however, viewer sensitivity tends to be high due to the public nature and interest in natural areas and the inconsistent environment of natural and industrial lands.

In addition to its use by recreationalists, the Columbia River is also navigable by commercial boat operators. Viewers from commercial boats are expected to have a low sensitivity to change in aesthetics because of the infrequent and transitory nature of their views, making it unlikely that they would focus on the project site.

The proposed project would improve the roadway used to access the informal recreation area located to the north of the project site and would provide a new parking area. The project site is visible in views to the south from this recreation area and appears mainly as a barren dredge material disposal site Viewers currently access the recreational area through an industrial setting, passing by the existing Steelscape facility, Air Liquide facility, and the Port of Kalama wastewater treatment plant. Thus, viewer sensitivity is expected to be low as it is not characterized by an expectation of natural scenic settings. There are also a low number of viewers from this location.



Viewpoint 4 - North 5th Street

Figure 10-6

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The following is a summary of the key natural viewpoints.

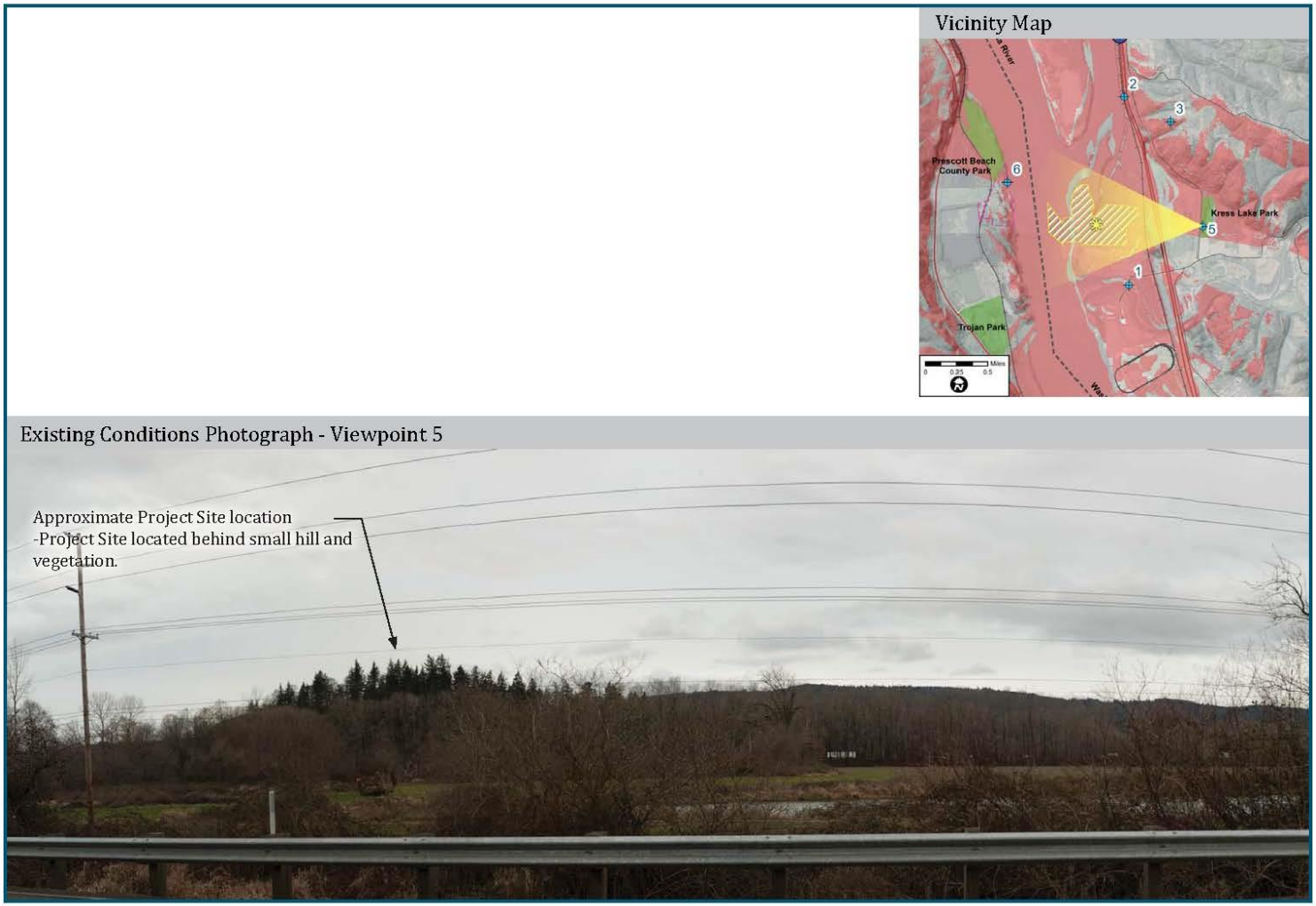
Key Natural Viewpoints

Viewpoint 5 **–** Kress Lake (2,700 feet east of the nearest project limit line): The project site lies east of I-5 and Drays Mound and large tracts of natural vegetation; therefore, it is not anticipated that recreational users would have direct views of the project site except during times when the vegetation is dormant (see **Figure 10-7**). Some screened views of the northern portions of the project site may be possible during winter months when vegetation is dormant; however, it is anticipated that the majority of recreational users access Kress Lake in summer months when vegetation blocks most views. Furthermore, Kress Lake is a day-use only facility and therefore viewers are not sensitive to nighttime lighting conditions. This viewpoint has been included because views are possible in winter months and water vapor plumes from the project site may be visible, depending on atmospheric conditions. Recreational viewers from Kress Lake (e.g., anglers, hikers), are expected to have an overall low viewer sensitivity to changes at the project site.

Viewpoint 6 **–** Prescott Beach Park (2,800 feet northwest of the nearest project limit line): Viewers from Prescott Beach Park, as well as on-water river recreationalists (e.g., anglers, cruisers, wind/kite surfers) view the site from public locations and may have expectations of naturalistic settings. Visual elements down-river of the project site are compatible with viewer expectations and are characterized by natural riparian vegetation and shorelines along the east bank of the Columbia River, including Cottonwood Island. On the other hand, visual elements upstream from Prescott Beach Park are characterized by existing Port of Kalama industrial uses and facilities (see **Figure 10-8**). Viewers are expected to have a moderate sensitivity to visual changes to the existing site.

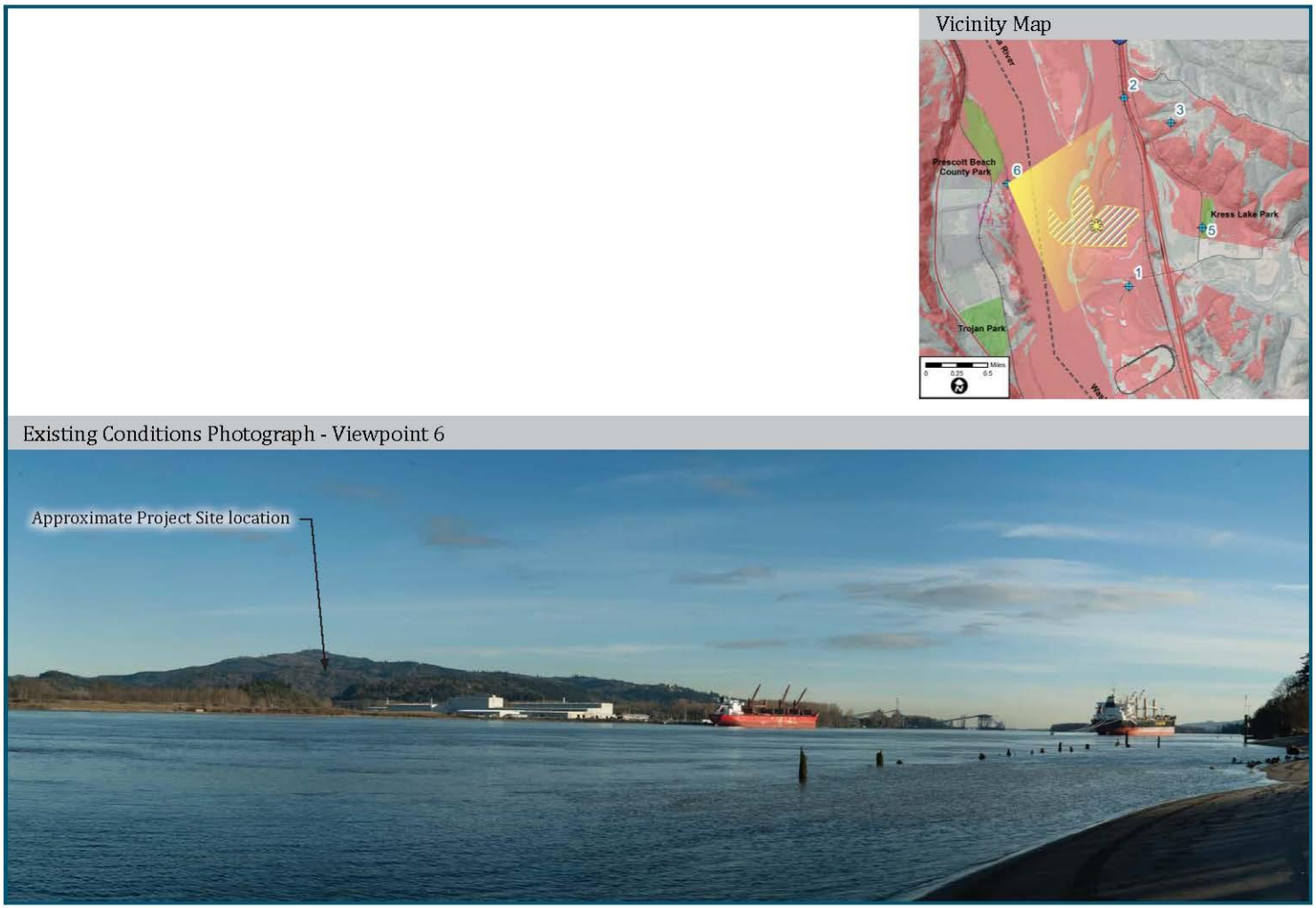
Nighttime light along the Columbia River mainly originates from industrial facilities and is reflected in water surfaces. Prescott Beach Park is a day-use only facility (open from an hour before sunrise to an hour after sunset) and most on-water recreationalists view the project site during daylight hours. Therefore, viewers at this viewpoint have low sensitivity to light and glare.

As noted above, this viewpoint also represents potential views from residential uses within Prescott, Oregon.



Viewpoint 5 - Kress Lake Park
Figure 10-7

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Viewpoint 6 - Prescott Beach Park
Figure 10-8

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10.4.2 Viewpoint Summary

Table 10-1 summarizes the potential viewer sensitivity levels and existing visual quality of each viewpoint as it relates to the proposed project.

Table 10-1. Proposed Project - Viewpoints, Potential Viewer Sensitivity, and Existing Visual Quality

Viewpoint	View	Distance from Viewpoint to Project Site	Potential Viewer Sensitivity	Viewer Description	Type
1	Looking north on North Hendrickson Drive	±1,700 feet	Low	Assumed to be industrial workers and commuters travelling on North Hendrickson Drive and other local roads west of I-5. Viewers experience frequent views of the project site from nearby industrial areas.	Urban/ Industrial
2	Looking south along I-5	±4,650 feet	Low	Assumed to be travelers on I-5. Viewers would experience short duration views of the project site and frequency may range from infrequent to daily for commuters.	Urban/ Industrial
3	Looking southwest from West Kingsbury Road	±3,900 feet	High	Assumed to be residents looking southwest toward the project site from hillsides in unincorporated Cowlitz County. Views may be frequent and of long duration.	Rural/ Residential
4	Looking north from North 5th Street	±12,100 feet	Moderate	Assumed to be residents looking north toward the project site from hillsides in Kalama or unincorporated Cowlitz County. Views may be frequent and of long duration.	Rural/ Residential
5	Looking west from Kress Lake	±2,700 feet	Low	Assumed to be recreational viewers looking west toward the site. Views of the project site are primarily obstructed by Drays Mound and existing vegetation. Day-use only facility.	Natural
6	Looking southeast from Prescott Beach Park	±2,800 feet	Moderate	Assumed to be public beach and/or on-water recreationalists looking southeast toward the site. Viewers would likely experience infrequent views of the project area of short duration but may be highly aware of change. Day-use only facility.	Natural

10.4.3 Related Actions

10.4.3.1 Kalama Lateral Project

The proposed pipeline alignment would pass through areas that are primarily privately owned forest and undeveloped lands. There are three residences within 250 feet of the proposed pipeline route. The proposed route does not cross designated scenic areas.

10.4.3.2 Electrical Service

The new electrical service transmission lines would cross I-5 to connect with an existing transmission line corridor on the east side of the highway. The proposed substation improvements would occur within the existing footprint of the substation.

10.5 Environmental Impacts

10.5.1 Proposed Project Alternative

As discussed in Chapter 2, Proposed Project and Alternatives, the proposed project would redevelop the project site with a methanol manufacturing facility that would include processing facilities, storage facilities, loading facilities, and a new marine terminal in the Columbia River. Exterior building materials in the proposed project would include concrete, steel, and wood.

The size, layout, and appearance of the proposed project would vary depending on the alternative selected from among the Technology Alternatives and Marine Terminal Alternatives. However, these differences would be minor in the context of the larger viewshed and would not affect the overall perception of the proposed project for a viewer. The visual simulations in this assessment are of the ULE Alternative and Marine Terminal Alternative 1, but these views are representative of the potential visual impacts of the proposed project with either Technology Alternative and either Marine Terminal Alternative. Therefore, this assessment does not differentiate between the various alternatives.

The new facilities would result in new sources of light and glare. However, these changes would be consistent with the existing industrial aesthetics of the project site and the Port of Kalama industrial area.

Water vapor exhaust plumes from cooling towers has the potential to result in visual and aesthetic impacts to viewers within the study area. Plume size and height would vary depending on atmospheric conditions such as temperature, humidity, and wind speed and direction; however, the Seasonal Annual Cooling Tower Impact (SACTI) modeling analysis described in Chapter 4, Air Quality and Greenhouse Gas Emissions, indicates that most plumes would be less than 1,000 meters high and less than 60 meters in radius. The largest plumes occurring during conditions of high relative humidity, cooler air temperatures, and stable atmospheric conditions may have a radius of less than 500 meters and extend out to the north and south to a distance of 7 kilometers.

Water vapor exhaust plumes, while not considered pollution, introduce white emission plumes that are not consistent with the natural character of the viewshed. Visual impacts also include vertical and horizontal movement which tend to distract viewers. Depending on atmospheric conditions water vapor plumes can also cause shadows or ground level fog in surrounding areas. Additionally, the water vapor plume may reflect light during nighttime conditions.

Plumes are expected to be visible to most viewers; however, viewers would see this project within the visual context of the Kalama and Longview industrial areas, which include numerous emission plumes. Additionally, conditions conducive to larger emission plumes also coincide with atmospheric cloud cover, precipitation and fog which would reduce the visual and aesthetic impact of water vapor emissions from cooling towers. Water vapor emission plume details are provided in Chapter 4 and **Appendix D**.

A flare system would be used for safe disposal of combustible gases during process upset or an emergency shutdown situation, and during the normal start-up and shutdown of the production process with either of the Technology Alternatives. The flare is anticipated to be in use for approximately 14 hours per start-up event, 1.4 hours per shutdown event, 4 hours during a plant upset event, and 2 hours per emergency shutdown. The flare would be approximately 245 feet in height and would be the tallest structure in the proposed project. The project assumes the worst case scenario of six startups, four shutdowns, four upsets, and two emergency shutdowns

per year. The flare would be enclosed and flames would only be visible during events described above. Flare usage events would be clearly visible to viewers. However, these events would be irregular, infrequent, and not part of the regular operation of the proposed project. Therefore, flare usage events were not modeled in the analysis below. The approximately 245-foot-tall flare structure is shown in the photo simulations for the proposed project.

As noted in Chapter 2, Proposed Project and Alternatives, the project site would be graded to an elevation of approximately 23 feet Columbia River Datum (CRD), but the northwest portion of the project site may be up to 10 feet higher. This area would include the infiltration pond, flare, first flush pond, fire suppression and water storage, cooling towers, chemical storage and waste water treatment facilities. The visual simulations presented in this assessment were prepared with the entire project site at approximately 23 feet CRD. Raising the northwest portion of the project site up to 10 feet higher than the rest of the site would be barely perceptible from viewpoints north, south, and east of the project site (i.e., viewpoints 1 through 5) because of existing obstructions, natural topography and the location of viewpoints at generally higher elevations than the project site. The change in elevation on the northwest portion of the project site may be visible from viewpoint 6; these potential impacts are discussed below.

Nighttime Lighting with the Proposed Project

Upon buildout, some outdoor areas of the facility would be illuminated at night as required by Occupational Safety and Health Administration (OSHA) regulations. Artificial light is common throughout the Kalama area along the Columbia River. It clearly defines the extent of the industrial operations but the concentration of similar facilities and land uses would make changes in nighttime lighting with the proposed project less discernible (see **Figure 10-9b** and **Figure 10-14b**). This lighting would include general ambient lighting for roadways (0.5 foot-candle minimum) and building exteriors (1 foot-candle minimum).[1] This lighting would be placed above doorways, walkways, and stairs around the exteriors of buildings and ancillary equipment for operator access and safety under regular operating conditions.

Spot lighting would be provided for illumination-level enhancement where needed in the methanol manufacturing area (5 foot-candle minimum) and the pump area and cooling towers (5 foot-candle minimum). This lighting would be higher in intensity than general outside lighting, but would be limited to specific areas.

Exterior lighting fixtures are proposed to be energy efficient light emitting diode (LED) fixtures and are intended to create less visual impact than traditional lighting fixtures and layouts. LED lights placed on poles and mounted to the exterior of some of the buildings are flexible and have adjustable mounting heads designed to illuminate very specific areas while minimizing light pollution. The lighting system layout has been designed so that no direct light would leave the grounds of the methanol manufacturing facility. The lighting would be designed to be very focused and allow precise control of where the fixture emits light, and more importantly, where it does not emit light. Overall, the proposed project lighting would be designed to minimize potential light pollution.

Night sky viewing opportunities in the study are limited. Ideal conditions for night sky viewing call for high elevations (i.e., in areas with less atmosphere) away from light pollution. The proposed project lies at less than 30 feet elevation and existing industrial, roadways and

[1] A foot-candle is a unit of illuminance or illumination, equivalent to the illumination produced by a source of one candle at a distance of 1 foot.

residential/commercial areas in Kalama and Longview make night sky viewing unsatisfactory. Additional light from the proposed project would have little effect on night sky viewing conditions in the context of existing lighting along the Columbia River and in the cities of Kalama and Longview.

10.5.1.1 Construction Impacts

During construction, activity within the project site would increase. As construction proceeds, construction equipment such as cranes, methanol production line modules, 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, natural gas pipe laying equipment, welders, water pumps, river dredging barges, and related equipment would be utilized and visible to viewers. Construction activities on the project site would be visible to residents, workers, commuters, recreationalists, and boat operators, but these activities would be temporary and consistent with the general industrial context of the adjacent area. These activities would alter the context of some views by changing the use of an existing cleared site. However, construction of the proposed project would be temporary and would not alter the overall visual character or aesthetic quality of surrounding views. Viewers with moderate or high sensitivity to change (i.e., those at viewpoints 3, 4, and 6) would continue to have views of the Columbia River and surrounding floodplain, the defining feature of the surrounding visual character. Furthermore, within the project site's industrial context, it is expected that it would be difficult for more distant viewers, such as those at viewpoints 2 and 4 (see **Figure 10-4 and Figure 10-6**), to perceive noticeable changes during construction activities.

Overall, construction of the proposed project would result in a low level of temporary adverse effect to aesthetics and visual quality. Therefore, construction activities would not result in significant adverse impacts to aesthetics and visual resources.

10.5.1.2 Operational Impacts

The operation of the proposed project would introduce new visual features to the project site and accompanying new sources of light and glare. The new visual features would include new structures and equipment on the project site, additional workers, and increased vehicle and ship movements on and adjacent to the site. These features would alter the aesthetics of the project site. The potential for these changes to affect the various viewpoints is discussed below.

Urban/Industrial Views (Viewpoints 1 and 2)

Viewpoints from Urban/Industrial areas are generally within the immediate vicinity of the project site or from major transportation corridors. **Figure 10-9a** presents the photo simulations for viewpoint 1. As discussed above, views from this viewpoint are dominated by existing industrial facilities, operations, and activities. Large-scale buildings, heavy utility transmission lines, industrial plumes, and ancillary facilities and equipment define the existing visual character of this view. The proposed project's facilities and water vapor plumes would be a new element in these views but would be consistent with the overall visual character of the industrial area. Furthermore, the visual perception of viewers at this viewpoint is limited because their attention is focused on work, construction, or commuting activities.

The proposed project would also alter views for travelers on southbound I-5 by introducing new industrial features and water vapor plumes. **Figure 10-10a** presents the photo simulations for viewpoint 2. However, these viewers have low sensitivity to aesthetic and visual resources

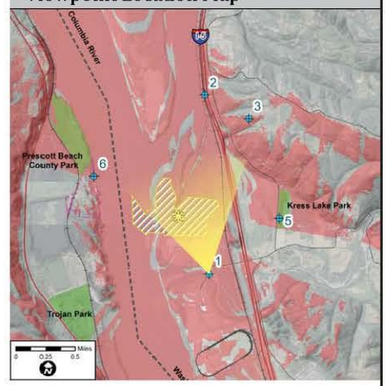
because they tend to be focused on driving and have transitory views of short duration, and many views from I-5 are partially obstructed by existing vegetation.

With respect to the designation of I-5 as part of the Lewis and Clark Trail Scenic Byway, the proposed project would not affect substantial natural areas and would develop contiguous to existing industrial areas and facilities. The proposed project would be consistent with the overall character of the byway, which passes through a variety of terrains and landscapes and transitions between urban and rural areas.

Existing Conditions Site Photograph - Viewpoint 1



Viewpoint Location Map



Visual Simulation - Viewpoint 1



Visual Simulation #1
Field of View = 64 degrees
Image Width = 12.3 inches
Zoom = 50%
True View Distance = 19.8" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5.
5. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint 1 - North Hendrickson Drive
Figure 10-9a

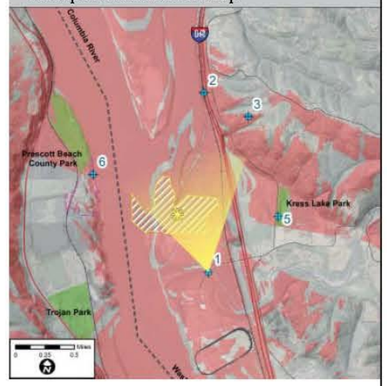
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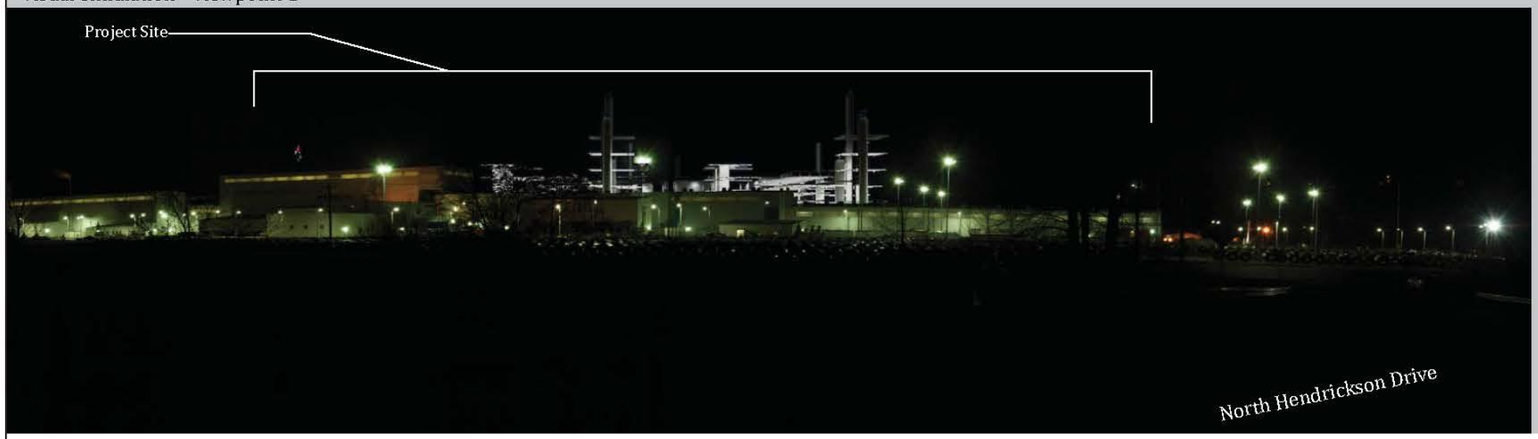
Existing Conditions Site Photograph - Viewpoint 1



Viewpoint Location Map



Visual Simulation - Viewpoint 1



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

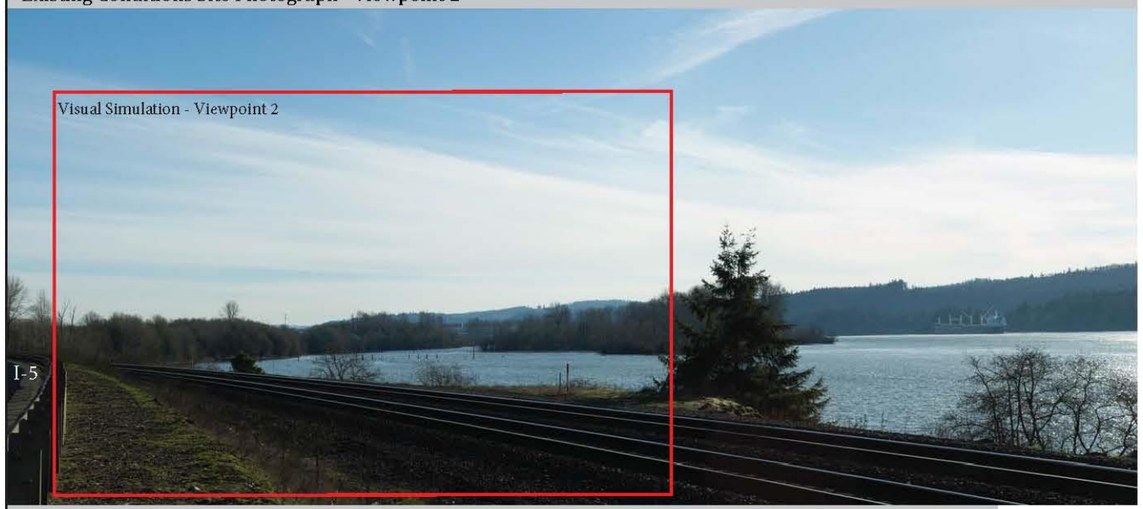
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Viewpoint 1 - North Hendrickson Drive
Figure 10-9b

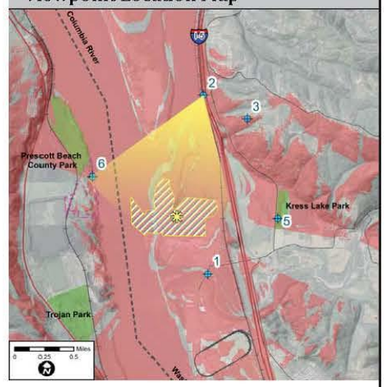
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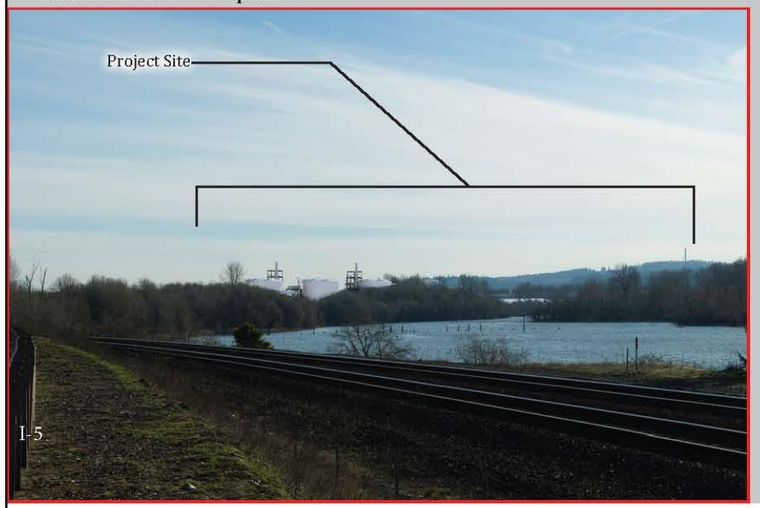
Existing Conditions Site Photograph - Viewpoint 2



Viewpoint Location Map



Visual Simulation - Viewpoint 2



Visual Simulation #2
Field of View = 68 degrees
Image Width = 8.25 inches
Zoom = 50%
True View Distance = 12.2" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5.
5. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint 2 - I-5
Figure 10-10a

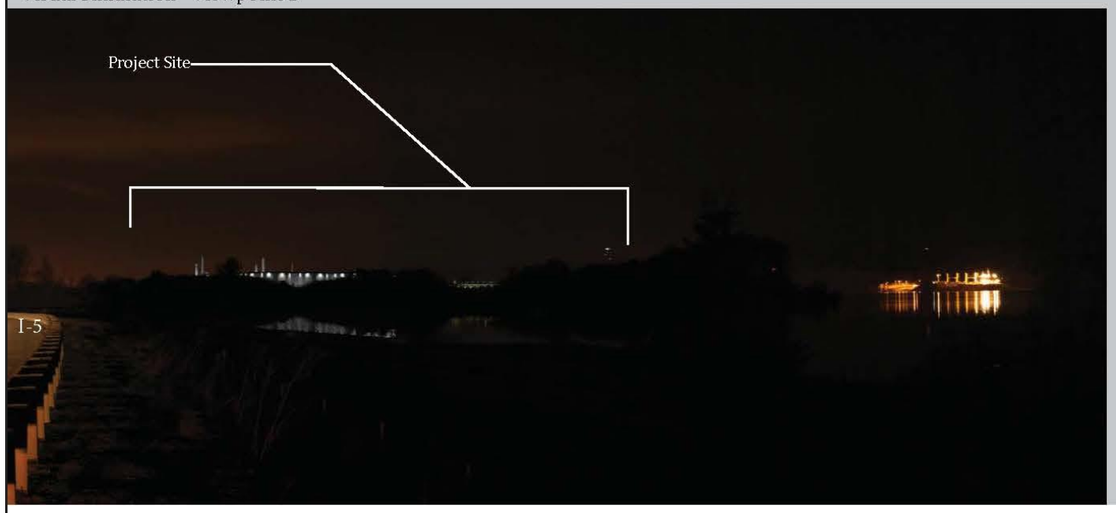
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Existing Conditions Site Photograph - Viewpoint 2



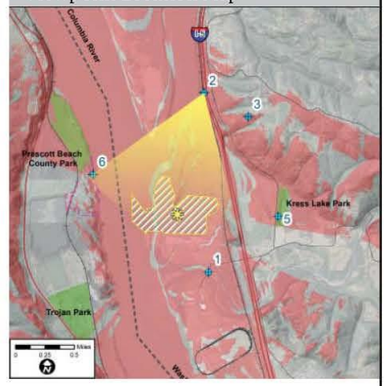
Visual Simulation - Viewpoint 2



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint Location Map



Viewpoint 2 - I-5
Figure 10-10b

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Artificial light is common throughout the Port of Kalama industrial area and along the Columbia River. In nighttime views, the presence of artificial lighting clearly defines the extent of the industrial operations along the Columbia River. Site operational activities would occur 24 hours per day, which at times would be similar to those of adjacent industrial areas. The proposed project would result in new nighttime lighting and would expand the extent of artificially lit industrial activities along the river. However, the concentration of similar facilities and land uses would make changes in nighttime lighting on the project site difficult for viewers to discern. From viewpoint 1, the proposed project's lighting would likely be visible behind existing lighting at the Steelscape facility. From viewpoint 2, the proposed project would add new sources of nighttime lighting to a view that currently has little artificial light, and this lighting may result in new reflections in the Columbia River. However, as discussed above, viewers from viewpoint 2 on I-5 would have low sensitivity to changes in light and glare, and new lighting in industrial views, such as those from viewpoint 1, would be consistent with the overall visual character.

Overall, the proposed project would not affect the visual character and aesthetic quality of Urban/Industrial views adversely. The proposed project would have a low level of effect on viewers at Urban/Industrial viewpoints and would not result in significant adverse impacts to the aesthetics and visual resources of these views.

Additional impacts associated with raising the infiltration pond would largely be blocked by existing and proposed facilities for industrial viewers, and existing natural vegetation would block most impacts for viewers traveling along I-5 (see **Figure 10-9a and Figure 10-10a**). With the low sensitivity of these viewers and the minimal additional impacts associated with the raised facilities, there would be little or no additional impacts. **Table 10-2** is a summary of visual and light/glare effects from viewpoints 1 and 2.

Table 10-2. Proposed Project - Visual and Light/Glare Effects from Viewpoints 1 and 2

Viewpoint	View	Distance (feet)*	Visual Effects	Light/ Glare Effects
1	Looking north on North Hendrickson Drive. Primary view would be of Steelscape buildings with some views of proposed project facilities above. Emission plumes are expected to be visible in most atmospheric conditions and may cause shadows or ground level fog.	+1,700	L	L
2	Looking south along I-5. Views of proposed project would be partially obstructed by existing vegetation. Water vapor plumes, the taller facilities, and both indirect and ambient lighting may be visible. Individual facilities and light sources can be discerned but no single facility expected to dominate views. Some lighting may be reflected in water of Columbia River. Emission plumes are expected to be visible in most atmospheric conditions and may cause shadows.	+4,650	L	L

Notes:
L = low level of effect.
* Distance measured from viewpoint to nearest project limit line.

Rural/Residential Views (Viewpoints 3 and 4)

As discussed above, prominent features of the views from the Rural/Residential viewpoints include the existing industrial area along the Columbia River as well as a broader context that includes the Columbia River, surrounding hillsides, rural farmland, and fairly continuous stands of native vegetation and other features that bring natural characteristics into the visual

character. The existing dominant character seen by rural/residential viewers is the Columbia River and floodplain, rural forested hillsides, and open space as well as intermittent views of industrial development along the Columbia River.

Views from the rural/residential viewpoints would change as the relatively empty and flat project site is developed with the proposed project. For many viewers at Rural/Residential viewpoints, existing landforms and vegetation would partially obstruct views of the project site.

Figure 10-11a and Figure 10-12a present the photo simulations for viewpoints 3 and 4. At views where the proposed project facilities, including the bulk product storage tanks and methanol production lines, would be visible, they would appear in a larger context of the industrial facilities along the Columbia River. The proposed project would alter views of the Columbia River by changing the appearance of the project site, but it would not obstruct views of the Columbia River from Rural/Residential viewpoints.

New artificial lighting with the proposed project would be discernible for rural/residential viewers. In addition, glare may be introduced with light colored or reflective man-made surfaces, or from the lighting reflected in the Columbia River. However, the existing concentration of similar facilities and land uses along the waterfront and the distance to some viewpoints would make changes in nighttime lighting less perceptible.

Potential viewers at the Rural/Residential viewpoints are presumed to be residents within neighborhoods located in low-density residential areas in unincorporated Cowlitz County or residences in the City of Kalama. Visual sensitivity for such viewers would be high because views are often frequent and/or prolonged. However, most residents would not have direct views of the site and the proposed project would be in keeping with the industrial character of the area, and some residential areas, such as those at viewpoint 4, are located more than 2 miles away from the project site. Depending on atmospheric conditions, water vapor emission plumes may be visible to residential viewers but would be viewed with the context and uses of the Kalama and Longview industrial areas, which include similar emission sources.

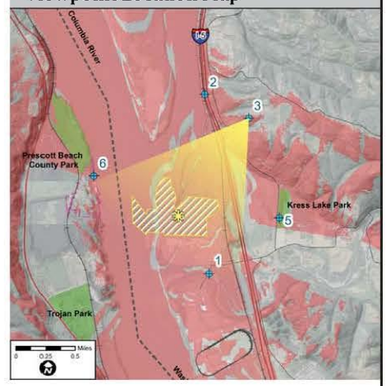
Overall, although the proposed project would not obstruct views of the Columbia River, a prominent feature in Rural/Residential viewpoints, it would result in low to moderate adverse effects to these views. From viewpoint 3, the proposed project would introduce visible changes to views and new sources of light and glare in relatively close proximity to residences. From viewpoint 4, the proposed project would alter distant views and changes would be more difficult to discern. Therefore, the proposed project would result in a moderate level of effect on views from viewpoint 3 and a low level of effect on views from viewpoint 4. However, given that many viewers in Rural/Residential areas would not have direct views of the project site, it is expected that the proposed project would affect only a small number of viewers at each viewpoint. Therefore, the proposed project would not result in significant adverse impacts to the aesthetics and visual resources of these views.

If the northwest portion of the project site is elevated 10 feet higher than the remainder of the project site, views of this change would largely be blocked by existing natural vegetation for rural/residential viewers. Theses viewers would view the proposed project from at least 3,900 feet away and most rural/residential viewers would also be viewing from a higher elevation making the additional 10 feet in elevation on the project site more difficult to discern (see **Figure 10-11a and Figure 10-12a**). Artificial lighting impacts may be slightly more visible; however, the context of the existing and proposed industrial facilities would make these additional artificial lighting impacts minimal.

Existing Conditions Site Photograph - Viewpoint 3



Viewpoint Location Map



Visual Simulation - Viewpoint 3



Visual Simulation #3
Field of View = 65 degrees
Image Width = 11.5 inches
Zoom = 50%
True View Distance = 18.1" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5.
5. This view is intended to be representative of views from residential areas on hills east of the project site.
5. Project Site brackets shown are not intended to indicate proposed facility height.

For Illustrative Purposes Only.

Viewpoint 3 - West Kingsbury Road
Figure 10-11a

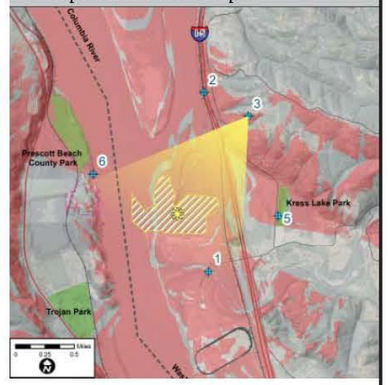
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Existing Conditions Site Photograph - Viewpoint 3



Viewpoint Location Map



Visual Simulation - Viewpoint 3



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint 3 - West Kingsbury Road
Figure 10-11b

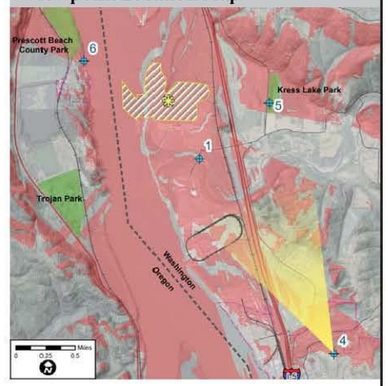
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Existing Conditions Site Photograph - Viewpoint 4



Viewpoint Location Map



Visual Simulation - Viewpoint 4



Visual Simulation #4
Field of View = 39 degrees
Image Width = 9.25 inches
Zoom = 50%
True View Distance = 25.8" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5..
5. This view is intended to be representative of views from residential areas in Kalama South of the project site.
5. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint 4 - North 5th Street
Figure 10-12a

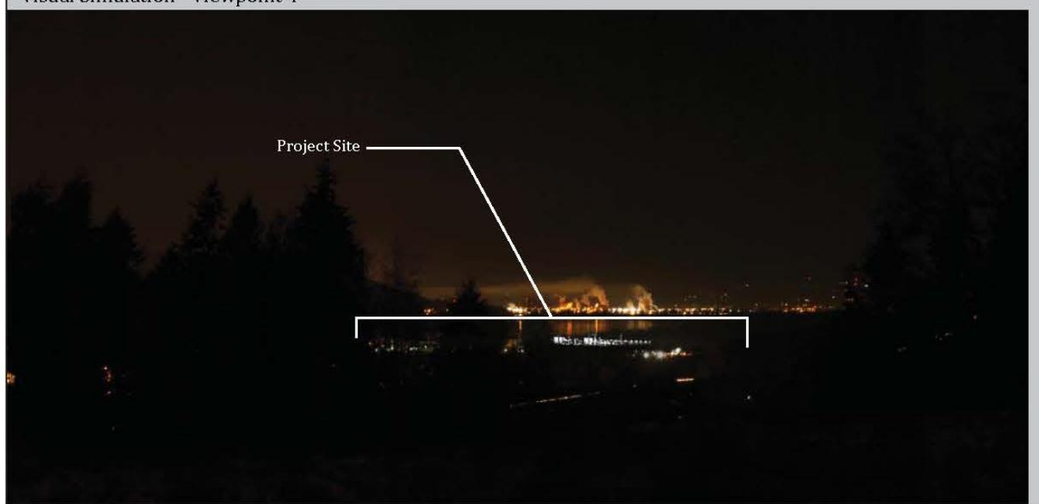
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Existing Conditions Site Photograph - Viewpoint 4



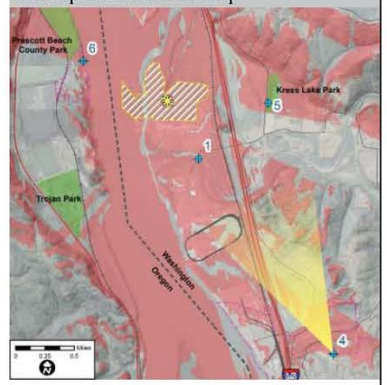
Visual Simulation - Viewpoint 4



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint Location Map



Viewpoint 4 - North 5th Street
Figure 10-12b

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Table 10-3 is a summary of visual and light/glare impacts from viewpoints 3 and 4.

Table 10-3. Proposed Project - Visual and Light/Glare Effects from Viewpoints 3 and 4

Viewpoint	View	Distance (feet)*	Visual Effects	Light/ Glare Effects
3	Looking southwest from West Kingsbury Road. Views are elevated above proposed project. Areas are characterized by low density residential neighborhoods on winding hillsides. General visual character is Columbia River and floodplain with large tracts of vegetation. Project site would be in middle ground of residential areas in this location. Indirect sources and ambient light would be clearly visible. Light sources may be discerned but no single facility expected to dominate views. Emission plumes are expected to be visible in most atmospheric conditions. Views would potentially be experienced by a low number of highly sensitive viewers.	+3,900	M	M
4	Looking north from hillside residential areas (from North 5th Street). Areas are characterized by contiguous residential neighborhoods on winding hillsides. Views are elevated above proposed project and would be visible for some residential areas in the City of Kalama; however, most views would be partially/completely blocked by landform and existing vegetation. Light sources may be discerned but no single facility expected to dominate views. Emission plumes are expected to be visible in most atmospheric conditions.	+12,100	L	L

Notes:
M= moderate level of effect; L = low level of effect.
* Distance measured from viewpoint to nearest project limit line

Natural Views (Viewpoints 5 and 6)

The project site lies directly east of Drays Mound, which partially blocks views of the project site from Kress Lake (viewpoint 5). Therefore, recreational users at Kress Lake (viewpoint 5) would not have direct views of the project site except during the winter months when the surrounding vegetation is dormant (see **Figure 10-13a**). Depending on atmospheric conditions, water vapor plumes may be visible at any time of year. Recreational viewers from Kress Lake (e.g., anglers, hikers) are expected to have low viewer sensitivity to changes in the existing site. No direct lighting sources associated with the project are anticipated to be seen by recreational users at Kress Lake because it is a day-use only facility. Given that only water vapor plumes from the proposed project may be visible, the proposed project would result in a low level of effect on visual character and aesthetic quality at viewpoint 5, and no effect due to light and glare.

The proposed project would introduce additional large-scale industrial uses along the Columbia River and would introduce straight lines, geometric forms, hard visual textures, and manmade materials to the site. These changes would be visible to on-water recreational users and viewers from Prescott Beach Park on the west shore of the river (viewpoint 6) and would affect these views adversely by replacing a cleared site with a new industrial use. **Figure 10-14a** presents the photo simulation for viewpoint 6. However, the proposed project would be contiguous and visually consistent with existing industrial facilities along the Columbia River upriver of the project site. Emission plumes are expected to be visible in most atmospheric conditions. As noted above, viewer sensitivity at this viewpoint would be high because of viewers' expectation of natural views, the public nature of and interest in some natural areas, and the inconsistent environment of natural and industrial lands. However, it is expected that the proposed project would affect a low number of viewers at this viewpoint.

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Existing Conditions Site Photograph - Viewpoint 5



Visual Simulation - Viewpoint 5

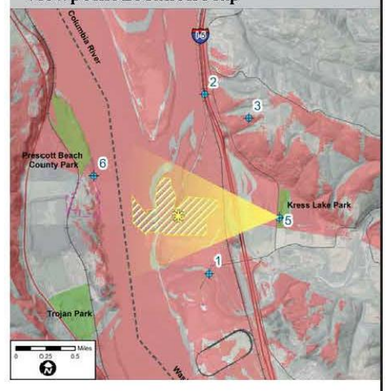


Visual Simulation #5
Field of View = 50 degrees
Image Width = 12.85 inches
Zoom = 50%
True View Distance = 27.9" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5.
5. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint Location Map



Viewpoint 5 - Kress Lake Park
Figure 10-13a

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Existing Conditions Site Photograph - Viewpoint 5



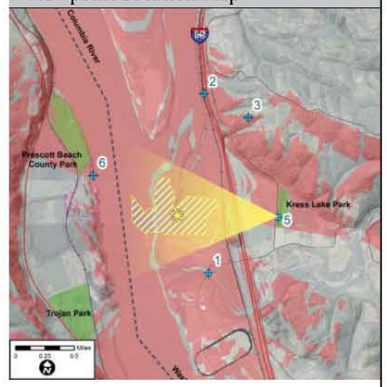
Visual Simulation - Viewpoint 5



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint Location Map



Viewpoint 5 - Kress Lake Park
Figure 10-13b

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Existing Conditions Site Photograph - Viewpoint 6



Visual Simulation - Viewpoint 6

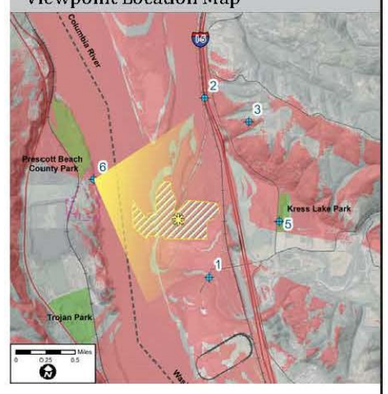


Visual Simulation #6
Field of View = 100 degrees
Image Width = 14.75 inches
Zoom = 50%
True View Distance = 12.4" inches

Notes:
1. The True View Distance is the reading distance that the photograph correctly reconstructs the correct size, scale and perspective seen from the viewpoint location from which the photograph was taken.
2. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
3. Visual Simulation is based on 3D model and AutoCAD files provided by NWIW.
4. Visual Simulation created with AutoCAD, Sketchup Pro, GoogleEarth and Photoshop CS5.
5. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint Location Map



Viewpoint 6 - Prescott Beach Park
Figure 10-14 a

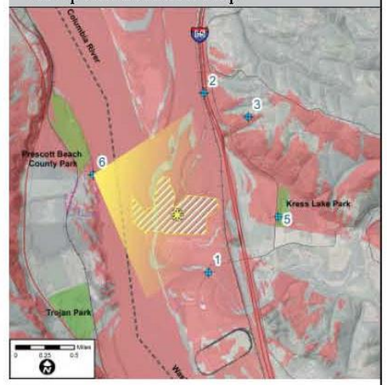
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Existing Conditions Site Photograph - Viewpoint 6



Viewpoint Location Map



Visual Simulation - Viewpoint 6



Notes:
1. Existing Conditions photographs taken with Nikon D-70 (50mm lens) and panorama photomerged using Photoshop CS5.
2. Visual Simulation is based on night time simulation provided by Creative Lighting Solutions and NWIW.
3. Visual Simulation created with Photoshop CS5.
4. Project Site brackets shown are not intended to indicate proposed facility height.

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Viewpoint 6 - Prescott Beach Park
Figure 10-14b

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The proposed dock facilities would require moderate to high levels of light for operation at night while vessels are arriving, departing, or being loaded. Lighting associated with the proposed project would be reflected in the waters of the Columbia River and may be visible from Prescott Beach Park. However, artificial lighting is common along the Columbia River in the study area and Prescott Beach Park is designated as a day-use only facility. Furthermore, most on-water recreational viewers access the river during daylight hours and would not experience increased light and glare impacts. Therefore, viewers at this viewpoint would experience a low level of effect due to proposed project-generated light and glare.

Overall, the proposed project would result in a moderate level of effect to viewpoint 6, and a low level of effect due to light and glare.

The Columbia River is also navigated by commercial boat operators. Viewers from commercial boats are expected to have a low sensitivity to changes in aesthetics. Because of low sensitivity, infrequent views, and the transitory nature of boat operator views, it is unlikely that viewers would experience adverse visual effects based on changes to the project site.

As noted above, the proposed project would improve the roadway used to access the informal recreation area located to the north of the project site and would provide a new parking area. No photo simulations of this view were produced but the following section describes the predicted changes to views from the recreational area with the proposed project.

The project site is visible in views to the south from this recreation area. Views north, west, and east from this recreation area would not be affected by the proposed project. The proposed project would, however, result in a substantial change in the character of views to the south from the recreation area. As noted above, existing views to the south are of a dredge material disposal site with weedy, low-growing vegetation. With the proposed project, facilities including the flare, stormwater infiltration pond, and water treatment facilities would be located in close proximity to this recreation area (e.g., approximately 100 feet from the recreation parking area to the edge of the infiltration pond and approximately 250 feet to the flare) and would be visible in views to the south. However, the project site is part of an existing industrial area and viewers would continue to access the recreational area through an industrial setting, much like they do currently. There would also be a low number of viewers from this area, and viewer sensitivity would be low as the area is not characterized by an expectation of natural scenic settings. Recreational users are not expected to utilize the area after sunset and therefore would not be affected by nighttime light and glare from the proposed project.

As noted above, viewpoint 5 would not have views of the northwest portion of the project site, and an additional 10 feet in elevation would not be visible. Views would be blocked by the proposed project itself and by existing natural vegetation. The greater elevation on the northwest portion of the project site would be most visible to viewers at viewpoint 6. However, changes in elevation would be viewed in the context of the surrounding proposed project and the existing industrial areas. The infiltration pond and first flush pond are at surface elevation and would have little or no visual impact. The fire suppression and water storage, cooling towers, chemical storage, and waste water treatment facilities would be at a higher elevation, but would be viewed in front of the larger and taller bulk product storage tanks. Artificial lighting would be slightly more visible; however, the context of the existing and proposed industrial facilities would make these additional artificial lighting impacts minimal. The additional height of the proposed flare tower would be visible but would not change its overall effect on visual resource.

Overall, the proposed project would not result in significant adverse impacts to the aesthetics and visual resources of natural views.

Table 10-4 is a summary of visual and light/glare impacts from viewpoints 5 and 6.

Table 10-4. Proposed Project - Visual and Light/Glare Effects from Viewpoints 5 and 6

Viewpoint	View	Distance (feet)*	Visual Effects	Light/ Glare Effects
5	Looking west from Kress Lake. Direct views are blocked by Drays Mound and existing vegetation. Water vapor plumes may be seen depending on atmospheric conditions. Ambient light may be discerned; however, recreational viewers are generally not present at night.	+2,700	L	N
6**	Looking east from Prescott Beach Park. Views are of wide flat-water channel with Cottonwood Island to northeast. Heavy industrial uses and facilities characterize Columbia River upriver from project site. Lighting for dock facilities would be visible and reflected by Columbia River while vessels are arriving, departing, or being loaded. Upland light sources would be discerned and glare effects are increased by water; however, few recreational viewers should be present at night. Emission plumes are expected to be visible in most atmospheric conditions.	+2,800	M	L

Notes:
L= low level of effect; M = moderate level of effect.
* Distance measured from viewpoint to nearest project limit line
** This viewpoint also represents the potential impacts of the On-Site Alternative for on-water viewers. Views would be comparable from Prescott Beach Park and an on-water location.

10.5.2 Related Actions

10.5.2.1 Kalama Lateral Project

Construction of the proposed pipeline, particularly the removal of trees from the route, would result in temporary and permanent effects on visual resources. However, the existing topography would be recontoured to as near pre-construction condition as practical and the disturbed soils would be revegetated soon after the completion of pipeline construction.

Visual impacts from the construction of aboveground facilities would be minimal. The new take-off and interconnection facility at the proposed tie-in location with Northwest Pipeline LLC's (Northwest) existing mainline would be constructed within the already cleared portion of the existing right-of-way. The new meter station at the project site would be constructed in a cleared area already prepared for development.

The area most likely to experience visual impacts from the proposed pipeline is along the portion of the alignment between approximately MPs 1.1 and 1.5. Five homes, Mount Pleasant Cemetery, and Hale Barber Road and Raven Ridge Road are located at varying distances from the pipeline centerline in this area. This area includes notable stands of evergreen trees and mixed forest that provide a sense of privacy and seclusion to nearby residents and visitors to the cemetery. Several landowners in this area expressed concern that land clearing and tree removal in this area would change its character and appearance. Northwest would install a combination of mid-sized shrubs and appropriate trees, selected in consultation with the landowners, to provide visual screening between homes, similar to preconstruction conditions. Northwest has committed to working with affected landowners to develop a revegetation plan

for the temporary construction right-of-way and temporary extra workspace that would minimize visual impacts in this area. Therefore, construction of the proposed pipeline would result in a low level of effect on visual resources.

During operation of the proposed pipeline, the aboveground facilities would be located either on forested land or at the project site, among the other facilities associated with the proposed project. Because of the small footprint and low profile of these aboveground facilities, they would have a low level of effect on visual resources.

Overall, construction and operation of the proposed pipeline would not result significant adverse impacts to aesthetics and visual resources.

10.5.2.2 Electrical Service

The potential transmission line and substation improvement-related action would have a low level of effect on visual resources. The transmission line crossing over I-5 and the substation upgrades may be visible to motorists on I-5, but these viewers have low sensitivity to aesthetic and visual resources because they tend to be focused on driving and have transitory views of short duration. The transmission line crossing would appear in the context of many other existing power lines along I-5 and the substation improvements would be within the existing substation next to existing electrical equipment. Therefore, the potential transmission line and substation improvements would not result in significant adverse impacts to aesthetics and visual resources.

10.5.3 On-Site Alternative Impact Summary

As discussed above, the construction and operation of the proposed project would introduce new visual, aesthetic, and light and glare elements that would be visible from viewpoints within the study area. These elements would result in varying levels of effect to aesthetics and visual resources depending on the type of viewer, the amount of use of the view, and the context of the view.

Viewers from Urban/Industrial viewpoints would view the proposed project from within similar heavy industrial areas or from major travel corridors. The proposed project would be visually compatible with adjacent industrial uses and would affect a low number of sensitive viewers, and thus is anticipated to result in a low level of effect to viewpoints within Urban/Industrial areas.

At Rural/Residential viewpoints, the proposed project would appear in the context of the existing industrial areas as a relatively continuous visual resource. The proposed project would not obstruct views of the Columbia River, a prominent feature in many Rural/Residential views. The degree of effect on views would depend on the distance from the project site. In more distant views, such as those at viewpoint 4, it would be difficult to perceive specific changes and the proposed project would result in a low level of effect. In closer views, such as those at viewpoint 3, changes due to the proposed project would be easily perceived and could result in adverse effects on views. Therefore, the proposed project would result in a moderate level of effect on views from viewpoint 3 and a low level of effect on views from viewpoint 4.

For viewers at Natural viewpoints, the proposed project would introduce operations, buildings, and structures that would be visible to sensitive viewers from the Columbia River and Prescott Beach Park. The proposed project would also introduce artificial lighting for nighttime operations. However, viewers would experience a low level of effect due to this lighting

because there should be very few viewers at Natural viewpoints during the night. The proposed project is anticipated to result in a low level of effect to viewers from Kress Lake (viewpoint 5) and a moderate level of effect to viewers from Prescott Beach Park (viewpoint 6).

Overall, the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in significant adverse impacts to aesthetics or visual resources.

10.5.4 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed. It is expected that the Port of Kalama would pursue future industrial or marine terminal development of the site absent the proposed project.

10.5.4.1 Construction Impacts

As with the proposed project, construction activities under the No-Action Alternative would be visible to residents, workers, commuters, recreationalists, and boat operators, but these activities would be temporary and consistent with the general industrial context of the adjacent area. Like the proposed project, it would be difficult for more distant viewers (particularly Rural/Residential viewers at viewpoint 4) to perceive noticeable changes during construction under the No-Action Alternative, and viewers with moderate to high sensitivity to change (i.e., those at viewpoints 3, 4, and 6) would continue to have views of the Columbia River and surrounding floodplain, a defining feature of the surrounding visual character.

Overall, like the proposed project, construction of the No-Action Alternative would have a low level of temporary adverse effect on aesthetics and visual quality. Therefore, construction of the No-Action Alternative would not result in significant adverse impacts to aesthetics and visual resources.

10.5.4.2 Operational Impacts

The No-Action Alternative could result in new uses, buildings, and/or structures on the project site. Like the proposed project, the operation of the No-Action Alternative would introduce new visual features to the project site and accompanying new sources of light and glare. These features would alter the aesthetics of the project site. However, as discussed below, these changes would likely be consistent with the existing industrial aesthetics of the site and the Port and would therefore result in a low level of effect. Because there are no specific development plans with the No-Action Alternative, no photo simulations were produced.

New activities and structures under the No-Action Alternative would likely be visible to viewers at industrial viewpoints (viewpoint 1) but, as noted above, these viewers tend to have low sensitivity to changes in visual conditions. Furthermore, new industrial forms would be compatible with the existing visual character of the adjacent industrial area. Therefore, the No-Action Alternative would result in a low level of effect on industrial viewpoints.

From more distant viewpoints (viewpoints 2, 3, and 4), changes to conditions on the project site would become more difficult to perceive, and potential new buildings or facilities would be expected to appear as a relatively continuous industrial waterfront for viewers. Therefore, the No-Action Alternative would result in a low level of effect to viewers at more distant viewpoints (viewpoints 2, 3, and 4). Depending on the type of development pursued in the No-Action Alternative, changes may or may not be visible from viewpoint 5 and are expected to result in no to low effect to this viewpoint.

As with the proposed project, the No-Action Alternative would be visible to viewers at Prescott Beach Park (viewpoint 6) and on the Columbia River. Potential new or changed facilities, especially development along the river, would be visible to a low number of viewers with high sensitivity; however the No-Action Alternative, like the proposed project, would be adjacent to existing industrial facilities and would be contiguous and visually consistent with existing industrial facilities along the Columbia River shoreline. Therefore, the overall visual impacts to views from Viewpoint 6 would be a moderate level of effect.

Light and glare impacts to recreational viewers on the Columbia River would be low because most recreational viewers access the river during daylight hours and would not experience increased light and glare impacts. Furthermore, potential changes to nighttime lighting under the No-Action Alternative would be seen within the industrial visual context of this section of the Columbia River waterfront.

Overall, the No-Action Alternative, like the proposed project, would not result in significant adverse impacts to aesthetics and visual resources.

10.6 Mitigation Measures

10.6.1 Project Mitigation

The design features and BMPs the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the Project and have been considered in assessing the environmental impacts to aesthetics and visual resources and are listed below.

10.6.1.1 Design Measures

The proposed project and alternatives would implement measures designed to minimize the effects on aesthetics and visual resources. These measures would include:

- Motion- and/or user-controlled light systems would minimize the amount of nighttime artificial lighting produced by the proposed project where practicable.
- Neutral colors would be used for non-safety-related structures and equipment to reduce the visual impact of bright colors.
- Non-reflecting materials and finishes would be used to reduce glare where practicable.

10.6.2 Additional Mitigation

There are no significant adverse impacts identified for aesthetics and visual resources and therefore no additional mitigation measures are identified.

10.7 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts to aesthetics and visual resources.

10.8 References

Bureau of Land Management. 1986. The Visual Resource Inventory. Available: http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS/2.html. Accessed: August 15, 2014.

Federal Energy Regulatory Commission (FERC). 2015. Kalama Lateral Project Environmental Assessment. July 2015. Docket No. CP15-8-000.

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Northwest Pipeline LLC. 2014. Resource Report 8, Land Use, Recreation, and Aesthetics, submitted to Federal Energy Regulatory Commission on October 27, 2014. Docket No. CP15-8-000.

U.S. Forest Service. 1995. Landscape Aesthetics, A Handbook for Scenery Management. Available: http://www.fs.fed.us/cdt/carrying_capacity/landscape_aesthetics_handbook_701_no_append.pdf. Accessed: August 15, 2014.

Chapter 11 Historic and Cultural Resources

11.1 Introduction

This chapter addresses the potential impacts of the proposed project's Technology Alternatives and Marine Terminal Alternatives and a No-Action Alternative on historic and cultural resources. The sections below describe the regulatory context, the cultural resources within the Area of Potential Effect (APE) for the proposed project, and probable impacts on such resources. This chapter summarizes information from the cultural resource survey completed for the proposed project (see **Appendix J)**.[1]

This chapter also addresses related actions, the Kalama Lateral Project (the proposed pipeline) and proposed electrical service improvements, and summarizes relevant cultural resource information from the proposed pipeline's environmental review documentation.

The analysis concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, the Related Actions, and the No-Action Alternative, would not result in significant adverse impacts to cultural resources.

11.2 Regulatory Context

The Washington State Department of Archaeology and Historic Preservation (DAHP) is the reviewing agency under State Environmental Policy Act (SEPA) with expertise in archaeological, historic, and cultural resources. SEPA lead agencies consult with DAHP regarding potential impacts to historic and cultural resources in an environmental review. DAHP considers impacts to properties that are eligible for listing in the Washington Heritage Register (WHR), the National Register of Historic Places (NRHP), and local registers.

Cowlitz County maintains a cultural resource inventory though it does not have a register. The APE lies within a designated shoreline zone, with development guidelines provided in the County's Shoreline Management Master Program (SMMP) of 1977, which was approved following the Washington State Shoreline Management Act of 1971 (RCW 90.58.610 and RCW 36.70A.480). The Cowlitz County SMMP specifies that proposals requiring a shoreline permit should include an assessment of cultural resources (Historical/Cultural Policy 1), and a provision for reporting inadvertent discoveries (Historical/Cultural Policy 2), following the guidelines set forth by the National Historic Preservation Act (NHPA) (Historical/Cultural Policy 3), with sufficient time provided for site protection or data recovery (Historical/Cultural Policy 4) (Cowlitz-Wahkiakum Regional Planning Commission 1977).

In addition, the SMMP's Use Activity Regulations for all shoreline districts state that developers shall notify the shorelines administrator in the event that an archaeological area or historic site is found during construction (Cowlitz-Wahkiakum Regional Planning Commission 1977). Similarly, a data-sharing agreement between the County and DAHP specifies steps for consideration of cultural resources during development review when the development is subject

[1] Because of the sensitive nature of information about the location of certain archaeological resources, the cultural resource survey will not be provided for review by the general public. The survey will be made available for review as appropriate by the co-lead agencies, DAHP, and other reviewing agencies.

to SEPA or the Shoreline Management Act. These steps are consistent with the methodology for the proposed project.

The regulations of the NHPA define historic properties as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places" as well as "properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization … that meet the National Register criteria" (NHPA 36 CFR 800.16).

Historic and archaeological resources, historic properties, and traditional cultural properties are terms with different definitions in various regulatory contexts. For the purposes of this chapter, the term "cultural resources" encompasses all of these.

Cultural resources under consideration for potential project impacts do not need to be formally listed in the NRHP or the WHR, as long as they meet the basic criteria for listing. To be eligible for listing in the WHR, a resource or property must:

- be at least 50 years old;
- retain historic integrity (i.e., important characteristics of the time that it was built or made); and
- have historical significance at the local, state, or national level (Washington State Department of Archaeology and Historic Preservation 2015).

To be eligible for listing in the NRHP, a cultural resource must:

- generally be at least 50 years old;
- retain historic integrity; and
- meet at least one of the following criteria: the resource is associated with significant historical events or with the lives of significant historical people; represents a distinctive type of construction or grouping of stylistic elements or construction by a master artisan; or is likely to provide important information about history or prehistory (U.S. Department of the Interior 1991).

Cultural resources identified for the proposed project include archaeological sites, historical buildings or structures, and traditional cultural properties within and adjacent to the APE of the proposed project and the areas described under the alternatives. These cultural resources were evaluated for eligibility for inclusion in national and state registers. Resources that are currently listed in or determined eligible for listing in the NRHP or WHR were evaluated for potential construction and operation related direct effect from the proposed project and alternatives. A cultural resource's indirect setting may affect its register eligibility, particularly in the case of traditional cultural properties and intact historic properties. Therefore, indirect effects by construction and operation activities are considered as well. Mitigation measures, if necessary, would allow the proposed project and the alternatives to preserve important information about the past in the course of typical construction and operation activities. These mitigation measures are outlined in section 11.6, Mitigation Measures.

11.3 Methodology

11.3.1 Definition of the Area of Potential Effect

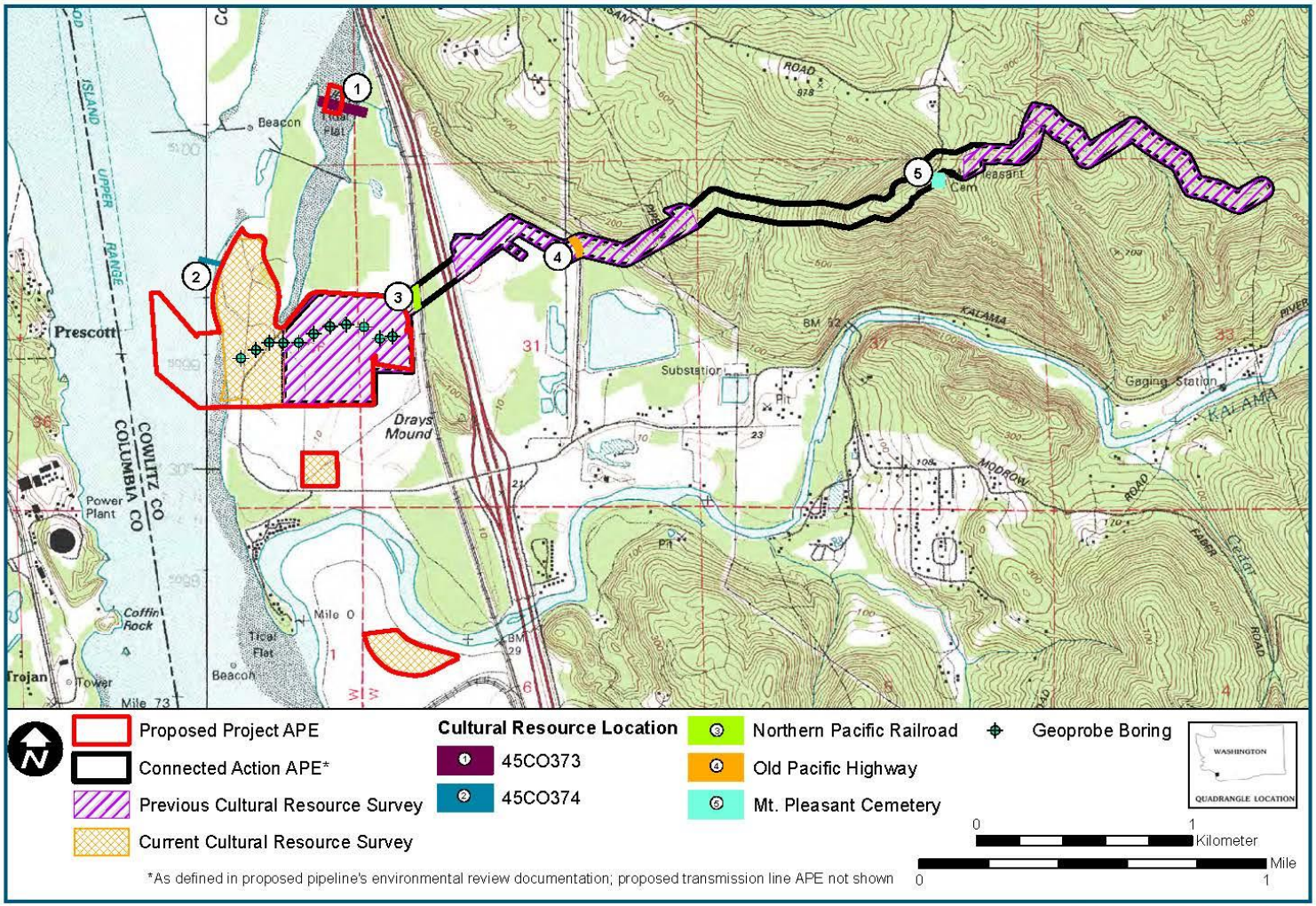
The project site is within the Port of Kalama (Port) North Port site in unincorporated Cowlitz County. The proposed project, with either Technology Alternative and either Marine Terminal Alternative would be located on the same project site, and so for the purposes of the cultural resource study, the Technology and Marine Terminal Alternatives are assessed using the same APE. The APE is defined as the project site, the wooden pile structure in the Columbia River and sloughs north of the project site, and the three potential temporary construction parking areas, for the purpose of considering potential impacts to cultural resources resulting from the proposed project. The wooden pile structure is included because it is proposed for removal as part of the proposed project's mitigation activities (see **Figure 11-1**). The APE also extends below the surface of the ground and was assessed to determine the potential for buried cultural resources. The submerged portions of the proposed project within the Columbia River are unlikely to retain cultural resources, because this area has undergone major changes as the river has eroded and redeposited sediment. Additional surveying in the river portion of the APE is not needed.

The APE for the proposed pipeline is defined in the environmental assessment for the pipeline (Federal Energy Regulatory Commission [FERC] Docket No. CP15-8-000, see **Appendix B**). The proposed pipeline APE includes all land that would be disturbed during construction of the pipeline. The APE for the electrical service improvements includes land that would be disturbed during its construction activities.

11.3.2 Identification of Cultural Resources

An inventory of cultural resources was compiled following the definition of the APE for the proposed project. A review was conducted of records and reports held by DAHP that are available through the Washington Information System for Architectural and Archaeological Records Data online database. Other materials, including historical maps and published secondary sources, were also reviewed to determine if cultural resources had been identified within or near the project site in the past and to determine if surrounding areas had been surveyed. The affected environment for this cultural resources assessment included cultural resources within or adjacent to the APE for the proposed project. Resources were considered if they meet or overlap the boundary of the APE. Resources that were not within or adjacent to the APE evaluated in this assessment would not be affected by the proposed project and are not identified in this analysis.

Background research and reviews of records revealed previous cultural resource inventories that covered a portion of the APE for the proposed project. An archaeological pedestrian survey and shovel testing were conducted within the APE of the proposed project in 2012 and 2013 (see **Figure 11-1** and **Appendix J**). The 2012 and 2013 fieldwork included the current APE though this field survey work was conducted based on plans for a previous project. The pedestrian survey followed meandering transects spaced at intervals of approximately 50 feet to cover most of the APE, which is crossed by dirt roads and covered in dredged fill material. The dredge materials that are present over much of the APE prevented observation of the deeply buried native soil surface where archaeological materials may be present. The eastern portion of the APE is bounded by an existing road, and appeared to be disturbed. A pedestrian survey of potential temporary construction parking areas was completed in 2015. The proposed parking areas were surveyed using transects spaced at intervals of approximately 50 feet. The parcels are capped by dredged sediment and gravel. No cultural resources were encountered within the proposed parking areas.



Cultural Resources in the Areas of Potential Effect
Figure 11-1

KALAMA SEPA
Manufacturing & Marine Export Facility

Shovel tests were excavated as part of the cultural resources survey to determine the presence of subsurface archaeological deposits. Two shovel tests were located on the west side of the inaccessible fenced area within the current APE. Soils encountered in both shovel tests represented modern dredge fill. A Geoprobe survey was completed in 2015 to inventory potential cultural resources within the native soils of the APE. Eleven Geoprobe borings were completed to a maximum depth of 60 feet below surface along an east-west transect crossing the project area. The native soils beneath the fill revealed wetland and sandy riverbank environments with little evidence of stable landforms. Cultural resources were not encountered in the borings.

11.4 Affected Environment

11.4.1 Cultural History Overview

Research, shovel testing, and Geoprobe sampling completed, for this assessment did not identify cultural resources associated with prehistoric or historic Native American settlement or land use on or adjacent to the APE. The recorded cultural resources are associated with historic-period Euroamerican settlement of the region. However, the cultural history of the Northwest Coast, including the APE, covers at least 13,800 years. Key elements of the cultural history of the surrounding area are outlined in this section.

11.4.1.1 Archaeological Background

The earliest archaeologically known pre-contact populations in the southern Northwest Coast are dated to about 13,800 years ago (Waters et al. 2011). Paleoindian (13,800 to 12,500 years ago) and subsequent Archaic Period (12,500 to 6,400 years ago) archaeological sites are rare in this region and sites of this age may be deeply buried under floodplain sediments (Aikens 1993; Ames and Maschner 1999). Archaeological sites dating to the Archaic Period in this region contain numerous hearths, fire pits, and earth ovens, as well as rich deposits of faunal remains and stone tools (Daugherty et al. 1987a, 1987b; Evans 2009; McClure 1986; Punke et al. 2009). Pacific Period (6,400 years ago to historic times) sites in the area include a diverse array of tools and personal items, as well as human remains (Ames et al. 1999; Burtchard 1989; Foutch et al. 2012; Jermann 1980; Ozbun et al. 2008; Punke et al. 2009; Warner and Warner 1975).

11.4.1.2 Ethnographic Background

The surrounding area was historically occupied by both Cowlitz and Chinookan-speaking peoples (Hajda 1990; Silverstein 1990). One or two ethnographically documented villages were located where the Kalama River flows into the Columbia River, approximately 0.3 mile south of the proposed project APE. According to Silverstein (1990) and Hajda (1984), these villages were occupied by Chinookan-speaking peoples. The word "kalama" is derived from one meaning "those of the rock" (Silverstein 1990). The first contacts with Europeans and Euroamericans in the late 1700s and early 1800s resulted in a demographic collapse for Chinook and Cowlitz ways of life. Many of the survivors went to reservations at Yakama, Warm Springs, and Grand Ronde after treaties were negotiated in 1855 (Boyd 1985; French and French 1998; Silverstein 1990).

11.4.1.3 Historical Background

Euroamericans did not establish permanent settlements in the area until the mid-1800s (General Land Office 1857a). Maps from 1857 depict the project area and the surrounding vicinity as generally undeveloped (General Land Office 1857b, 1857c), although a transportation corridor

labeled "Trail from Monticello to Fort Vancouver" was mapped approximately 0.4 mile to the east (General Land Office 1857b).

The first settlers to claim lands within the area were Joseph and Elizabeth Dray, who claimed a property encompassing most of the proposed project APE in 1865 under Donation Land Claim Nos. 37 and 40 (Bureau of Land Management 1865). The nearby Dray's Mound was likely named after this family, many of whom claimed land in this area.

Northern Pacific built the first railroad on the Washington side of the Columbia River in the 1870s (Asay 1991). The company's decision to build its headquarters at Kalama initiated the larger settlement and development there (Urrutia 1998:93). Today, BNSF operates the railroad. The area supported the logging and mill industries that would dominate this region throughout the twentieth century.

The Port was organized in 1920 and initially consisted of 600 acres on the east side of the Columbia River (Urrutia 1998). The Old Pacific Highway was completed in 1923 and Interstate 5 (I-5) followed a similar route by 1960. The U.S. Army Corps of Engineers (USACE) began dredging the Columbia River to improve navigation after the Rivers and Harbors Act of 1962 was passed. By 1969, dredge deposits had created an 18-foot-tall, 600-foot-long berm of sand, rocks, and logs on the Port shoreline to help reduce periodic flooding (Urrutia 1998). A portion of this berm became the existing marina, located 4.6 miles south of the current project area and operated by the Port. The project site was purchased by the Port in 1980 and the existing marine terminal located adjacent to the proposed project APE was built in 1997 (Trade Winds 2010).

New dredge fill was added within the proposed project APE after the 1980 eruption of Mount St. Helens. This eruption caused a huge flow of ash and debris down the Toutle River, into the Cowlitz River, and into the Columbia River just downstream from the Port (Urrutia 1998). The existing Steelscape facility was established on top of these newer dredge materials, leaving the area north of the proposed project APE as wildlife habitat (Urrutia 1998).

11.4.2 Cultural Resources Inventory

The investigation conducted for the proposed project and the alternatives identified four potential cultural resources within the proposed project APE, including one adjacent to the potential construction parking area at 2310 Hendrickson Drive (see **Table 11-1**). These resources are described below and mapped on **Figure 11-1**.

Table 11-1. Cultural Resources within the Proposed Project APE, Off-Site Alternative APE, and Related Action APE

Map No.	Name	Location[1]	NR-Eligible/WHR-Eligible
1	45CO373	Proposed Project APE	No[2]
2	45CO374	Proposed Project APE	No[2]
3	Northern Pacific/ BNSF Railway	Adjacent to Proposed Project APE/Within Related Action APE	No[2]
4	Old Pacific Highway	Within Pipeline Related Action APE	Varies, but local segment is not eligible[2]

[2] Pending review by DAHP.

Map No.	Name	Location[1]	NR-Eligible/WHR-Eligible
5	Mt. Pleasant Cemetery	Within Pipeline Related Action APE	Unevaluated[3]
*	45CW5	Adjacent to 2310 Hendrickson Drive Potential Construction Parking Area	Unevaluated

Notes
1 Cultural resources identified within the proposed project APE are also within the Marine Terminal Design Alternative APE.
2 This resource has been recommended as not eligible for listing in the NRHP and WHR as part of the Kelso-Martin's Bluff Rail Project review (Jones & Stokes 2003), but has not been formally evaluated by DAHP.
3 This potential cultural resource has been identified within the related action environmental review documentation but has not been formally evaluated by DAHP.
* The precise site location is considered confidential information, and it is not provided in this document.

Two archaeological resources consisting of remnants of timber pier or dock structures were recorded within the mitigation portion of the proposed project APE (resource numbers 45CO373 and 45CO374, as assigned in the cultural resources survey report). These two archaeological resources (45CO373 and 45CO374) are at least 50 years old, triggering an assessment of their eligibility for listing in the NRHP. This assessment is provided in **Appendix J**. A third timber pier or dock structure is also identified in **Appendix J**, but it is no longer included in the APE as it will not be impacted by the current project. Portions of 45CO373 are proposed for removal as mitigation for the proposed project. Because the timber structures, as originally built, are in ruin, they are addressed as archaeological sites rather than historic structures. Both were formerly structures supported by piles driven into the bed of the Columbia River and adjacent sloughs, all are in ruin with superstructures mostly absent, and all date to the late 1800s or early 1900s. These appear on historic maps and are described in detail in **Appendix J**. According to AECOM's 2011 survey of USACE pile dikes, the entirety of 45CO374 (shown in **Figure 11-1**) is a USACE-maintained pile dike at River Mile 71.87 (AECOM 2011). Visual inspection of 45CO373 and 45CO374 by AINW indicates that maintenance has not been performed in some time and the structures are derelict. The portions of the original structures that extend across the tidal flat fall within the APE. These timber pier or dock structure remnants are recommended as not eligible for listing in the WHR or NRHP.

One other cultural resource is located adjacent to the proposed project APE. The historic alignment of the Northern Pacific Railroad (now BNSF) is located immediately west of the APE. This resource lies outside the APE and would not be affected by the proposed project or alternatives; therefore, it is not discussed further in this assessment.

There are no cultural resources located within the APE for the proposed project that are listed in or determined eligible for listing in the NRHP, the WHR, or the Cowlitz County cultural resource inventory. Furthermore, there are no traditional cultural properties or intact historic properties listed in or determined eligible for listing in the NRHP or WHR nearby the proposed project APE.

The potential temporary construction parking area at 2310 Hendrickson Drive is adjacent to a recorded pre-contact archaeological village site. DAHP records identify site 45CW5 in this area, which corresponds to an ethnographically documented village near the mouth of the Kalama River (Harder and Hannum 2006; Smith and Hudziak 1948; Wildesen and Holstine 1982). This site has not been evaluated for eligibility for listing in the NRHP or WHR, and the boundaries are unconfirmed.

Dray's Mound, a prominent rock outcropping, is located near the APE. Ethnographic and historic evidence suggests that Dray's Mound, as well as similar small rocky hills near the Columbia River, may be associated with human burials (Ed Arthur, personal communication, 24 February 2010, as cited in Ozbun et al. 2011). Nearby Coffin Rock (on the opposite side of the river from the APE) was so named because of the historic presence of human remains in Native American canoes (Moulton 1990; Urrutia 1998; Vancouver 1984).

11.4.3 Related Action

The APE defined for the proposed pipeline related action was found to contain three cultural resources: the Old Pacific Highway, the Northern Pacific Railroad, and the Mt. Pleasant Cemetery. These resources were identified based on the information provided in environmental assessment for the proposed pipeline (FERC Docket No. CP15-8-000, see **Appendix B**). The historic-period Old Pacific Highway and the historic-period Northern Pacific Railroad are not recommended to be eligible for listing in the WHR or NRHP. The historic-period Mt. Pleasant Cemetery has not been formally evaluated for eligibility by DAHP.

Within the APE for the proposed electrical service improvements-related action, there are no recorded cultural resources that are listed in or determined eligible for listing in the NRHP, the WHR, or the Cowlitz County cultural resource inventory.

11.5 Environmental Impacts

The following sections describe the potential impacts on cultural resources that could result from the construction and operation of the proposed project and the No-Action Alternative. The Technology Alternatives and Marine Terminal Alternatives for the proposed project would affect the same APE and would not alter the portions of the APE likely to contain buried cultural resources. Because of this, the impact analysis does not differentiate between the various Technology and Marine Terminal Alternatives for the proposed project.

There are no traditional cultural properties or intact historic properties listed in or determined eligible for listing in the NRHP or WHR within or nearby the APE for the proposed project. Therefore, the proposed project would not have the potential to result in indirect effects to such properties. The following section focuses on the potential for direct effects to cultural resources.

11.5.1 Proposed Project Technology and Marine Terminal Alternatives

There are no cultural resources listed in or eligible for listing in the NRHP or WHR within the proposed project's APE. Therefore, the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in significant adverse impacts to cultural resources.

The proposed project would prepare an inadvertent discovery plan in advance of construction as required by the Cowlitz County SMP (Cowlitz-Wahkiakum Regional Planning Commission 1977). This plan would detail protocols to be followed in the event that cultural resources or human remains are encountered during project construction activities. This measure would avoid potential adverse impacts to unanticipated cultural resources on the project site.

Dray's Mound is located near the APE for the proposed project and, as noted above, is a rock outcropping similar to other rocky hills that have been associated with human burials. The proposed project would not alter Dray's Mound, and the landform is already located nearby

existing industrial properties and I-5. Therefore, the proposed project would not result in adverse impacts to Dray's Mound.

As discussed in Chapter 2, Proposed Project and Alternatives, three potential temporary construction parking areas are under consideration: the Air Liquide and Steelscape parcels adjacent to the project site, and 2310 Hendrickson Drive on the south bank of the Kalama River (**Figure 11-1**). These areas would be graveled for use as parking lots but would not otherwise experience ground disturbance, such as grading or excavation activities. The Air Liquide property has been surveyed for cultural resources as part of the proposed pipeline-related action, and is immediately adjacent to the APE surveyed for cultural resources for this project. The survey for the proposed pipeline-related action found no cultural resources within the property. In addition, the fill cap observed within the APE is likely to continue onto the Air Liquide property. No recorded cultural resources would be adversely impacted by construction of a graveled parking area on this property.

The proposed parking area at the Steelscape facility has been surveyed for cultural resources as part of this project. The property contains a substantial cap of dredge fill. No cultural resources were encountered within the property, and therefore no cultural resources would be adversely impacted by construction of a graveled parking area on this property.

The proposed parking area at 2310 Hendrickson Drive has been surveyed for cultural resources as part of this project. The property lies adjacent to archaeological site 45CW5. The location and boundaries of this site are unconfirmed and may intersect the property, but the property contains a substantial cap of fill and is currently graveled. No cultural resources were encountered within the property, and if the proposed use of 2310 Hendrickson Drive as a parking area does not lead to additional ground disturbance, there would be no adverse impacts to cultural resources.

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would increase vessel traffic by an additional three to six vessel round-trips per month. The increased in wakes from these vessels could lead to increased erosion of the shoreline, which in turn could impact cultural resources that are located in areas susceptible to erosion.

Potential impacts from erosion would vary depending on the proximity of a cultural resource to the existing river channel, the susceptibility of the shoreline to erosion and the amount of vessel traffic increase. The USACE's Channel Deepening Environmental Impact Statement noted that the natural shorelines of the lower Columbia River have remained very stable over the past 100 years (USACE 1999). Previous cultural resource studies of shoreline erosion effects on archaeological sites along the Columbia River have been conducted downstream for shipping terminal developments at Longview, Washington, and Bradwood, Oregon. These studies concluded that increased vessel traffic anticipated for these projects would have minimal cumulative effects on archaeological sites given the existing vessel wakes on the river. These effects were considered unlikely to impact previously recorded archaeological sites on the lower Columbia River in Oregon and Washington and no additional study was recommended (McDaniel et al. 2015). The project will only result in a minor increase in vessel traffic and the entire vessel corridor is currently exposed to vessel wakes from the ships that use the river. The vessels that would call at the marine terminal are within the size range of current vessels and would be piloted at similar speeds resulting in similar wakes. This means the shorelines, which have little susceptibility to erosion, would be subject to an incremental increase in vessel wakes

that are not currently causing erosion and no significant impacts from vessel wakes are anticipated.

11.5.2 Related Actions

11.5.2.1 Kalama Lateral Project

The Kalama Lateral Project (proposed pipeline) consists of construction and operation of a proposed pipeline to provide natural gas to the proposed project. The cultural resource survey of the related action project area remains incomplete because of a denial of permission to access some properties, but the related action will be required to complete Section 106 review under FERC. There would be no construction or operational impacts to recorded eligible cultural resources under the related action. The related action project area contains three recorded cultural resources; the Old Pacific Highway and the Northern Pacific Railroad have been determined to be ineligible for listing in the NRHP and WHR, and the Mt. Pleasant Cemetery has not been evaluated. It was also determined that the related action would avoid all three resources by aligning the route to avoid the cemetery and using horizontal directional drilling and conventional boring to route the pipeline beneath the highway and railroad. Therefore, the related action would not result in significant adverse impacts to cultural resources.

11.5.2.2 Electrical Service

The electrical service improvements upgrades an existing transmission line from the existing Kalama Industrial Substation to the project site by installing new lines on existing towers within the existing transmission line corridor. A new, short transmission line may be constructed between the Kalama Industrial Substation and an existing 115-kilovolt [kV] transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. Upgrades to the existing towers would not result in adverse impacts to existing cultural resources. The proposed locations of the new utility poles do not overlap with any recorded cultural resources. The fill cap within the Washington State Department of Transportation right-of-way renders it unlikely that significant cultural resources would be encountered within the project area for this related action, and no adverse impacts are anticipated.

11.5.3 No-Action Alternative

The proposed project would not be constructed under the No-Action Alternative. It is anticipated that the Port would pursue future industrial or marine terminal development at the North Port site, consistent with the Port's *Comprehensive Scheme for Harbor Improvements*. There are no cultural resources listed in or eligible for listing in the NRHP or WHR within the proposed project APE. Continued light industrial use of the proposed parking areas would not result in adverse impacts to site 45CW5. Therefore, the No-Action Alternative would not result in significant adverse impacts on cultural resources during either construction or operation. Depending on the nature of future development at the Port, the effects of vessel traffic on riverbank erosion may continue.

11.6 Mitigation Measures

11.6.1 Project Mitigation

The design features and best management practices the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by

agency standards or permits are assumed to be part of the project and have been considered in assessing the environmental impacts to historic and cultural resources and are listed below.

11.6.1.1 Design Measures

There are no cultural resources listed in or eligible for listing in the NRHP or WHR within or nearby the APE for the proposed project as noted throughout this chapter. The cultural resources survey encountered no cultural materials, and the buried wetland and river landforms are unlikely to contain archaeological sites. Therefore, no monitoring during construction is recommended. Site 45CW5 is unevaluated for eligibility for listing in the NRHP or WHR, but if parking improvements at 2310 Hendrickson Drive do not lead to ground disturbance, no mitigation would be needed. Although not currently anticipated as part of the proposed project, if ground disturbance of native soils is required at the potential construction parking area at 2310 Hendrickson Drive, 45CW5 may need to be evaluated for eligibility for the NRHP or WHR. However, it is anticipated that adverse impacts can be avoided during construction and use of the parking area by maintaining or adding to the existing gravel surface and refraining from ground-disturbing improvements to the parking area.

An inadvertent discovery of a cultural resource during construction would be addressed with an inadvertent discovery plan. This measure would minimize potential adverse impacts to unanticipated cultural resources on the project site.

11.6.2 Additional Mitigation

There are no significant adverse impacts identified for historic and cultural resources and therefore no additional mitigation measures are identified.

11.7 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts to cultural resources. There are no cultural resources listed in or eligible for listing in the NRHP or WHR within or nearby the project APEs. In addition, wake impacts generated by the proposed project are not likely to increase the erosion and impact cultural resources along the river, beyond already existing conditions caused by existing vessel traffic.

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Chapter 12 Transportation

12.1 Introduction

This chapter addresses the potential impacts of the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative, as well as the related actions, on transportation facilities. The sections below describe the regulatory context, define a study area for the assessment, describe the existing conditions within the study area, and assess the probable impacts on transportation facilities.

The assessment of the proposed project's potential impacts on area roadways and other surface transportation facilities presented in this chapter is based on a detailed transportation impact analysis provided in **Appendix K**. All backup analysis materials associated with this analysis are provided in **Appendix K**.

The proposed project, with either Technology Alternative and either Marine Terminal Alternative would be located on the same project site and would result in the same construction and operational employment, and so for the purposes of the transportation study, the Technology and Marine Terminal Alternatives for the proposed project are assessed using the same study area. This analysis applies to the proposed project with either Technology Alternative and either Marine Terminal Alternative and does not distinguish between the various alternatives.

The analysis concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in significant adverse impacts to transportation facilities.

12.2 Regulatory Context

12.2.1 Roadways

Area roadways are located in unincorporated Cowlitz County. The "Cowlitz County Road and Street Design Standards," issued by the Cowlitz County Department of Public Works specifies standards for establishing, laying out, constructing, altering, repair, improvement, and maintenance of roadways, bridges, and other related work in Cowlitz County.

12.2.2 Vessel Transportation

Table 12-1 lists the applicable federal, state, and local regulations applicable to marine vessels.

Table 12-1. Laws and Regulations Related to Vessel Transportation

Laws and Regulations	Description
Federal	
Ports and Waterways Safety Act of 1072 (31 U.S.C. 1221 et seq,)	Authorizes U.S. Coast Guard (USCG) to provide for navigation and vessel safety.
Anchorages under Ports and Waterways Safety Act (33 CFR 109)	Authorizes USCG to specify times of movement, restrict operations, and direct anchoring of vessels under hazardous conditions.

Laws and Regulations	Description
Navigable Water Regulations (33 CFR 126)	Regulates the handling of explosives or other dangerous cargoes within or contiguous to waterfront facilities.
Navigation and Navigable Waters, Subchapter E: Inland Navigation Rules (33 CFR 83–90)	Applies to vessel on the inland waters of the United States.
Navigable Water Regulations (33 CFR 160 – 167)	Ports and waterways safety regulations.
State	
Maritime Pilots and Pilotage (Oregon Revised Statutes Title 58 Chapter 776)	Requires the use of registered pilot when navigating certain waters in the State of Oregon including the Columbia River and/or Bar.

12.3 Methodology

12.3.1 Study Area

The project site is within the Port of Kalama's (Port) North Port site in unincorporated Cowlitz County. The study area for the surrounding surface transportation network was defined as the following five intersections near the project site (see **Figure 12-1**):

- Tradewinds Road – N. Hendrickson Drive/Kalama River Road
- Interstate 5 Southbound Ramps/Kalama River Road
- Interstate 5 Northbound Ramps/Kalama River Road
- Meeker Drive/Kalama River Road
- Old Highway 99 S/Kalama River Road

The study area for marine transportation was defined as the navigable channel of the Columbia River, from the project site to 3 nautical miles beyond the river mouth, which represent the route for vessels serving the facility within the state of Washington.

Transportation Study Intersections
Figure 12-1

12.3.2 Identification of Existing Roadway Conditions

The existing conditions analysis identifies site conditions and current operational and geometric characteristics of roadways within the study area. This section creates a basis for comparison to other conditions. The study area was visited and inventoried in July 2015. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic conditions, and transportation facilities in the study area.

12.3.2.1 Analysis Period

The weekday afternoon period (4:00 – 6:00 PM) was selected for evaluation of peak hour traffic conditions at all study intersections based on a review of current traffic patterns, which indicate higher weekday PM peak hour flows than AM peak hour flows on the street system, and expected weekday afternoon peaking conditions of the proposed project.

12.3.2.2 Intersection Analysis Methodology

All level of service (LOS) analyses described in this report were performed in accordance with the procedures stated in the 2000 *Highway Capacity Manual* (Transportation Research Board, 2000). LOS is used by planners and transportation engineers to describe the operational condition of a roadway network or intersection. LOS is described on a graded scale from LOS A, which indicates free-flow conditions with little to no delay, to LOS F, which indicates a breakdown in flow with significant congestion and delay. A more detailed description of LOS and the criteria by which it is determined for both signalized and unsignalized intersections is provided in the detailed Transportation Impact Analysis Report in **Appendix K**.

The peak 15-minute flow rate was used in the evaluation of all intersection operations to ensure that this study was based on a reasonable worst-case scenario. For this reason, the operations analyses reflect conditions that are only likely to occur for the peak 15 minutes of the weekday PM peak hour. Traffic conditions during all other weekday hours would likely operate under better conditions than those described in this report.

For the intersections operations analyses, Synchro Version 9.0 software was used to analyze all study intersections.

12.3.2.3 Intersection Operating Thresholds

The Washington State Department of Transportation (WSDOT) sets LOS standards for state highways of statewide significance based on RCW 47.06.140(2). WSDOT has established a LOS C standard for the Interstate 5 (I-5) corridor.

LOS E represents the level of delay at which drivers begin using alternative routes or may take risks when attempting maneuvers. Because Cowlitz County has no official LOS standards, a target threshold of LOS E or better was identified in this analysis for unsignalized, stop-controlled intersections under County authority. This threshold was selected because it represents the point at which drivers experience difficulty finding acceptable gaps in opposing traffic, and the length of average control delays approaches intolerable levels due to little or no remaining intersection capacity.

12.3.3 Development of Future Roadway Conditions

Future conditions in the transportation study area were projected based on planned or anticipated geometric changes to roadways and forecast transportation volume growth. This included a review of historical traffic growth trends on existing facilities to establish future

growth trends, as well as identification of planned developments, their associated trips, and roadway improvements.

12.3.4 Vessel Transportation Existing Conditions

Existing conditions within the vessel corridor were determined by reviewing existing vessel transit numbers from published sources. The primary data source is the Vessel Entries And Transit (VEAT) data published by the Washington Department of Ecology (Ecology 2015). Other sources include data from the United States Maritime Administration. Information on operating practices in the river were obtained from the National Oceanic and Atmospheric Administration U.S. Coast Pilot 7 Pacific Coast. 2016 Edition (NOAA 2016) and the Lower Columbia Region Harbor Safety Plan (LCRHSC 2013)

12.3.5 Vessel Transportation Assessment Methodology

The analysis evaluated the capacity of the navigation channel, berth, anchorages, pilotage organizations and assist tugs. Channel capacity was evaluated by comparing historic volumes to the 2014 baseline and adding the anticipated vessels serving the facility. There is no established level of service or published capacity of the channel.

Berth capacity is not considered a limiting factor because the project proposes a new berth and berth capacity is not discussed further. Anchorage capacity is not considered a limiting factor as the Applicant has indicated that vessels serving the facility would not be expected to anchor in the river either on the return or exit transit. Vessels would not be expected to cross the bar and enter the river unless the berth is available and similarly would not leave the berth unless conditions allow for an exit to the sea. The ability of the pilotage organization and assist tugs to serve vessels calling on the facility was addressed qualitatively by looking at the relative increase in demands presented by the vessels when compared to the existing base line and historic volumes.

12.4 Affected Environment

12.4.1 Roadways

12.4.1.1 Site Conditions and Adjacent Land Uses

The project site is located at the Port's North Port site, north of Kalama River Road and west of Tradewinds Road, the BNSF Railway and Union Pacific Railroad (UPPR) rail lines, and I-5. The site is currently used as a dredge material disposal site and has been graded in anticipation of future industrial development and is approximately 100 acres in size.

Existing land uses bordering the site include the Air Liquide facility and the Port's wastewater treatment facility to the southeast. The Steelscape manufacturing facility is immediately south of the project. To the north, the site is bounded by Port property primarily used for open space, recreation, and wetland mitigation. The Columbia River borders the site to the west. A marine terminal (the existing North Port dock serving the Steelscape facility) also exists on the Columbia River immediately southwest of the project site.

Beyond the site boundary lies the Kalama River Industrial Park to the south along N. Hendrickson Drive across the Kalama River, and a small cluster of cabins that receive seasonal use to the southwest along Sportsman Club Road. Across I-5 to the east are additional Port properties, including a large undeveloped property northeast of the I-5/Kalama River Road interchange, west of Old Highway 99 S, the future site of the Eastport Business Park along the north side of Kalama River Road, and Haydu Park south of Kalama River Road, which

provides a wide array of recreational opportunities, sports fields, shoreline access, a picnic area, riding arena, and an event center.

12.4.1.2 Adjacent Roadway Facilities

Table 12-2, Existing Transportation Facilities and Roadway Designations, summarizes key characteristics of the local study area roadways.

Table 12-2. Existing Transportation Facilities and Roadway Designations

Roadway	Classification	Cross Section	Speed Limit	Side-walks?	Bicycle Lanes?	Median?	On-Street Parking?
Kalama River Road	Rural Major Collector (east of I-5) Rural Minor Arterial (west of I-5)	2-lane	35 mph	No	No	No	No
Tradewinds Road	Private	2-lane	Not Posted	No	No	No	No
N. Hendrickson Road	Rural Minor Arterial	2-lane	35 mph	No	No	No	No
Interstate 5	Freeway	6-lanes	70 mph[2]	No	No	Yes	No
Meeker Drive	Rural Minor Collector	2-lane	35 mph	Yes, partial	No	No	No
Old Highway 99 S	Rural Major Collector[1]	2-lane	40 mph	No	No	No	No

1 Source: Cowlitz County 2012
2 Posted speed limit is 60 mph for trucks.

Kalama River Road

At its westernmost point, Kalama River Road begins next to the Columbia River at the existing North Port dock and Steelscape facility. The roadway proceeds east and up onto a grade-separated structure over the BNSF and UPPR rail lines and I-5. From there, the roadway continues east as it follows along the north side of Kalama River. The roadway has rural design features with two lanes of travel, and open shoulders with no bicycle lanes or sidewalks. There are continuous guardrails lining both sides of the roadway where there are steep slopes in the vicinity of the I-5 interchange.

Tradewinds Road

Tradewinds Road, a private road owned by the Port, would serve as the primary access road into and out of the proposed project. The roadway has two lanes of travel, and can facilitate the turning needs of large interstate-type trucks (WB 67) along the roadway, including its intersection with Kalama River Road. It should be noted that although a stop sign is posted, adequate stop bar striping is lacking on the southbound approach of Tradewinds Road at Kalama River Road.

N. Hendrickson Drive

This roadway is just west of I-5 and provides north-south access for industrial businesses and Port facilities located between Kalama River Road and the City of Kalama to the south. It is a

public road with two lanes of travel, no sidewalks or bicycle lanes, and no on-street parking. Where shoulders are present, they are narrow and unpaved.

Interstate 5
Interstate 5, including the ramp terminals at the Kalama River Road interchange, is operated and maintained by WSDOT. From the study area, I-5 leads north to the cities of Longview, Kelso, and Olympia, and south to the cities of Woodland and eventually Vancouver and Portland. The freeway has six lanes of travel, with single-lane on- and off-ramps at the Kalama River Road interchange.

Meeker Drive
Meeker Drive is just east of I-5, providing north-south access between Kalama River Road, the I-5 ramps, and the City of Kalama to the south. It is a public local road with two lanes of travel, partial sidewalks, no bicycle lanes, and no on-street parking. Where shoulders are present, they are narrow and unpaved. Sidewalk is present along the southern portion of the road near residential neighborhoods.

Old Highway 99 S

Old Highway 99 S extends north from Kalama River Road parallel to I-5. It is a rural, regional road with two lanes of travel, no bicycle lanes, and no on-street parking. Most sections of the road have unpaved shoulders.

12.4.1.3 Bicycle and Pedestrian Facilities

Sidewalks and bicycle lanes generally are not present at the project site or along facilities near the site. No continuous sidewalks or bicycle lanes are installed on the local streets that lead directly to the site, namely Tradewinds Road and Kalama River Road.

12.4.1.4 Transit Facilities

The rural public transportation service south from Longview to Vancouver runs six times a day, Monday through Friday. Stops include Longview (Transit Center), Kalama (Toteff Park), Woodland (Visitors Center/Park & Ride), and Vancouver (99th Street Station).

The service north from Longview to Castle Rock runs two times a day, Monday through Friday. Stops include Longview (Transit Center), Lexington (Country Run Apts.), and Castle Rock (Exit 49 Park & Ride).

Rural transportation is open to the general public. The fare for each one-way trip is $1.00. Vans are equipped with bike racks and are wheel chair accessible. These services do not serve the project site directly.

12.4.1.5 Existing Lane Configurations and Traffic Control Devices

Each of the study area intersections is described below.

Tradewinds Road – N. Hendrickson Drive/Kalama River Road
This four-legged intersection operates with stop-control on the minor street approaches of Tradewinds Road and N. Hendrickson Drive. All approaches operate with single shared left-through-right lanes.

I-5 SB Ramps/Kalama River Road

This four-legged intersection operates with stop-control on the minor approach of I-5 SB off-ramp, a one-way southbound road. The south leg the intersection is the I-5 SB on-ramp and operates as a one-way southbound entrance to the freeway. The north, east, and west approaches operate with single shared left-through-right lanes.

I-5 NB Ramps/Kalama River Road

This four-legged intersection operates with stop-control on the minor street approach of I-5 NB off-ramp, a one-way northbound road. The north leg the intersection is the I-5 NB on-ramp and operates as a one-way northbound entrance to the freeway. The south, east, and west approaches operate with single shared left-through-right lanes.

Meeker Drive/Kalama River Road

This T-shaped intersection operates with stop-control on the minor street approach of Meeker Drive. All approaches are single lanes with shared turn movements.

Old Highway 99 S/Kalama River Road

This T-shaped intersection operates with stop-control on the minor street approach of Old Highway 99 S. All approaches are single lanes with shared turn movements. Although a private drive intersects Kalama River Road on the south side of this intersection, for the purpose of this study, due to low volume, it was not considered in the analysis of intersection operations.

12.4.1.6 Existing Traffic Conditions

Traffic counts were obtained at the study intersections on Wednesday, 4 February 2015, during the afternoon (4:00 – 6:00 PM) peak period. The counts were compiled and reviewed to identify the peak hour for the street system, which occurred from 4:25 – 5:25 PM.

As shown in **Table 12-3**, all WSDOT study intersections meet the WSDOT standard of LOS C or better while all other intersections operate at levels that meet the target threshold of LOS E or better during the weekday PM peak hour.

Table 12-3. Existing Traffic Operations Summary (Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (sec) [1]	LOS
Tradewinds Rd - N Hendrickson Dr/ Kalama River Rd	SB	9.6	A
I-5 SB Ramps/Kalama River Rd	SB	12.0	B
I-5 NB Ramps/Kalama River Rd	NB	9.5	A
Meeker Dr/Kalama River Rd	NB	10.0	A
Old Highway 99 S/Kalama River Rd	SB	9.5	A

[1] Represents delay of worst movement at two-way stop controlled intersections.

12.4.2 Vessel Corridor

12.4.2.1 Columbia River Navigation System

The project is located at approximately Columbia River Mile 72 on the federally authorized Columbia and Lower Willamette project. The proposed dock will be located approximately 650 feet from the channel and a new berth will be dredged to accommodate vessels. The

channel in this location is straight stretch with an anchorage area located directly across the river from the project site. The federally authorized Columbia and Lower Willamette project begins at the mouth of the Columbia River and extends 106.5 miles to the I-5 Bridge crossing at Vancouver and the lower 11.6 miles of the Willamette River. The federally authorized mouth of the Columbia River project covers the 6 miles of the river located between the north and south jetties. The width of the Columbia River varies from up to 5 miles across at its mouth (Columbia Bar) to approximately 1/2-mile wide at the project site. Maintained channel depths are 55 feet over the bar (the entrance to the river from the Pacific Ocean), 43 feet from River Mile 3 to the lower turning basin at Vancouver. The 43-foot portion of the channel was deepened from the previous level of 40 feet between 2005 and 2010 (USACE 2016).

The channel operates similar to a two-lane highway with one 300-foot inbound and one 300-foot outbound vessel traffic lane. The channel widens beyond 600 feet near the Columbia bar and in designated vessel turning areas and anchorages along the entire stretch of the river to accommodate the flow of vessel traffic. The majority of the channel's bottom and edges is composed of soft, sandy mud with the exception of a few areas where shear rock edges are present (USACE 1999).

USACE is authorized to maintain the Lower Columbia River's navigational channel depth at -43 feet (below mean lower low water). As a safety measure, the pilots implement a 2-foot underkeel clearance requirement for vessels navigating the channel, which allows for fully laden drafts up to -41 feet to be accommodated. Occasionally the river levels run below mean lower low water, depending on the season and dam and lock operations upriver, and draft restrictions are instigated by the pilots limiting vessels to become fully laden during that time.

Between the bar and the Port of Kalama, there are two bridges over the Columbia River. The Astoria Megler Bridge is located at approximately River Mile 13 and connects Astoria, Oregon, with the Washington shoreline. It is a fixed span with a vertical clearance of 205 feet at the center of the main channel and a horizontal clearance of 1,070 feet (NOAA 2016). The Lewis and Clark Bridge is located at River Mile 57.3 and connects Longview, Washington, and Rainier, Oregon. It has a fixed span with a vertical clearance of 187 feet and a horizontal clearance of 1,120 feet (NOAA 2016). There are 11 designated anchorages within the river that can accommodate oceangoing vessels; 6 of which are located at or downstream of the Port of Kalama and typically can accommodate 36 total vessels (LCRHSC 2013).

Astoria, Oregon; Longview, Washington; Kalama, Washington, Vancouver, Washington; and Portland, Oregon, are the principal shipping points along the river and include both private and public (port) facilities. The distances above the mouth of the Columbia River to these ports are, respectively: 12 nautical (14 statute) miles, 58 (66) miles, 92 (106) miles, and 97 (112) miles; Portland has facilities on both the Columbia and Willamette Rivers.

USCG has designated Regulated Navigation Areas pursuant to 33 CFR Part 165B in the Columbia River. The only applicable Regulated Navigation Area that would apply to the vessel corridor is the Columbia River Bar. This Regulated Navigation Area provides USCG with the ability to close the bar to vessel traffic when conditions exceed the operational limitations of the USCG search and rescue resources (NOAA 2016). The Columbia River Bar Pilots also impose bar restrictions based on their expertise of the river.

Pilotage service is provided by two separate organizations. The Columbia River Bar Pilots guide vessels across the Columbia River Bar. Bar pilots board vessels by either helicopter or boat in the vicinity of the Columbia River Entrance Buoy, about 5 miles from shore. Bar pilots

assume navigation control of the vessel until approximately the Astoria Megler Bridge. From this location, Columbia River Pilots assume navigational control until reaching the destination. All vessels serving the proposed Facility would be required to use pilot services to enter, transit, and exit the Columbia River and bar.

Information on the number of vessels using the Columbia River is available from several sources, with several differences in the way vessel activity is reported. Ecology produces an annual report, Vessel Entries and Transits for Washington Waters[1] (VEAT). The VEAT report is a summary based on a compilation of many primary data sources, including some individual vessel operators and shipyards and is used as the primary source of data in determining the existing vessel use of the channel. It is important to note that this represents all deep draft vessels transiting the river and they have various destination ports. Not all vessels transit the entire channel length. **Table 12-4** lists the historic vessel traffic in entry transits.

Table 12-4. Existing Columbia River Deep Draft Vessel Traffic

Year	Entry Transits
2014	1581
2013	1457
2012	1428
2011	1466
2010	1583
2009	1397
2008	1806
2007	1872
2006	1720
2005	1654
2004	1669
2003	1771
2002	1780
2001	1881
2000	1934
1999	2269

Source: Ecology 2015, 2014

12.5 Environmental Impacts

12.5.1 Roadways

The assessment of environmental impacts is an analysis of the cumulative impacts of the proposed project. It begins by projecting future conditions at the study area intersections without the proposed project (referred to as the year 2019 background traffic forecast). Then,

[1] VEAT data includes vessels bound for both Washington and Oregon ports.

traffic conditions with the proposed project (referred to as the 2019 total traffic conditions) are assessed by adding the site trips to the projected 2019 background traffic forecast.

12.5.1.1 Background Traffic Conditions

The background traffic conditions analysis estimates operating conditions for the year 2019, when the proposed project is anticipated to reach full capacity and full employment. This baseline analysis accounts for expected traffic growth in the region and anticipated trips from a planned project (Eastport Business Park) but does not include traffic from the proposed project. It also accounts for planned transportation improvements associated with the planned project (Eastport Business Park) but not improvements associated with the proposed project.

12.5.1.2 Background Traffic Volumes

A 2.5 percent lineal annual growth rate was developed based on a review of the mean change in Average Annual Daily Traffic (AADT) volumes on I-5 between 2011 and 2013[2] near the project. This annual growth rate was then applied to existing year 2015 PM peak hour traffic volumes at all study intersections over a 4-year period to reflect continued anticipated growth in the region.

Additionally, vehicle trips associated with the planned Eastport Business Park project were identified and included in the 2019 traffic volume forecast. Although not yet approved, the Eastport Business Park is a planned industrial, professional, and business commercial development located east of the I-5/Kalama River Road interchange on the north side of Kalama River Road. The vehicle trips associated with this development were obtained from the *Eastport Business Park Traffic Impact Study* (Lancaster Engineering 2014).

12.5.1.3 Planned Transportation Improvements

No known roadway or intersection improvements have been planned by Cowlitz County, per a review of the updated six-year Transportation Improvement Plan (2014-2019). Also, there are no known planned and funded WSDOT projects in the vicinity of the site.

It should be emphasized that the Eastport Business Park Traffic Impact Study indicates certain physical improvements would be necessary to maintain acceptable operations with the addition of traffic from the Eastport Business Park development. Recommended improvements from the study include:

- Installation of an eastbound left-turn lane at Old Highway 99 S/Kalama River Road intersection,
- Channelization of the Southbound right-turn lane at Old Highway 99 S/Kalama River Road intersection,
- Installation of an all-way stop control at Old Highway 99 S/Kalama River Road intersection, and
- Installation of an all-way stop control at I-5 SB ramps/Kalama River Road intersection.

While the above improvements are not funded and not yet approved as final conditions of development approval, they were anticipated as a requirement of the Eastport Business Park site and, therefore, were accounted for in the background traffic conditions of this assessment.

[2] Year 2013 data are the most recent AADT data available from WSDOT.

Should higher-capacity solutions (e.g. traffic signals or roundabouts) be identified for implementation through development of the Eastport Business Park, the intersections included in this analysis would perform better than as described in this study. No other funded transportation improvements were identified in the study area.

12.5.1.4 Background Traffic Operations

Table 12-5 presents the build-out year 2019 background traffic operations for the weekday PM peak hour without the proposed project. These results reflect the assumed annual traffic growth pattern and the projected trip generation of the planned Eastport Business Park, as well as the anticipated physical improvements associated with the Eastport Business Park. As the table shows, all WSDOT study intersections are forecast to meet the WSDOT standard of LOS C or better, while all other intersections are forecast to operate at levels, which meet the target threshold of LOS E or better during the weekday PM peak hour.

Table 12-5. Background Traffic Operations Summary (Year 2019 Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (sec) [1]	LOS
Tradewinds Rd - N Hendrickson Dr/ Kalama River Rd	SB	9.8	A
I-5 SB Ramps/Kalama River Rd	-	14.8	B
I-5 NB Ramps/Kalama River Rd	NB	13.0	B
Meeker Dr/Kalama River Rd	NB	17.2	C
Old Highway 99 S/Kalama River Rd	-	10.4	B

[1] Represents average delay of all movements at all-way stop controlled intersections and delay of worst movement at two-way stop controlled intersections.

12.5.2 Proposed Project Alternative

This section presents the proposed project, its anticipated trip generation, distribution and assignment patterns, and presents the operational impacts of project trips on the study intersections.

Northwest Innovation Works, LLC – Kalama (NWIW) and the Port are proposing to construct the proposed project, which would receive natural gas from the Kalama Lateral Project (a proposed pipeline to be constructed by Northwest Pipeline LLC [Northwest]), process the gas into methanol, store it on site, and then ship it via the Columbia River to global markets. The proposed project is assumed to reach peak operations (full staffing) by 2019. At that time, the proposed project would reach peak employment of 192 workers.

Access to the proposed facility, including the new marine terminal, would occur from Tradewinds Road and then from a series of secure access points along Eastwind Road at the northern site boundary. It should be emphasized that one of these access points to Eastwind Road exists today for the Air Liquide facility and the Port's wastewater treatment facility. For security reasons, a separate access road to these facilities would be established with a new two-lane standard county road access along Tradewinds Road as part of the proposed project.

12.5.2.1 Site Trip Generation

Trip generation estimates of average daily and weekday PM peak hour vehicle trip ends for the proposed project were calculated using the employment plan and shift schedule provided by

NWIW for the methanol manufacturing facility. Based on NWIW plans, the plant is expected to operate under a three-shift schedule with shift changes occurring at 8:00 AM, 4:00 PM, and 12:00 AM. An alternate schedule is under consideration in which the production staff, which constitutes 15 employees per shift, would operate on a two-shift schedule with shifts changing at 6:30 AM and 6:30 PM and one of three shift-groups not scheduled to work for any given day.

Estimates were prepared for both the three- and two-shift production staff scenarios. The two-shift schedule requires 15 fewer daily employees than the three-shift schedule, which translates to 30 fewer average daily trips compared to average daily trips for the three-shift schedule. Moreover, the two-shift schedule sets the PM shift change for production staff members (15 departing and 15 arriving) at 6:30 PM, which is outside the weekday PM peak hour. Compared to the three-shift schedule, the two-shift schedule would have 30 fewer total trips during the PM peak hour (15 fewer inbound and 15 fewer outbound).

For comparative purposes, trip generation estimates were also prepared using the standard reference manual *Trip Generation* (Institute of Transportation Engineers, 2012). For this exercise, a Light Industrial land use (ITE Land Use Category 110) was assumed to apply and the number of permanent site workers was used as the independent variable. (Another comparative ITE Land Use Category 140, Manufacturing, was not used for this exercise as its trip generation in the PM peak hour is lower than that of Light Industrial.) Two different ITE Light Industrial trip rates were used to assess weekday afternoon peak hour conditions; one that reflects the weekday PM peak hour of adjacent street traffic (typically within the 4:00 – 6:00 PM period), and one that reflects the peak hour of the site generator (typically prior to 4:00 PM).

Table 12-6 shows the trip generation results for the proposed project under the two worker shift schedules and for the two alternative ITE rates considered. As shown, the three-shift production staff schedule in the first row of the table represents a worst-case estimate of average daily and weekday PM peak hour trips. Therefore, these trips were selected to produce a conservative analysis of site traffic impacts.

Table 12-6. Site Trip Generation Estimates

Options	Average Daily	Weekday PM Peak Hour		
		Total	In	Out
Plant Schedule: 3 Production Shifts*	**320**	**128**	**32**	**96**
Plant Schedule: 2 Production Shifts	290	98	17	81
ITE Code 110: Adjacent Street	484	68	15	54
ITE Code 110: Site Generator	484	82	24	58

* Denotes estimate used for analysis

12.5.2.2 Site Truck Traffic

Because the primary function of the proposed project is to produce methanol and transfer it from the manufacturing facility to vessels at the proposed project's marine terminal, operation of the proposed project is not expected to generate any meaningful level of tractor-trailer truck trips on the external street network. Instead, typical delivery and service vehicle trips are expected.

12.5.2.3 Site Trip Distribution and Assignment

The estimated vehicle trip distribution pattern was based on a review of the existing traffic counts at the Kalama River Road intersections with Tradewinds Road and the I-5 ramp terminals to understand the traffic patterns of current North Port facilities.

12.5.2.4 Total Traffic Operations

The analysis of year 2019 total traffic conditions identifies how the study area's transportation system would operate with the proposed project complete and operating at full capacity and full employment. Traffic volumes for this scenario were determined by adding the site trip assignment to year 2019 background traffic volumes, which include trips and improvements associated with Eastport Business Park.

Table 12-7 displays the year 2019 total traffic operations analysis results. As shown, all WSDOT study intersections are forecast to meet the WSDOT standard of LOS C or better, while all other intersections are forecast to operate at levels which meet the target threshold of LOS E or better during the weekday PM peak hour with the proposed project in place.

Table 12-7. Total Traffic Operations Summary (Year 2019 Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (s) [1]	LOS
Tradewinds Rd - N Hendrickson Dr/ Kalama River Rd	SB	11.1	B
I-5 SB ramps/Kalama River Rd	-	17.2	C
I-5 NB ramps/Kalama River Rd	NB	16.9	C
Meeker Dr/Kalama River Rd	NB	18.2	C
Old Highway 99 S/Kalama River Rd	-	10.6	B

[1] Represents average delay of all movements at all-way stop controlled intersections and delay of worst movement at two-way stop controlled intersections.

12.5.2.5 Traffic Operations with No Eastport Business Park

Because the Eastport Business Park had not yet been approved at the time the analysis was performed for this study, there is the possibility the proposed project would become operational before the business park is fully built out. For this reason, all study intersections were reanalyzed under year 2019 total traffic conditions assuming no Eastport Business Park trips or associated transportation improvements. This analysis used year 2019 background traffic plus site generated traffic and existing roadway capacity conditions.

Table 12-8 displays the analysis results. As shown, all WSDOT study intersections are forecast to meet the WSDOT standard of LOS C or better while all other intersections are forecast to operate at levels that meet the target threshold of LOS E or better during the weekday PM peak hour.

Table 12-8. Total Traffic Operations with No Eastport Business Park (Year 2019 Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (sec)[1]	LOS
Tradewinds Rd - N Hendrickson Dr/ Kalama River Rd	SB	10.7	B
I-5 SB ramps/Kalama River Rd	SB	13.4	B
I-5 NB ramps/Kalama River Rd	NB	10.7	B
Meeker Dr/Kalama River Rd	NB	10.4	B
Old Highway 99 S/Kalama River Rd	SB	9.7	A

[1] Represents delay of worst movement at two-way stop controlled intersections.

12.5.2.6 Vehicle Queuing Impacts

Estimated vehicle queues on all approaches of the Tradewinds Road – N. Hendrickson Drive/Kalama River Road study intersection would be accommodated within available lane storage during the year 2019 background and total traffic conditions of the weekday PM peak hour.

12.5.2.7 Intersection Sight Distance

Intersection sight distance at the Tradewinds Road access with Kalama River Road is adequate and consistent with standards specified in AASHTO's A Policy on Geometric Design of Highways and Streets (AASHTO 2011).

12.5.2.8 Construction Traffic Impacts

Construction of the proposed project is assumed to occur over a 26-month period with peak construction activity expected to occur in months 13 and 14 of the construction period. This peak period was selected to analyze the potential impacts of construction activity under worst-case conditions.

The assessment of construction-related impacts was conducted by projecting future traffic conditions in the study area without project construction activities (referred to as the construction year 2017 background traffic conditions) and then assessing conditions at peak construction of the project (referred to as the construction year 2017 total traffic conditions).

Construction Year 2017 Background Traffic Conditions

Consistent with prior assumptions of future traffic growth, a 2.5 percent lineal annual growth rate was applied to existing year 2015 PM peak hour traffic volumes over a two-year period to reach an assumed peak construction year of 2017. The projected trips and roadway improvements associated with the planned Eastport Business Park were excluded from this forecast because the business park is not expected to be operational by 2017.

Table 12-9 presents the construction year 2017 background traffic operations for the weekday PM peak hour. As shown in the table, all WSDOT study intersections are forecast to meet the WSDOT standard of LOS C or better while all other intersections are forecast to operate at levels that meet the target threshold of LOS E or better during the weekday PM peak hour.

Table 12-9. Construction Year 2017 Background Traffic Operations Summary (Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (sec) [1]	LOS
Tradewinds Rd - N Hendrickson Dr/ Kalama River Rd	SB	9.6	A
I-5 SB Ramps/Kalama River Rd	SB	12.3	B
I-5 NB Ramps/Kalama River Rd	NB	9.6	A
Meeker Dr/Kalama River Rd	NB	10.1	B
Old Highway 99 S/Kalama River Rd	SB	9.5	A

[1] Represents delay of worst movement at two-way stop controlled intersections.

Construction Trip Generation

NWIW provided an estimated amount of construction materials and the construction time line. Based on conversations with NWIW, certain assumptions were made about the number of trucks needed to transport the materials to and from the project site throughout the course of construction. **Appendix K** includes the chart of estimated amount of materials, a table documenting assumptions and resultant truck deliveries per material type, and the construction time line.

Construction Delivery Trips

Based on the estimated time line for construction, it was assumed that 11 percent of all truck deliveries (23,665 tractor-trailer deliveries for total project) would occur during the peak construction month, constituting 2,605 deliveries during this month. Assuming 20 delivery days in the month (five days per week across four weeks), 131 deliveries would be made on average per day. For worst-case analysis of the PM peak hour, it was further assumed that deliveries would be made with consistent frequency across an 8-hour workday rather than be concentrated in the first half of the day, which commonly occurs on construction sites.

Construction Worker Trips

Based on the estimated time line for construction, a maximum of 1,122 workers could be on the project site on a daily basis during the peak construction month.[3] It was assumed that these workers would depart the site at the end of a workday with uniform distribution across a 3-hour period, from 4:30 PM to 7:30 PM. This window for worker departures is based on anticipated worker schedules, as well as constraints associated with the circulation frequency of a shuttle service provided to transport workers between temporary off-site parking areas and the construction site.

The Port and NWIW have identified multiple locations where the workers may park during the construction phase. These locations are 2310 Hendrickson Drive, the Air Liquide facility parking area nearby at 185 Eastwind Road, and the Steelscape facility parking area nearby at 222 W. Kalama River Road. For the purposes of being conservative, it was assumed that

[3] Subsequent to the completion of the traffic analysis, the peak construction worker population estimate was revised to 1,032 per day during the peak construction month. The higher estimate in this assessment was retained because it provides for a conservative assessment.

workers would park primarily at the lot on N. Hendrickson Road, which is just south of the Tradewinds Road – N. Hendrickson Drive/Kalama River Road intersection. Workers were assumed to be shuttled to and from the project site using 40-person buses, based on experience with construction efforts for similar industrial facilities.

Table 12-10 displays the trip generation for peak construction conditions.

Table 12-10. Construction Trip Generation

Trip Type	Average Daily Trips	Weekday PM Peak Hour Trips		
		Total	In	Out
Tractor-trailer Truck Deliveries	262	36	18	18
Workers	2,244	374	0	374
Shuttles to/from Worker Parking	120	20	10	10
TOTAL	**2,566**	**430**	**28**	**402**

Construction Trip Distribution and Assignment

The estimated vehicle trip distribution pattern used in the prior analysis of permanent worker project trips was used for the construction worker trips. Tractor-trailer truck delivery trips were routed to/from I-5 with equal north-south distribution. Bus shuttle trips were also accounted for in this step.

Construction Year 2017 Total Traffic Conditions

The analysis of construction year 2017 total traffic conditions identifies how the study area's transportation system operate with the estimated peak season construction traffic. Traffic volumes for this scenario were determined by adding the construction trip assignment to year 2017 background traffic volumes.

Table 12-11 displays the construction year 2017 total traffic operations results. As shown, all WSDOT study intersections are forecast to meet the WSDOT standard of LOS C or better while all other intersections are forecast to operate at levels that meet the target threshold of LOS E or better during the weekday PM peak hour with peak season construction traffic.

Table 12-11. Construction Year 2017 Total Traffic Operations Summary (Weekday PM Peak Hour)

Intersection	Critical Movement	Delay (sec) [1]	LOS
Tradewinds Rd – N. Hendrickson Dr/Kalama River Rd	SB	36.2	E
I-5 SB ramps/Kalama River Rd	SB	19.4	C
I-5 NB ramps/Kalama River Rd	NB	12.2	B
Meeker Dr/Kalama River Rd	NB	10.7	B
Old Highway 99 S/Kalama River Rd	SB	9.7	A

[1] Represents delay of worst movement at two-way stop controlled intersections.

12.5.3 Vessel Corridor

The operation of the proposed project under either Marine Terminal or Technology Alternative would result in increased ship traffic along the Columbia River from the project site to the mouth of the river. The proposed project would result in approximately 36 to 72 entry transits per year. The use of the berth for general use by the Port would not likely result in additional vessel traffic to the marine terminal because in most cases it is expected that these vessels would already be transiting the Columbia River for other reasons such as to load grain at one of the existing port terminals. Based upon the most recent data, the river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel entry transits in 2014. As shown in Table 12-3, the channel has historically accommodated much higher numbers of vessels (Ecology 2015). The small increase in vessel traffic associated with the proposed project operations would contribute a minor increase in vessel trips (less than 5 percent) but would remain at levels below the historic highs and the channel would be able to accommodate the increase without any impact on existing traffic.

The dock face is located approximately 650 feet from the edge of the navigation channel. The location of the dock is such that any vessel using the facility will not interfere with use of the navigation channel or anchorages by blocking or otherwise preventing access. In addition, an analysis of the project and its effect on river flow and sediment movement indicated that the new dock and berth would not affect sedimentation rates or dredging needs of the channel (Coast & Harbor Engineering 2015).

The additional ship traffic will increase the demand on assist tugs that are used to help the vessel during arrival and exit from the marine terminal. Assist tugs are provided by private companies and are not on contract or otherwise provided by the Port or another public agency. On the Columbia River assist tugs are provided by Shaver Transportation and Foss. The minor increase in vessel traffic would not be expected to impact the ability to provide assist tugs to the additional traffic or existing vessels. The private companies providing the services would likely respond by increasing available crews or adding additional vessels to their fleet.

Similarly the minor increase in vessel trips would result in a minor increase in demand on pilots. Both pilot groups indicate that they are not operating at full capacity and if demand requires additional pilots could be added (DNV GL 2014).

12.5.4 Related Action

Two related actions would be constructed to facilitate the development of the proposed project. The related actions are the Kalama Lateral Project (the proposed pipeline) and the new transmission lines and substation improvements by the Cowlitz County Public Utility District No. 1 (Cowlitz PUD). Each of these related actions is assessed below.

12.5.4.1 Kalama Lateral Project

The assessment of the proposed pipeline is based on information contained in its environmental assessment (Federal Energy Regulatory Commission [FERC] Docket No. CP15-8-000, see **Appendix B**).

Construction of the proposed pipeline would last approximately five months and require a peak workforce of 75 construction workers and 12 construction inspectors, except during work in the vicinity of I-5 and the BNSF railroad, which would require approximately 8 additional workers. The effects of these workers on the surrounding transportation network would be temporary, lasting only for the duration of construction activities.

Construction across paved roads, highways, and railroads would be conducted in accordance with Northwest's Erosion Control and Revegetation Plan and requirements identified in road and railroad crossing permits or approvals. A horizontal directional drill would be used to install the pipeline below I-5 and the BNSF Railroad. At most other road crossing locations, Northwest anticipates using open-cut methods. Northwest anticipates that each open-cut road crossing, including cutting the road, installing the pipeline, and repairing the road, would be completed in a single day. One exception to the use of the open-cut method would be Old State Highway 99, which would be crossed using the bore-crossing method. The bore-crossing method would consist of excavating a pit on each side of the road; placing boring equipment within the pits; boring a hole under the roadbed; and pulling a section of pipe through the hole. Typically, there would be little or no disruption to traffic at road, highway, or railroad crossings during boring operations. Northwest would prepare a traffic plan in coordination with Cowlitz County to limit disruption and ensure safety to both workers and the public at all proposed road crossings. At paved county road crossings, Northwest has committed to maintaining 5 feet of cover between the road surface and the top of the pipe where possible.

Operation of the proposed pipeline would not generate additional traffic. Overall, the proposed pipeline would not result in significant adverse impacts to transportation.

12.5.4.2 Electrical Service

In order to provide electric service to the proposed project with the Ultra-Low Emissions Alternative, it is expected that Cowlitz PUD would upgrade an existing transmission lines and install new equipment at its existing Kalama Industrial Substation. Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. Traffic flow would be maintained during construction activities and the upgraded transmission lines and substation would not generate additional trips during operation. Therefore, the upgraded transmission lines and substation would not result in significant adverse impacts to transportation.

12.5.5 No-Action Alternative

The proposed project would not be constructed on the project site under the No-Action Alternative. However, it is anticipated that the Port would pursue future industrial or marine terminal development at the North Port site, consistent with the Port's *Comprehensive Scheme for Harbor Improvements* (Port of Kalama 2015). The potential transportation impacts of the No-Action Alternative during construction and operation would depend on the type of industrial development that is ultimately pursued and could be greater or less than those of the proposed project.

12.6 Mitigation Measures

12.6.1 Project Mitigation

The design features the Applicant proposes to avoid or minimize transportation environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the Project. These design features have been considered in assessing the environmental impacts to transportation resources and are discussed below.

12.6.1.1 Design Measures

The Transportation Impact Analysis report recommended the installation of stop bar striping on the southbound approach of the Tradewinds Road/Kalama River Road intersection, consistent with Cowlitz County and/or Manual of Uniform Traffic Control Devices striping standards. This measure is intended to improve transportation safety near the project site by addressing an existing substandard condition not related to the proposed project.

12.6.2 Additional Mitigation

There are no significant adverse impacts identified for transportation resources and therefore no additional mitigation measures are identified.

12.7 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse impacts to transportation facilities.

12.8 References

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Chapter 13 Public Services and Utilities

13.1 Introduction

This chapter assesses the potential impacts on public services and utilities of the proposed project's Technology Alternatives and Marine Terminal Alternatives, a No-Action Alternative, and the related actions. The public services and utilities considered in this analysis include: (1) fire protection and emergency services, (2) police services, (3) schools, (4) public parks and recreation facilities, and (5) water and sewage services. This chapter also provides an estimate of potential economic benefits that would be generated by the proposed project in the form of tax revenues, jobs and wages, and revenue to the Port of Kalama from land leases and dock fees. Potential impacts to energy service providers are discussed separately in Chapter 7, Energy, of this environmental impact statement. Emergency response procedures and potential impacts related to vessel spills and other incidents that may occur with the proposed project are discussed in detail in Chapter 8, Environmental Health and Safety. This chapter discusses the methodology employed to assess impacts, describes the public service and utility providers that could be affected by the proposed project and alternatives, and assesses the potential impacts on these public services and utilities.

The analysis concludes that the proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in significant adverse impacts to public services and utilities with the proposed mitigation measures described below.

13.2 Methodology

The following section describes the methodology used to characterize the affected environment and assess potential impacts for public services and utilities. This assessment begins with a screening analysis to determine whether the alternatives and related actions would have the potential to impact certain public services and utilities (see section 13.3). If warranted, a more detailed analysis is provided in the sections that follow.

The characterization of the affected environment consisted of researching publicly available information documented on the websites of service providers. The research identified the service providers for the proposed project and alternatives, the types of services offered by the provider, staffing levels, equipment, office/station locations, and overlapping responsibilities with other service providers, if available. The assessment of the related actions relies on the information in the environmental assessment prepared by the Federal Energy Regulatory Commission (FERC) for the proposed pipeline.

Potential impacts on public services and utilities can be direct or indirect. Direct impacts can occur when an alternative displaces, physically alters, or affects access to or from a public service or utility. Indirect impacts can occur if an alternative introduces a new population or activity that places substantial new demands on a public service or utility. The assessment of the environmental impacts analyzed the demand of each alternative on public services and utilities, identified the magnitude of the impact, discussed proposed project measures to reduce impacts, and assessed the significance of the impact after the implementation of impact reduction measures. Generally, the impact assessment was qualitative in nature, but in cases such as water and sewage systems, quantitative assessments were possible. The assessment of environmental impacts analyzed:

- Whether there is potential for the proposed project to impact public services and utilities. The analysis identified potential impacts to public service and utilities, as well as instances where the project would have no impact on them. For example, the analysis determined that the proposed project and alternatives would not have the potential to affect schools or parks and recreation facilities based on the screening analysis provided in section 13.3 below.
- The magnitude of the impact, where possible. The analysis of the magnitude of impacts was qualitative when numerical information or estimates for the magnitude of the impact were not available.
- Design or operational measures meant to reduce the magnitude of the impact. This analysis identified aspects of the project design, operational practices, or standards meant to reduce the level of the impact. As an example, providing security personnel on site would be an operational practice meant to reduce the need for police services.
- Whether impacts would be reduced to non-significant levels with implementation of proposed onsite measures. For example, an alternative may place new demands on fire services but the on-site systems, project design, or measures that are proposed would reduce the demands on fire services to non-significant levels.

In order to evaluate whether the project will generate tax revenue and other favorable impacts on economic resources to offset potentially increased demands on public services, ECONorthwest analyzed the proposed project's regional economic impacts using the Impact Analysis for Planning Model (IMPLAN). See **Appendix M**, Census Block Group Data (ECONorthwest 2015) for the analysis. IMPLAN, an input-output modeling system, describes the flow of goods and services between industrial sectors in regions usually defined as a county, a group of counties, or a state. The IMPLAN databases contain county-level, inter-industry trade flows for hundreds of estimated commodities based on nationwide production functions (i.e., relationships showing the average amounts of various goods and services required to produce a unit of each commodity). ECONorthwest customized the IMPLAN data based on proprietary information describing trade flows in the regional economy, and on information about the proposed project provided by the Applicant.

Input-output models estimate not only the employment and income generated to construct and operate a project (direct effects) but also the increased employment and income in industries linked to the project (indirect effects). The model also estimates the increased purchases that workers in the affected industries make, due to their increased income (induced effects). The sum of the direct, indirect, and induced effects is called the total effect. Economic output measures the total value of economic transactions related to the proposed project.

13.3 Regional Economy and Service Provider Screening Analysis

13.3.1 Proposed Project

Workers at the proposed project are expected to live in Southwest Washington and the Portland-Vancouver-Hillsboro metropolitan statistical area according to the *Economic Impact Analysis of the Proposed Kalama Manufacturing and Marine Export Facility* (ECONorthwest 2015) (see **Appendix M**). This area covers the major towns and cities within a less than

90-minute driving radius of the project site. The area is defined as the "regional economy" from which the proposed project would likely obtain nearly all of its employees.[1]

The regional economy is large, encompassing 12 counties in Southwest Washington and Northwest Oregon with a population of 2.7 million people and a labor force of 1.4 million workers (ECONorthwest 2015). The area has hundreds of schools, parks and recreational opportunities, and dozens of school districts and park/recreation providers. The proposed project and alternatives would employ approximately 1,000 temporary construction workers and 192 permanent employees during operation. It is likely that many of the project construction and operational workers already live within the 12-county region, and these workers would not place new demands on schools, park, and recreation facilities. Even if all construction and operational workers relocated from outside the region for employment at the proposed project, the project would not have significant impacts on school, park, and recreation providers in the context of the overall population and abundance of service providers in the regional economy. Workers that relocate to take jobs at the proposed project would likely be dispersed throughout the 12-county region and would not introduce substantial new demands for schools, parks and recreation facilities in any one location. Therefore, the proposed project and alternatives would not result in significant adverse impacts to schools, park, and recreation facilities and further assessment is not warranted.

The proposed project could result in new demands on fire, emergency, police, water, and sewage service providers. Therefore, potential impacts to these public services and facilities warrant additional assessment.

13.3.2 Related Actions

The proposed project would be supported by two related actions: (1) the Kalama Lateral Project (the proposed pipeline); and (2) new transmission lines and substation improvements. The proposed pipeline would employ 87 workers during the peak of construction and a very small number of workers during operations. The proposed pipeline would not generate substantial demand for police services, parks, or schools. The proposed pipeline would not require public water and sewer services during construction or operation. Likewise, the new transmission lines and substation improvements would not introduce new employment nor would it place new demands on police or fire services, parks, schools, or public water and sewer services. Therefore, the related actions would not result in significant adverse impacts to police services, schools, or park and recreation facilities and further assessment is not warranted.

The proposed pipeline may generate demand for fire protection and emergency services from incidents involving external forces such as earthquakes, damage from third-party digging, geologic hazards, hydraulic hazards, or other natural occurrences (FERC 2014). Therefore, an assessment of these public services is provided below for the proposed pipeline.

13.4 Affected Environment

13.4.1 Fire Protection and Emergency Services

The proposed project could place new demands on fire and emergency services. These new demands would be offset by measures included in the operation and design of the proposed project. Northwest Innovation Works, LLC – Kalama (NWIW) would conduct a process hazard

[1] The 12-county metro region includes seven counties in Washington (Cowlitz, Clark, Lewis, Pacific, Skamania, Thurston, and Wahkiakum) and five counties in Oregon (Clackamas, Columbia, Multnomah, Washington, and Yamhill).

analysis (PHA) to identify risks of unplanned releases of hazardous chemicals or fire during the methanol manufacturing process and to identify safety measures and protocol. The PHA would reduce the risks related to a chemical release or fire.

The proposed project would also provide process-specific on-site fire suppression and emergency response capabilities that would be augmented by Cowlitz County Fire District No. 5 and would not place substantial new demands on public fire protection. Therefore, the proposed project would not result in a significant adverse impact to fire protection and emergency service providers.

See Chapter 2 and Chapter 8 for details regarding the on-site fire suppression and emergency facilities.

13.4.2 Police

Law enforcement services for the project site would be provided primarily by the Cowlitz County Sheriff's Department (Cowlitz County 2015). Their office is located at 312 SW First Avenue in the City of Kelso and has 20 patrol deputies in 2013 (Washington State Auditor's Office 2013).

The existing marine terminals on nearby industrial sites along the Columbia River are subject to the Maritime Transportation Security Act (MTSA), which requires the development of port security programs. The Port of Kalama has a U.S. Coast Guard (USCG)-approved port security plan and security officer as required by MTSA (USCG 2015a). This security program supplements local police services in the port areas along the Columbia River. The Port contracts with a private firm to patrol the gate to each terminal while a ship is berthed and the terminal is always secured. The security staff implements the facility security plan if an incident occurs. All Port security contractors are trained, conduct regular drills, and conduct an annual security exercise. The security staff performs random patrols from 5 p.m. to 4 a.m. each day. Cameras cover all secured areas and record 24 hours a day (Port of Kalama 2015). Transportation Worker Identification Credentials (TWIC) are required for access to the secured areas of the port and individuals without TWIC credentials are escorted by authorized personnel. The USCG's Maritime Security (MARSEC) system is used to communicate threat levels and identify needs for greater security from the Port of Kalama and USCG during times when there is a credible threat affecting the Port or project site (USCG 2015b).

13.4.3 Water and Sewage

There is no existing water service to the project site. The nearest public water system is operated by the City of Kalama (City of Kalama 2007). The Port of Kalama would construct a collector well capable of delivering up to 6,600 gallons of non-potable water per minute to meet process water needs under an existing groundwater permit as part of the proposed project. Potable water for domestic uses would be supplied from a connection to the City of Kalama water system. Alternatively, the proposed project may receive potable water from the Port's water supply system rather than the City of Kalama. Water treatment would be provided on site if potable water is supplied by the Port.

The City of Kalama owns and operates a Group A public water system (Washington State Department of Health Identification No. 37550F) that services the City and a portion of unincorporated Cowlitz County. The water for the system is entirely supplied by the Kalama River. The City has a total storage capacity of 2.5 million gallons (MG) composed of a single 2.0-MG reservoir and 10 smaller reservoirs. The proposed project is located within the City's

"main pressure zone" served by the existing 2.0-MG reservoir. The City waterlines nearest to the proposed project are located in Tradewinds Road east of the project site and south of the site on the Steelcase site (City of Kalama 2007).

As of summer 2015, the City was updating its water system plan as required by the Washington State Department of Health. City representatives indicate that the system has sufficient supply and reservoir capacity to serve the water service area for six years and sufficient water rights for a 20-year period. In the baseline year (2014), 6-year planning period (2020), and 20-year planning period (2034), the City's average day production is an estimated 845,000 gpd, 867,000 gpd, and 1.1 million gpd, respectively. The City anticipates supplementing its existing storage capacity for the main pressure zone serving downtown and the Port of Kalama in the 20-year timeframe by constructing another reservoir of 1.0-MG in addition to the existing 2.0-MG reservoir serving that zone. Treatment upgrades in the 20-year timeframe are expected to include adding a third filter to the City's system (Gray and Osborne 2015).

There is currently no sewer service provided to the project site. The nearest wastewater treatment system is the Port of Kalama system. The Port's system is a packaged wastewater treatment system with a design capacity of an average of 20,000 gpd (Gibbs and Olson 2015).

13.4.4 Economic Conditions in the Study Area

Workers for the proposed project are expected to live in Southwest Washington and the Portland-Vancouver-Hillsboro metropolitan statistical area (**Appendix M**). This area covers the major towns and cities within a less than 90-minute driving radius of the project site defined as the "regional economy" from which the proposed project would likely obtain nearly all of its employees.[2]

The local labor market has 1.4 million workers and an unemployment rate of 6.6 percent. Cowlitz County has a higher unemployment rate of 8.4 percent, suggesting a greater potential to supply workers for the proposed project. Unemployment rates in the 12-county regional economy range from 5.7 percent in Washington County, Oregon to 10.1 percent in Pacific County, Washington; these rates are shown in **Table 13-1** along with the size of the labor force.

Table 13-1. Labor Force Size and Unemployment Rate by County in Local Region, 2014 Annual Averages

County/State	Labor Force	Unemployment Rate
Cowlitz, WA	44,048	8.4%
Lewis, WA	31,011	9.2%
Thurston, WA	123,119	6.6%
Pacific, WA	8,056	10.1%
Wahkiakum, WA	1,359,	9.9%
Clark, WA	208,909	7.9%
Skamania, WA	4,978	8.7%
Columbia, OR	22,639	8.4%

[2] The 12-county metro region includes seven Washington counties (Cowlitz, Clark, Lewis, Pacific, Skamania, Thurston, and Wahkiakum) and five Oregon counties (Clackamas, Columbia, Multnomah, Washington, and Yamhill).

County/State	Labor Force	Unemployment Rate
Multnomah, OR	420,520	6.1%
Washington, OR	293,632	5.7%
Clackamas, OR	200,522	6.3%
Yamhill, OR	50,300	6.6%
12-County Region	**1,409,093**	**6.6%**

Source: U.S. Bureau of Labor Statistics (BLS)

13.4.5 Related Actions

13.4.5.1 Fire Protection and Emergency Services

All portions of the proposed pipeline would be located within the jurisdiction of Cowlitz County Fire District No. 5 (Cowlitz Fire District No. 5 2015). That district would be the primary responder to incidents along the pipeline. Cowlitz 2 Fire and Rescue provides hazardous materials response capabilities along the pipeline route (Cowlitz 2 Fire & Rescue 2014).

13.5 Environmental Impacts

The following sections analyze the potential impacts to public services and utilities during the construction and operation of the proposed project, the No-Action Alternative, and the related actions.

13.5.1 Proposed Project Alternative

The Technology Alternatives and Marine Terminal Alternatives would each have the same construction and operational employment and would result in the same potential demands on public services and utilities. Therefore, this analysis does not differentiate between the either Technology Alternative and either Marine Terminal Alternative.

The economic and tax analysis focuses on the employment, income (including benefits), and economic output that would be generated in the region by the construction and operation of the proposed project. The Technology Alternatives and Marine Terminal Alternatives for the proposed project would have the same potential for economic and tax impacts for the construction and operation of the proposed project. The related actions (natural gas supply[3], electrical service) are expected to have less than significant economic and tax impacts in the context of the overall scale of the methanol facility and are not analyzed in this chapter.

13.5.1.1 Construction Impacts

Public Services and Utilities

Construction of the proposed project would generate demands for fire, emergency, and police services. These demands would be typical of an industrial construction site. The construction site would be fenced and locked to prevent entry by unauthorized persons. Security fencing and patrols would continue to ensure safety and prevent unauthorized activities during the second

[3] In their 2014 application to the FERC for the Kalama Project (the proposed pipeline) requesting a certificate of public convenience and necessity, Northwest Pipeline LLC noted that a socioeconomic analysis was not required for the Kalama Lateral Project due to the fact that significant aboveground facilities were not proposed.

phase of construction when the first methanol production line is operational. Construction personnel would follow all applicable state, federal, and local regulations with regard to fire prevention. The construction of the proposed project would not result in substantial new demands on existing fire, emergency, and police service providers with the proposed security measures.

The proposed project would generate modest water demand during the first phase of construction. The need would be temporary, lasting only during the first phase of construction. Demand would be typical of industrial construction projects and would be satisfied by a temporary connection to the City's system. The on-site collector well would provide water for construction purposes during the second phase of construction. Therefore, water demands would be minimal during construction and there would be no significant adverse impacts to public water systems.

No public sewage systems would be used during construction. Portable toilets would be used on site during construction. Therefore, there would be no significant adverse impacts to public sewage systems during construction.

Economic and Tax Impacts[4]

Project construction would begin in September 2016 and last 26 months until October 2018. Total direct, indirect, and induced construction costs are anticipated to be $1.8 billion (2018 dollars).

Project construction would result in the creation of jobs and expenditures on goods and services and lead to related indirect and induced effects. Expenditures for vendors providing products and services to the construction site (direct purchases) in turn would result in these vendors increasing spending on goods and services that are inputs to their businesses. For example, construction companies that work on the proposed project may need to purchase additional heavy equipment (trucks, cranes, backhoes, etc.). This purchase by a directly affected business is an indirect effect of the proposed project. If the income of an employee of the heavy equipment company is increased by his work on the proposed project, and if that employee then purchases other goods and services in the region from the increased income, this would constitute an induced effect.

The vast majority (89.2 percent) of construction workers are expected to be available locally. Of the approximately $1.8 billion of direct , indirect, and induced construction costs, $467 million would be direct local spending on materials, equipment, fuel, fees and services; $155 million direct spending on local labor, wages, and benefits; and $3.9 million direct spending on labor per diems for transient workers, for a total of $625.9 million of local direct impact. The total (direct, indirect, and induced) construction spending for the project is estimated at approximately $1.6 billion for materials, equipment, fuel, fees, and services; $173.8 million in total labor spending; $3.9 million in labor per diems for transient workers; and $47.5 million in sales taxes.

Of the $1.8 billion in construction costs, there is projected to be a total (direct, indirect, and induced) of $289.5 million of local labor income impacts associated with the creation of 3,519 total jobs resulting from the project. Total local direct, indirect, and induced economic impacts were estimated by ECONorthwest to be approximately $1.1 billion (**Table 13-2**).

[4] All economic and fiscal figures cited in this section are from **Appendix M**.

Table 13-2. Local Economic Impacts of KMMEF Plant Construction

Impact	Employment (Job-Years)	Local Income and Benefits (Million 2018$)	Local Economic Output (Million 2018$)
Direct	1,001	$158.9	$625.9
Indirect	1,129	$65.6	$203.4
Induced	1,389	$65.0	$188.1
Total	**3,519**	**$289.5**	**$1,017.3**

Note: A job-year is the total number of jobs in each month in each year divided by 12 months.
Source: ECONorthwest 2015

In addition to local economic impacts during construction, the state, Cowlitz County, and taxing jurisdictions within the County would be positively impacted through payment of business and occupation (B&O), and sales taxes by NWIW. Construction of the facility would be subject to a 0.471 percent B&O tax based on the value of construction less sales taxes and would also be subject to a 1.50 percent B&O tax on engineering and architectural services. ECONorthwest estimates that the project would generate $7.97 million in B&O tax revenue from the value of construction and another $900,000 from engineering and architectural services.

NWIW would pay sales and use tax on the value of construction minus some exemptions, such as the value of reused goods and concrete-forming lumber. Washington imposes a 6.5 percent sales and use tax and Cowlitz County has a 1.2 percent sales and use tax. As a high unemployment county, qualified machinery, equipment, and buildings are also exempt from sales and use tax in Cowlitz County. ECONorthwest estimates that $40.1 million of sales tax would be paid to the state, and $7.4 million to Cowlitz County for construction of the methanol plant. Another $229,347 would accrue to Cowlitz County and $1.2 million to the state for the construction of the dock which is estimated to cost $19.1 million. Total sales tax receipts to the state and County from the construction of the plant and dock are estimated at $48.9 million (**Table 13-3**).

Combining sales and use and B&O taxes, during construction, the proposed project would pay $57.7 million in taxes to the state and the County.

Table 13-3. Estimated Tax Revenues from Construction of the Proposed Project Alternative (millions of 2018$)

Taxes	Amount
Sales and Use Taxes	$48.9
Business and Occupation Tax	$8.87
Total	$57.7

Source: ECONorthwest, 2015

13.5.1.2 Operational Impacts

Fire Protection and Emergency Services

The proposed project could place new demands on fire and emergency services during its operation. These new demands would be offset by measures included in the operation and design of the proposed project. Additional discussion of the response to spills, fires, and other incidents at the proposed project or during vessel transport, and an assessment of potential impacts, is provided in Chapter 8, Environmental Health and Safety.

Police

The proposed project would introduce a new port industrial use and may place new demands on police services. Police services would be provided primarily by the Cowlitz County Sheriff's Department. Police services would also be supplemented through compliance with the requirements of the MTSA for the proposed marine terminal, private security for the upland methanol production facility, and compliance with the U.S. Department of Homeland Security Chemical Facility Anti-Terrorism Standards (CFATS).

The Port of Kalama has a port security plan and security officer as required by MTSA (USCG 2015a). The Port would complete a vulnerability assessment to update its security plan for the proposed marine terminal in compliance with MTSA prior to the start of facility operations. The assessment may include recommendations for the security of personnel and cargo, structural integrity, protection systems, procedural policies, communication systems, transportation infrastructure, utilities, and contingency response. The proposed marine terminal would require TWIC access and would be gated to prevent entry by unauthorized persons.

The upland methanol production facility would be secured with a perimeter fence and entry gate with security guards and would employ a private security contractor. Employees would be required to obtain a TWIC and there would be security cameras throughout the facility. The Cowlitz County Sheriff's Department would be notified of any security risks such as bomb threats, unauthorized access attempts, hazmat incidents or any other security risks (NWIW 2015).

Water and Sewage

The proposed project would require water for the methanol production process and for typical domestic water demands. Domestic water needs would be accommodated by the City's water system, while process water needs would be met by the Port's proposed collector well. The proposed collector well would provide up to 6,600 gallons of non-potable water per minute, or approximately 8 to 9 MG per day. The proposed project would require approximately 5.2 MG per day of process water. Therefore, the proposed collector well would meet all of the process water demands for the proposed project and there would be no demands on or connection to a public system for process water.

Domestic water needs would be served via a connection to the City of Kalama's water system. If necessary, water treatment could be added by the Port to serve as a secondary source or replacement for the City of Kalama's potable water system. The project proponent would construct an extension of Kalama's water line to service the property and supply the domestic water needs of the project. The project proponent estimates domestic water use at 5,600 gpd based on the estimated 192 full-time employees at the facility. The City would be able to serve the 5,600 gpd of projected domestic use by the proposed project, as verified in a letter from the City of Kalama Public Works Department dated March 25, 2015 (City of Kalama 2015; see

Appendix L). The proposed project's domestic water usage would represent approximately 0.6 percent of the City of Kalama water system's average day production in 2020. Therefore, the proposed project would not result in significant adverse impacts on the City of Kalama's water system.

Domestic wastewater from the project would be treated by the Port's existing wastewater treatment system. The Port's wastewater treatment system can accommodate the domestic wastewater flows from the proposed project. The Port's wastewater treatment system is designed to accommodate a flow of 20,000 gpd and is currently operating at approximately 3,300 gpd, or 16 percent of capacity. The proposed project is expected to generate an additional 2,200 gpd in demand, which would bring the total wastewater treatment to 5,500 gpd, or 28 percent of capacity (Gibbs and Olson 2015).

Process wastewater from the methanol production process would be treated onsite in the proposed project's wastewater treatment system and would not impact Port or municipal wastewater systems.

Overall, the proposed project would not result in significant adverse impacts to public water or sewer facilities.

Economic and Tax Impacts

The proposed project operations would result in three categories of economic and tax impacts during operation: (1) economic impacts, (2) land lease/dock fee revenues to the Port of Kalama, and (3) tax revenues to state and local governments.

The proposed facility would have the capacity to produce 3.65 million tonnes of methanol per year and would be assumed to operate at 92 percent capacity. The facility would produce 3.358 million metric tonnes of methanol for export each year of operation. ECONorthwest estimated that the U.S. export price of methanol in 2018 would be $383 per tonne. The plant would have annual direct economic output of $1.286 billion. The facility would employ 192 full-time workers with a payroll of $21 million per year. Annual operating expenses including electricity and water utility services, machinery, maintenance, and overhead costs are estimated at $37.2 million (**Appendix L**).

The ECONorthwest analysis estimated local economic impacts in terms of jobs and wages based primarily on payroll and operating expenses. Employees would be expected to spend most of their estimated $21 million in wages in the 12-county region. These direct payments to employees, direct purchases of operating inputs (e.g., machinery, maintenance services, and overhead costs), and direct plant output from the local area would result in total (direct, indirect and induced) impacts to the local economy of approximately $1.4 billion annually. In addition to the 192 direct jobs, there would be 258 indirect, and 218 induced jobs supported in a typical operating year, for a total of 668 jobs associated with the facility (**Table 13-4**).

Table 13-4. Annual Local Economic Impacts of KMMEF Plant Operations (millions of 2018 $)

Impact	Employment	Local Labor Income and Benefits	Local Economic Output
Direct	192	$21.0	$1,286.3
Indirect	258	$16.1	$42.6
Induced	218	$10.7	$30.3
Total	**668**	**$47.8**	**$1,359.2**

Source: ECONorthwest, 2015

Wages are estimated to average approximately $71,000 per year, roughly $5,000 higher than a living wage for a family of four in Longview, $10,000 above Cowlitz County's median family income, and $24,000 higher than the median annual wage in the county.

Five primary tax revenue streams apply to the proposed project during operation: B&O taxes, sales and use tax, leasehold taxes, hazardous substance taxes, and property taxes. B&O and sales tax revenues would accrue to the state and a portion of sales tax proceeds would accrue to Cowlitz County.

Washington imposes a B&O tax on methanol plant production equal to 0.484 percent of the wholesale value of production. Annual B&O tax estimates from methanol production would fall in the range of $4.98 million to $6.23 million annually, depending on adjustments for annual output in a given year. The state does not impose sales and use taxes on goods manufactured in the state and exported to other states or countries; therefore the facility would not pay sales tax for methanol production that is exported. However, the facility is expected to pay sales and use taxes for supplies, fuel (natural gas consumed at the plant for energy), and maintenance services. The analysis estimates that annual sales and use taxes during the operation of the proposed methanol manufacturing facility would be approximately $1.18 million to Cowlitz County and $6.41 million to Washington State, for a total of approximately $7.59 million (**Table 13-5**).

Leasehold taxes apply when property is leased from a governmental owner, such as the Port of Kalama, in lieu of property taxes on the land. Leasehold excise taxes on the subject property would total $197,754 per year, half of which ($98,877) goes to local government.

Hazardous substance taxes for methanol are 0.7 percent of the value of methanol production, for which the analysis estimates the tax would total about $9 million a year.

Property taxes are paid on the entire value of "real property" or all affixed industrial equipment. NWIW would lease the land and no taxes would be due on the land itself (except for the leasehold tax described above). The fiscal impact analysis assumed that the cost to construct ($1.8 billion) is a reasonable estimate of the true and fair market value of buildings and equipment on which property taxes would be based (ECONorthwest 2015). **Table 13-5** shows the projected property tax revenues from the proposed project in the first year and tenth year of operations. Because the value of buildings and equipment depreciates over time, resulting in lower property taxes as equipment and buildings age, two estimates are provided – Year 1 and Year 10. Equipment additions and replacements would add to the taxable property, but it is uncertain to what degree and has not been included in the estimate. The proposed project would result in approximately $16.47 million of property tax revenues to the various taxing

jurisdictions in the first year of operation and an estimated $9.3 million in the tenth operational year.

The addition of the proposed methanol manufacturing facility to the tax rolls in Cowlitz County represents an 18 percent increase over existing County tax revenues. Because the addition of the proposed methanol manufacturing facility would represent more than a one percent increase in a single year, levy rates for schools, which are voted on by the public, may decline, thereby lowering taxes for other taxable property holders. ECONorthwest estimates that levy rates for state schools and the Kalama School District would decline resulting in tax revenue from the methanol manufacturing facility decreasing from $9.29 million to $8.20 million in the tenth year of operation (**Table 13-5**).

The proposed methanol manufacturing facility is expected to pay approximately $4.9 million annually in dock fees and land leases to the Port of Kalama. Revenue from these sources can be reinvested by the Port to pay for infrastructure and other operations, and to help attract industrial tenants and jobs to Kalama and Cowlitz County. As noted above, the Port of Kalama does not collect property taxes from residents, as all expenses are paid through operating revenue. The land lease and dock fee revenue paid by the proposed facility would contribute to operating revenue, and would support the Port's ongoing practice of not collecting property taxes from residents.

Table 13-5. Estimated Annual Tax Revenues Generated by Operations at Full Buildout – Proposed Project Action (2018$)

Tax Type	Amount (Millions of 2018$)
Sales and Use	$7.59
Business and Occupation	$4.98 - $6.23
Leasehold	$0.20
Hazardous Substance	$9.0
Property Year 1	$16.47
Property Year 10 (no levy decrease)	$9.29
Property Year 10 (decreased levy rates)	$8.20
Land Lease/Dock Fee Revenues	$4.90
Total Taxes Year 1	**$43.14 - $44.39**
Total Taxes Year 10 (no levy decrease)	**$35.96 - $37.21**
Total Taxes Year 10 (decreased levy rates)	**$34.87 – $36.12**

Source: ECONorthwest 2015
Note: Assumes property levy rates stay the same in the first and tenth year

In total, the facility is estimated to pay $43.14 - $44.39 million in taxes to the state and County in the first year of operation, $35.96 - $37.21 million during the tenth year of operation if levy rates remain unchanged, and $34.87 - $36.12 million of operation if school levy rates decrease. Levy rates in each year would vary depending on the B&O tax paid in a given year based on plant output.

13.5.2 Related Actions

13.5.2.1 Construction Impacts

Kalama Lateral Project

Northwest estimates a staff of approximately 75 construction personnel and 12 construction inspectors would be required during peak construction activities for the proposed pipeline. Construction is expected to require five months (FERC 2015).

Utility line trenching and construction are common construction activities in Cowlitz County. The proposed pipeline would be constructed in accordance with U.S. Department of Transportation (DOT) regulations in Title 49 CFR Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards; by 18 CFR 380.15, Siting and Maintenance Requirements; and by other applicable federal and state safety regulations. Construction of the proposed pipeline would not generate substantial new demands for water or sewer services. Overall, construction of the proposed pipeline would not result in significant adverse impacts on public services and utilities.

13.5.2.2 Operational Impacts

Kalama Lateral Project

The proposed pipeline would transport natural gas to the project site. The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for accidental release of natural gas. The greatest hazard is a fire or explosion following a major pipeline rupture. The proposed pipeline would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. Detailed discussion regarding the operational impacts of the proposed pipeline are described in Chapter 8.

Operation of the proposed pipeline would not place new demands on water and sewer systems or fire and emergency services. The proposed pipeline would not result in significant adverse impacts to public services and utilities.

13.5.3 No-Action Alternative

The proposed project would not be constructed on the project site under the No-Action Alternative. However, it is anticipated that the Port would pursue future industrial or marine terminal development at the North Port site, consistent with the Port's Comprehensive Scheme for Harbor Improvements. Should the project site be developed with another port industrial use, it would generate demand for police, fire, water, sewer, and emergency services during construction and operation. The types of demand on these services would depend on the specific type of industrial project. Construction impacts from an alternative industrial use would be expected to be similar. Operational impacts from an alternative industrial use would depend on the specific use.

13.6 Mitigation Measures

13.6.1 Project Mitigation

The design features and best management practices the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the Project and have been considered in

assessing the environmental impacts to public service and utility resources. The avoidance and minimization measures to reduce potential risks from fires and explosions from the proposed project and related actions are provided in Chapter 8.

13.6.2 Additional Mitigation

There are no significant adverse impacts identified for public service and utility resources; therefore, no additional mitigation measures are identified.

13.7 References

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Chapter 14 Noise

14.1 Introduction

This chapter assesses the potential noise impacts resulting from the construction and operation of the proposed project's Technology and Marine Terminal Alternatives, a No-Action Alternative, and the related actions. The assessment begins by describing the acoustic environment at the project site and in the surrounding vicinity. Noise generated by the proposed project as received at nearby sensitive receivers was estimated using the CadnaA noise model, based on conservative assumptions and estimates of equipment sound levels within the proposed project. The potential noise impacts of the construction and operation of the proposed project and No-Action Alternative are then assessed and compared to regulatory noise standards, and measures to mitigate potential impacts are presented.

The analysis concludes that the proposed project, with either Technology and Marine Terminal Alternatives and the No-Action Alternative, would not result in significant unavoidable adverse noise impacts during construction or operation.

14.2 Methodology

14.2.1 Noise Terminology and Descriptors

Noise is sometimes defined as unwanted sound; this analysis uses the terms noise and sound more or less synonymously. The human ear responds to a very wide range of sound intensities. Noise levels are measured in units called decibels (dB). The dB scale used to describe sound is a logarithmic rating system that accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 dB – a 70-dB sound level would sound about twice as loud as a 60-dB sound level. People generally cannot detect differences of 1 dB. People can detect differences of 2 or 3 dB in ideal laboratory situations, but would probably not notice such a change in a typical outdoor environment. Most people probably would perceive a 5-dB change under normal listening conditions.

As mentioned above, the dB used to describe noise is logarithmic. On this scale, a doubling of sound-generating activity causes a 3-dB increase in the average sound produced by that source, but not a doubling of the loudness of the sound (which requires a 10-dB increase). For example, if traffic along a road is causing a 60-dB sound level at a nearby location, a doubling of the number of vehicles on this same road would cause the sound level at this same location to increase to 63 dB. However, such an increase might not be discernible in a complex acoustical environment, such as a typical outdoor environment.

When addressing the effects of noise on people, the frequency response of the human ear, or those frequencies that people hear best, must be considered. Sound measuring instruments are, therefore, often designed to weight sounds based on the way people hear. The frequency weighting most often used to evaluate environmental noise is "A" weighting because it best reflects how humans perceive sound. Measurements from instruments using this system are reported in dBA. Unless specified otherwise, noise levels in this chapter are given in dBA.

Relatively long, multi-source line sources – like the road with steady traffic in our example above – emit cylindrical sound waves. Because these sound waves spread cylindrically, sound

levels from such sources decrease at a rate of 3 dBA with each doubling of distance from the source. Sound waves from discrete events or stationary point sources (such as a conveyor motor in a stationary location) spread as a sphere, and sound levels from such sources decrease 6 dBA per doubling of the distance from the source. Conversely, moving half the distance closer to a source increases sound levels by 3 and 6 dBA for line and point sources, respectively.

For any noise source, several factors affect the efficiency of sound transmission traveling from it, which in turn affects the potential noise impact at off-site locations. Important factors include the distance from the source, the frequency of the sound, the absorbency and roughness of the intervening ground (or water) surface, the presence or absence of obstructions and their absorbency or reflectivity, and the duration of the sound.

Noise impacts tend to be cumulative with prolonged or repeated exposure, and the effects can include hearing loss, speech and sleep interference, and annoyance with the noise; there is some evidence that noise as an annoyance can affect health and well-being adversely in the same manner as chronic stress (e.g., hypertension and cardiovascular effects) (Suter 1991). The impact on humans also depends on existing sound levels and who is listening.

Table 14-1 presents typical sound levels of some familiar noise sources and activities.

Table 14-1. Common Sound Levels/Sources and Subjective Human Responses

Noise Source at a Given Distance	Sound Level (dBA)	Typical Noise Environments	Subjective Impression
Civil defense siren (100 feet)	130		Pain threshold
Jet takeoff (200 feet)	120	Rock music concert	
Loud rock music	110		
Pile driver (50 feet)	100		Very loud
Ambulance siren (100 feet)		Boiler room	
Freight cars (50 feet)	90	Printing press plant	
Freeway (100 feet)	80	Noisy restaurant	
Busy traffic, hair dryer	70		Moderately loud
Vacuum cleaner (10 feet)	60	Data processing center	
Light traffic (100 feet)	50	Private business office	
Large transformer (200 feet)	40		Quiet
Soft whisper (5 feet)	30	Quiet bedroom	
Very quiet background conditions	20	Sound-buffered room	
Normal breathing	10		
Complete silence	0		Hearing threshold

Source: Beranek (1988)

Environmental noise is usually described in terms of certain metrics that allow comparison of sound levels at different locations or in different time periods. Federal and state regulatory agencies often use the equivalent sound level (L_{eq}) or the day-night sound level (L_{dn}) to characterize sound levels and evaluate noise impacts. The L_{eq} is the level that, if held constant over the same period, would have the same sound energy as the actual, fluctuating sound. As such, the L_{eq} can be considered an energy-average sound level. Because the L_{eq} considers sound levels over time, this metric accounts for the number and levels of noise events during an interval (e.g., 1 hour) as well as the cumulative duration of these events. The L_{dn} is like a 24-hour L_{eq}, except that the calculation of the L_{dn} adds 10 dBA to the sound levels between 10:00 p.m. and 7:00 a.m. to account for possible sleep disturbance. The L_{dn} is used to describe the noise environment in areas where there are both nighttime and daytime uses, such as residences.

14.2.2 Regulatory Limits

This evaluation includes a consideration of noise criteria established by Cowlitz County, the City of Kalama, and Washington and Oregon.

14.2.2.1 Washington State and Cowlitz County Noise Regulations

The project site is located near the city of Kalama in unincorporated Cowlitz County, Washington. Cowlitz County has adopted the noise regulations set forth in Chapter 173-60 of the Washington Administrative Code (WAC 173-60), so this section describes state regulations.

Chapter 173-60 of the WAC establishes "maximum permissible" noise levels in identified environments pursuant to Chapter 70.107 RCW. These limits are based on the environmental designation for noise abatement (EDNA) of the noise source and the receiving properties. Classes of EDNAs are designated based on land use zoning and/or actual uses. Class A EDNAs generally correspond to residential areas, Class B EDNAs to retail and commercial areas, and Class C EDNAs to industrial and agricultural areas. The EDNA class of a property is typically determined by its predominant land use. The noise limits for each land use classification for facility operations are presented in **Table 14-2**. These noise limits are not applicable to construction activities.

Table 14-2. Washington Maximum Permissible Sound Levels (dBA)[a]

EDNA of Noise Source	EDNA of Receiving Property		
	Class A[b] (Residential)	Class B (Commercial)	Class C (Industrial)
Class A	55/45	57	60
Class B	57/47	60	65
Class C	60/50	65	70

Source: WAC Chapter 173-60

[a] Applicable to operation of a facility, not construction.

[b] Sound limits shall be reduced by 10 dBA between the hours of 10 p.m. and 7 a.m. at Class A EDNAs (WAC 173-60-040 (b)).

The noise limits presented in **Table 14-2** allow for short-term increases above the indicated levels as follows: 5 dBA for no more than 15 minutes in any hour, 10 dBA for no more than 5 minutes of any hour, or 15 dBA for no more than 1.5 minutes of any hour. These allowed short-term increases can be described and measured in terms of the percentage of time a certain

level is exceeded using statistical metrics called "L_{ns}" that consider levels over specific periods. For example, the hourly L_{25} represents a statistical sound level that is exceeded 25 percent of the time, or 15 minutes in an hour. Similarly, the hourly $L_{8.33}$ and $L_{2.5}$ are the sound levels that are exceeded 8.33 and 2.5 percent of the time, or 5 and 1.5 minutes in an hour, respectively. The levels indicated in **Table 14-2** are not to be exceeded by more than 15 dBA, as represented by the L_{max}, at any time.

The proposed project would be considered a Class C (industrial) noise source. In practice, a Class C noise source may not generate a sound level (L_{25}) exceeding 70 dBA at nearby Class C EDNAs (i.e., other industrial properties) during daytime and nighttime hours. At the nearest Class A (residential) EDNA, noise generated by the proposed project would be limited to 60 dBA during daytime hours (7 a.m. to 10 p.m.) and 50 dBA at night. Because the proposed project would operate 24 hours per day, it must be designed to meet the 50 dBA nighttime limit at any Class A EDNA. This means the noise limits (all as dBA) for the facility are as follows: $L_{25} = 50$, $L_{8.33} = 55$, $L_{2.5} = 60$, and $L_{max} = 65$.

Noises from traffic on public roads and waterborne vessels are exempt from the environmental noise limits. Noise from construction activities are also exempt from the noise limits, except when received in Class A EDNAs between 10 p.m. and 7 a.m. (WAC 173-60-050).

14.2.2.2 City of Kalama Noise Regulations

A portion of the Kalama Lateral Project-related action would be located within the boundaries of the city of Kalama. The City of Kalama has not adopted noise limits applicable to various facilities. Consequently, the environmental noise limits that apply to the evaluation of the related action are those established by WAC 173-60, identified in section 14.2.2.1.

Although the City has not identified noise limits that would apply to the related action, Chapter 9.14 of the Kalama Municipal Code (KMC 9.14) does define public disturbance noises. Noise emanating from construction sites outside the hours between 7 a.m. and 8 p.m. on weekdays and 9 a.m. and 6 p.m. on weekends and holidays is considered a public disturbance noise.

14.2.2.3 Oregon State Regulations

Because noise generated by the proposed project could affect residences across the Columbia River in Oregon, that state's noise regulations were also considered for guidance on the significance of potential noise impacts.

Chapter 350, Division 35 of the Oregon Administrative Rules (OAR 340-35) establishes statewide noise control regulations. OAR 240-35-035 identifies noise limits for new commercial and industrial uses on previously unused sites. The noise limits apply at "noise-sensitive property," defined as "real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries." Residences are the only noise-sensitive properties in Oregon that could be affected by the proposed project.

The noise limits in OAR 340-35-035 are presented as noise limits for the statistical levels L_{50}, L_{10}, and L_1 over any 1-hour period, i.e., the sound levels exceeded 50 percent, 10 percent, and 1 percent of the time, respectively.

Table 14-3 displays the allowable hourly statistical noise levels for two periods: between 7 a.m. and 10 p.m. (for protection of speech communication) and between 10 p.m. and 7 a.m.

(for protection of sleep at night). Because the plant would operate 24 hours a day, the stricter nighttime noise limits between 10 p.m. and 7 a.m. are the most relevant to this noise assessment.

Table 14-3. Oregon New Industrial and Commercial Noise Source Standards (dBA)

Statistical Level	Allowable Statistical Noise Levels in Any 1 Hour	
	7 a.m. – 10 p.m.	10 p.m. – 7 a.m.
L_{50}	55	50
L_{10}	60	55
L_{1}	75	60

Source: OAR 340-35-035

In addition to the overall noise limits shown in **Table 14-3**, OAR 340-35-035(1)(B)(b) specifies that new noise sources located on previously unused sites should not increase the ambient L_{10} or L_{50} noise levels by more than 10 dBA in any 1 hour. The resulting ambient statistical noise levels are to include all noises generated or indirectly caused by or attributable to the new source, even those otherwise exempt from the Oregon noise limits.

Similar to the WAC noise standards, traffic on public roads and construction activities are exempt from the noise regulations (per OAR 340-35-035(5)).

14.2.2.4 Environmental Impact Thresholds

This analysis based its determinations regarding the potential for significant adverse environmental noise impacts on an assessment of the compliance of the proposed project and alternatives with the applicable noise limits, including those identified in WAC 173-60-040 (**Table 14-2**) and OAR 340-35-035 (**Table 14-3**).

14.3 Affected Environment

14.3.1 Existing Sound Levels

The existing noise environment at several nearby properties was characterized by sound level measurements (SLMs) taken for another project in April 2006 at three locations near the project site. The 2006 measurements were supplemented by additional measurements taken in September 2014. All of the measurements used Larson Davis 820 Type I integrated sound level meters to measure hourly sound levels over a period of 24 hours or longer. The meters were field-calibrated prior to the measurements. The microphones were placed on tripods in Larson Davis environmental weather heads about 5 feet above the ground.

The SLMs were taken near residential/sensitive locations anticipated to have the greatest potential to be affected by noise from the proposed project. Although the meters were not attended for the entire measurement period, existing noise sources were noted during setup and retrieval of the meters.

A summary of the sound level measurement results is displayed below in **Table 14-4**. A brief description of the measurement locations and contributing noise sources is included below the table. Some of the noise descriptors captured for the Oregon measurement location differ from the WAC descriptors because Oregon's noise regulations use different descriptors as described previously. **Figure 14-1** displays the measurement locations.

Table 14-4. Range of Measured Hourly Sound Levels (dBA)

WA Location	Date	Time	L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{dn}
SLM1	4/18 – 4/20/2006	Day	62-67	71-87	66-71	64-69	63-67	69
		Night	61-66	69-79	65-72	63-69	62-67	
SLM2	4/18 – 4/20/2006	Day	68-72	78-88	74-77	73-75	70-73	75
		Night	66-71	77-83	73-76	71-75	67-73	
SLM4	9/4 – 9/5/2014	Day	48-61	59-89	51-73	50-57	48-53	57
		Night	48-52	56-70	51-56	49-54	48-53	
SLM5	9/4 – 9/5/2014	Day	57-69	68-105	61-64	60-62	58-60	64
		Night	52-59	62-78	57-63	55-62	52-60	
SLM6	9/4 – 9/5/2014	Day	44-52	62-77	50-57	46-54	43-52	51
		Night	40-47	51-68	44-51	42-49	40-48	
WA Noise Limits			NA	75/65	70/60	65/55	60/50	NA
OR Location	**Date**	**Time**	**L_{eq}**	**L_{max}**	**L_1**	**L_{10}**	**L_{50}**	**L_{dn}**
SLM3	4/18 – 4/20/2006	Day	44-61	60-88	49-76	46-58	44-54	57
		Night	46-53	54-84	50-60	48-56	45-52	
OR Noise Limits			NA	NA	75/60	60/55	55/50	NA

Sources: URS Corporation, 2007.
Note: Daytime hours are defined as between 7 a.m. and 10 p.m.; nighttime hours between 10 p.m. and 7 a.m. The Washington and Oregon noise limits are displayed as daytime/nighttime limits.

SLM1: Residence at 72 Bluff Road east of I-5 in Washington and overlooking I-5, the project site, and the Columbia River. The dominant noise source at this location was traffic on I-5. Other sources included trains and localized residential activities.

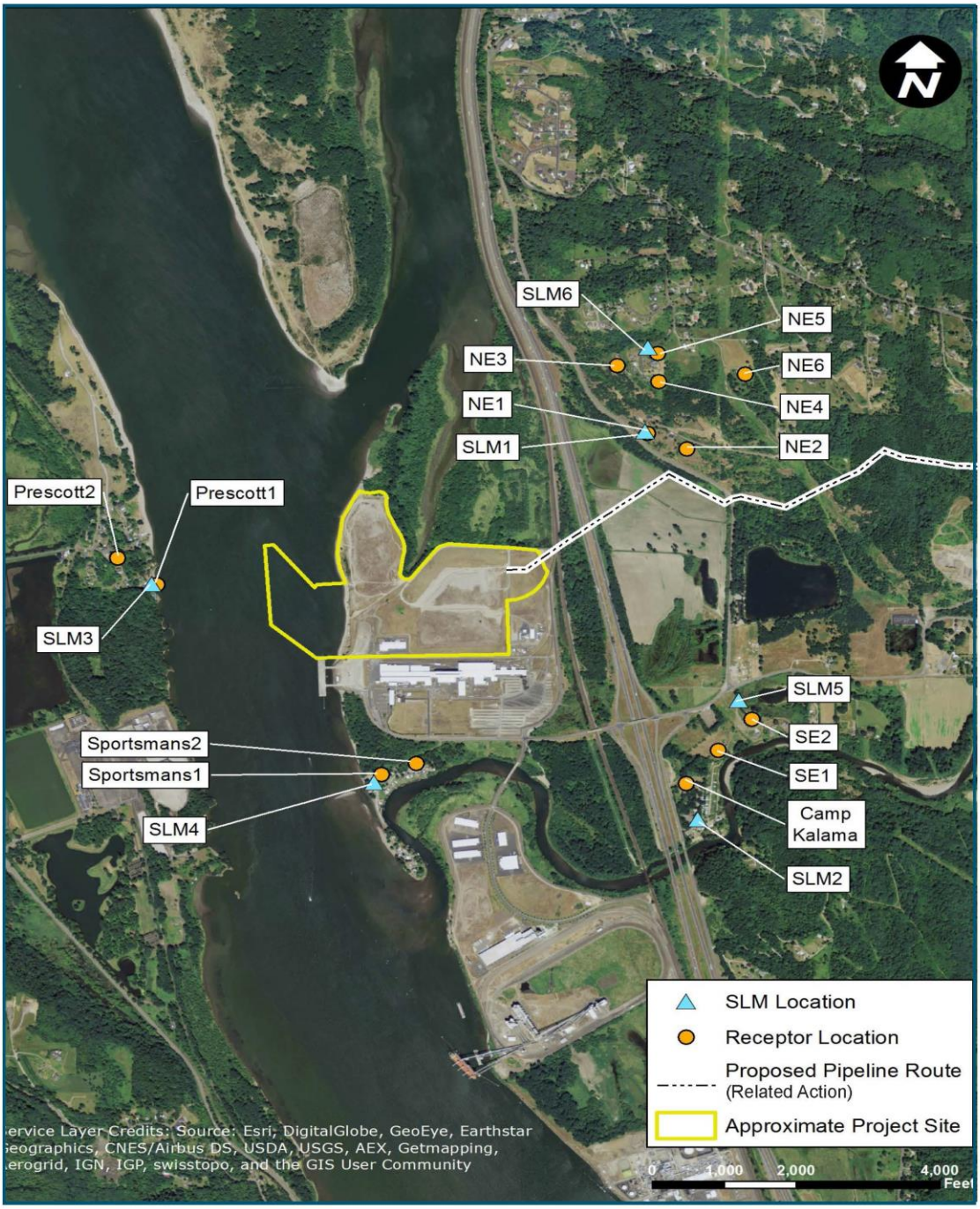
SLM2: Camp Kalama, located at 5055 N. Meeker Drive. This location represents a campground east of I-5 in Washington. The project site is not visible from this location because of intervening terrain and the structure of I-5. The dominant noise source at this location was traffic on I-5. Other sources included trains, traffic on Meeker Drive, and localized campground activities.

SLM3: Residence at 33182 School Street in Prescott, Oregon. Residence is on the Columbia River directly across from the project site. Background noise sources included traffic on I-5, occasional vessels on the Columbia River, and trains.

SLM4: The west entrance to the Sportsmans Club near the dead end of Sportsmens Club Road. This location represents a seasonally occupied recreation area used for activities such as camping south of the project site and adjacent to the Columbia River. For the purposes of the noise analysis, it is treated as a residential receptor. Existing noise sources included lawn mowing, the Steelscape plant, occasional vessels on the Columbia River, distant traffic, and trains.

SLM5: A location approximately 190 feet from Kalama River Road, near the intersection with Old Highway 99 representing several residences south of Kalama River Road. Existing noise sources included traffic on I-5, local traffic, and local residential activity. Between 3 and 4 p.m., a short event (likely caused by people) resulted in an unusually elevated Lmax and hourly Leq level.

SLM6: The yard of the residence at 431 Topeka Road at the top of the bluff east of the site. The project site is visible. The primary background noise at this location was traffic on I-5. Other sources included residential maintenance, birds, and aircraft.



Sound Level Measurements (SLM) & Receptor Locations
Figure 14-1

KALAMA SEPA
Manufacturing & Marine Export Facility

14.4 Environmental Impacts

14.4.1 Combined Reformer Alternative

14.4.1.1 Construction Impacts

During the construction phases of the Combined Reformer (CR) Alternative, noise from construction activities would add to the noise environment in the immediate vicinity. The construction of the CR Alternative would entail typical construction activities along with in-water pile driving and potentially upland pile driving. These various types of construction activities and associated noise levels are discussed separately, below.

Typical Construction Activities

The noise-sensitive uses that would be nearest to most construction areas and activities associated with the CR Alternative are the seasonally occupied recreation uses at the Sportsmans Club where people temporarily camp, approximately 1,800 feet away. As noted above, this analysis conservatively characterizes these uses as residential receptors. The next nearest residences are west of the project site in Prescott, Oregon, approximately 2,500 feet from proposed construction activities. Residences east of Interstate 5 (I-5) are generally farther than 2,500 feet from proposed construction activities. Typical sound levels associated with construction activities at these distances are displayed in **Table 14-5**. The calculated sound levels displayed in **Table 14-5** do not include potential reductions due to intervening structures, intervening terrain, vegetation, or other attenuation factors.

Table 14-5. Noise Levels from Typical Construction Activities and Equipment (dBA)

Activity	Range of Hourly Leqs			
	At 600’	At 1000’	At 1800’	At 2500’
Clearing	61	57	52	49
Grading	53-66	49-62	44-57	41-54
Paving	50-66	46-62	41-57	38-54
Erection	50-62	46-58	41-53	38-50
Types of Equipment[1]	**Range of Noise Levels**			
	At 600’	At 1000’	At 1800’	At 2500’
Bulldozer	55-74	51-70	46-65	43-62
Dump Truck	60-72	56-68	51-63	48-60
Scraper	58-71	54-67	49-62	46-59
Paver	64-66	60-62	55-57	52-54
Generators	49-60	45-56	40-51	37-48
Compressors	52-59	48-55	43-50	40-47

Notes:

(1) The noise levels for each type of equipment represents a range of sound levels for various modes of activity and various sizes of equipment. Some equipment produce wide-ranging levels of noise based on the mode of operation, and the highest levels of noise may only occur intermittently.

Source: EPA 1971

As shown in **Table 14-5**, the estimated hourly Leqs from even the nearest construction activities (i.e., clearing, grading, paving, and erection activities approximately 1,800 feet from the nearest residences) are less than the 60 dBA noise level limit that would apply to long-term operational noise (and from which construction noise is exempt). Furthermore, construction would be temporary and limited to daytime hours, and construction activities and the associated noise are generally common in the Port of Kalama area. Therefore, "typical" on-site construction activities under the CR Alternative would not result in significant adverse noise impacts.

Pile Driving

The CR Alternative would require pile driving during construction of the marine terminal and potentially for the manufacturing facility. Pile driving would occur at least 1,800 feet from the nearest residences to the site. Sound level measurement data of impact pile driving activities indicate that the hourly sound level (L_{eq}) of impact pile driving at a distance of 100 feet is approximately 86 dBA.[1] The maximum sound level (L_{max}) of impact pile driving is conservatively estimated to be 109 dBA at a distance of 100 feet.[2]

Impact pile-driving sound levels at the nearest residences to the site were calculated using the CadnaA noise model described in section 14.4.1.2. At residences in Prescott, Oregon, the model-calculated hourly Leqs were as high as 58 dBA, and the Lmax levels were as high as 82 dBA when impact pile driving was assumed to occur directly across the river from the houses. The next most-affected residences were those on the hillside northeast of the project site, represented by NE1 and NE2. These sensitive receptors were predicted to experience impact pile driving hourly Leqs in the low 50s dBA and Lmax levels in the upper 70s dBA. All other model-calculated hourly Leq levels were in the upper 30s to 40s dBA, with Lmaxs in the 60s to 70s dBA.

The hourly Leqs with impact pile driving would all be less than the 60 dBA noise limit identified in the WAC for long-term operational noise (and from which construction noise is exempt). In addition, the model-calculated levels at all locations would be within the range of measured existing noise levels. Nonetheless, because pile driving impact hammers generate impulsive noise, the CR Alternative's pile driving activities would likely be audible at the nearest residences. While the audible noise may be perceived by some people as intrusive and possibly annoying, the hourly Leqs of 58 dBA or less would be relatively low and pile driving activities would be temporary. In addition, some of the piles would be driven primarily using a vibratory hammer, which tend to produce less intrusive noise than impact hammers. The duration of pile driving activities is also expected to be short; it is expected to be completed over approximately 80 to 120 days (not necessarily consecutive) during one or two consecutive in-water work windows (1 September to 31 January) and would occur only during standard daytime working hours. For these reasons, the CR Alternative's pile-driving activities would not result in significant adverse noise impacts. Potential noise impacts to threatened and endangered animal species are discussed in Chapter 6, Plants and Animals.

[1] From Ramboll Environ archive of impact pile driving noise measurements. The hourly Leq included the placement and driving of two concrete piles in a 1-hour period.

[2] Washington State Department of Transportation (WSDOT), February 2015. *Biological Assessment Preparation for Transportation Projects – Advanced Training Manual – Version 2015. Chapter 7 – Noise Impact Assessment*, p. 7.14.

Potential Temporary Construction Parking Lots

As discussed in Chapter 2, Proposed Project and Alternatives, it is expected that construction employees would park off site at nearby locations and would be bused to the project site. Three locations have been identified for potential parking lots for construction workers. These areas are lots adjacent to the existing Air Liquide facility, adjacent to the Steelscape facility, and at 2301 Hendrickson Drive. During the peak construction period (three to four months), up to 1,000 workers would park in the lot(s) and continue to the site via a shuttle. Parking lots are not generally substantial noise generators and would only result in significant noise impacts if sited in a very quiet area directly adjacent to sensitive uses. The project area is dominated by traffic noise on I-5 and is not very quiet, particularly during the daytime hours that the parking lots would be used. In addition, the parking lots would not be located adjacent to sensitive uses. Therefore, no noise impacts are anticipated from the potential construction parking lots.

Potential Measures to Reduce Construction Noise

Some simple and inexpensive practices can reduce the extent to which people are affected by construction noise. Examples include using properly sized and maintained mufflers, engine intake silencers, and engine enclosures, and turning off idle equipment. Construction contracts can specify that mufflers be in good working order and that engine enclosures be used on equipment when the engine is the dominant source of noise. The measures are considered standard best practice for construction activities.

14.4.1.2 Operational Impacts

The CR Alternative would consist of the following major noise-emitting components:

- Two methanol production lines;
- Two air separation units (ASUs) to provide gas for the industrial processes;
- Cooling towers for industrial cooling water cooling;
- Flare system for the disposal of flammable gases;
- Various pumps; and
- A marine terminal, including a single berth and a dock with methanol loading equipment.

The CR Alternative is designed around the production process for methanol and its support needs. In general, the methanol production facilities would be located on the southern half of the project site and the product storage and support components would be located in the northern half of the project site. Transfer of the finished product to marine vessels would occur at the new marine terminal on the Columbia River.

CadnaA Noise Model

Noise generated by the proposed project as received at nearby sensitive receivers was estimated using the CadnaA noise model. CadnaA is a sophisticated software program that enables noise modeling of complex industrial sources using sound propagation factors as adopted by International Organization for Standardization (ISO) 9613.[3] Atmospheric absorption was estimated for conditions of 10°C and 70 percent relative humidity (i.e., conditions that favor noise propagation) and computed in accord with ISO 9613-1. The modeling process included

[3] The ISO has established internationally recognized standard methods for calculating noise attenuation through the atmosphere.

the following steps: (1) characterizing the noise sources, (2) creating 3-D maps of the site and vicinity to enable the model to evaluate effects of distance and topography on noise attenuation, and (3) assigning the equipment sound levels to appropriate locations on the site. CadnaA then constructed topographic cross-sections to calculate sound levels in the vicinity of the project site caused by noise sources that would be associated with the normal operation of the CR Alternative.

Using CadnaA, project-related sound levels were predicted at 13 sensitive receivers (e.g., residences) in the vicinity of the project site. Although there are no residential or sensitive receivers adjacent to or very near the proposed site (i.e., all are approximately 1,800 feet or farther from the site), some of the nearest residences could be affected by noise from the CR Alternative. The model receptors are depicted in **Figure 14-1**.

14.4.1.3 CR Alternative Noise Sources and Assumptions

The noise impact assessment was based on assuming full operation of the CR Alternative, with all major on-site equipment operating simultaneously and continuously, 24 hours a day.

The on-site equipment and activities expected to be the dominant noise sources associated with the operation of the CR Alternative are identified in **Table 14-6**. The table identifies the number of units expected with full operation and the approximate sound level 100 feet from each source (as estimated from the sound power level). The noise modeling for the proposed methanol manufacturing facility was based on conservative assumptions and estimates of equipment sound levels.

Other equipment on the site (e.g., employee vehicles) is expected to provide a negligible contribution to the overall sounds generated on the site, and such sources were not considered in this noise assessment. In addition, the new marine terminal would result in additional tugboat activity, but this would constitute only approximately 1 hour of activity for each vessel (approximately 45 minutes to berth a vessel, and 20 minutes for a departing vessel) occurring over approximately 1 mile of river. The actual amount of time that a tugboat would be operating near the marine (and potentially affected receptors) would be minimal. Therefore, intermittent vessel and tugboat traffic associated with the CR Alternative is also expected to provide a negligible contribution to the overall sound levels.

Table 14-6. CR Alternative – Manufacturing Facility Noise Sources

Source	Data Source	Number of Units	Approximate Sound Level at 100 ft (dBA)
Enclosed Flare	1,2	1	70 (Adjacent to windscreen, 15 feet from outside wall of flare)
Cooling Tower			
Cooling Tower Fan	1	10	64
Cooling Tower Water Cascading	1	4 sides	68
Crude Methanol Pump	3	1	59
Methanol Loading Pump	3	2	69
Flare KO Drum Pump	3	1	48
Raw Water Booster Pump	3	2	60

Source	Data Source	Number of Units	Approximate Sound Level at 100 ft (dBA)
Demineralized Water Plant Feed Pump	3	2	48
De-aerator Feed Pump	3	1	48
Cooling Water Pump	3	10	73
Ship Vent Scrubber Pump	3	1	45
Syngas Cooler	1	2	71
LP Loop Condenser	1	2	71
HP Loop Condenser	1	2	71
Topping Column Primary Condenser	1	2	71
Recovery Column Reflux Condenser	1	2	71
Natural Gas Compressor	1	2	60
Syngas Compressor	1	2	60
Loop Circulator	1	2	60
Combustion Air Fan	3	2	79
Flue Gas Fan	3	2	78
LT Saturator Circ Pump	3	2	69
HT Saturator Circ Pump	3	2	64
Topping Column Reflux Pump	3	2	53
Topping Column Bottom Pump	3	2	60
Refining Column Reflux Pump	3	2	60
Fuse Oil Pump	3	2	56
Recovery Column Reflux Pump	3	2	57
Recovery Column Bottom Pump	3	2	57
Boiler Feedwater (BFW) Pump	3	4	65
Process Condensate Pump	3	2	64
Startup BFW Pump	3	2	66
Product Transfer Pump	3	2	62
Syngas Compressor/Loop Circulator Turbine Pump	3	2	53
Combustion Air Fan Turbine	4	2	69
Flue Gas Fan Turbine	4	2	70
Syngas Compressor/Loop Circulator Turbine	4	2	75
BFW Pump Turbine	4	4	72
Power Generation Package (Steam Turbine)	1	2	57
Air Separation Unit (ASU)			

Source	Data Source	Number of Units	Approximate Sound Level at 100 ft (dBA)
ASU Equipment (combined)	5	2	77
ASU Air Inlet	5	2	48

Information Sources:
1. URS Corporation, 2007
2. DataKustik's CadnaA (v. 4.1.145) Sound Emission and Transmission (SET) module, 2015
3. Calculation techniques from Malcolm J. Crocker, Handbook of Acoustics, Chapter 69, 1998
4. Sound power levels (SWLs) for various equipment associated with the ASU were provided by client. All of the equipment was assumed to be located outside. Spectrum levels were estimated from similar types of equipment.

Note: Engineering and equipment selection has not been finalized and the sound levels listed above are reasonable, worst-case assumptions. They were used in this analysis to represent a reasonable estimate of overall future sound levels from the CR Alternative .

Model-Calculated Sound Levels

The noise assessment of the CR Alternative's operational noise sources evaluated the compliance of the alternative relative to the applicable Washington and Oregon noise limits. The assessment also evaluated the potential for noise impacts based on the project-related changes in the acoustic environment. Both aspects of the analysis are discussed below.

Compliance with Applicable Noise Limits

The noise limits are different for receiving locations east of the Columbia River in Washington and those west of the river in Oregon. Compliance with the appropriate standard was assessed for each of the receiver locations.

As discussed in section 14.2.2.1, the WAC sets specific noise limits on project-related noise for daytime and nighttime. Nighttime noise limits are 10 dBA lower than daytime limits for residential receivers. Because the proposed project would operate 24 hours a day, the more stringent nighttime noise limits were used for the evaluation of compliance. The WAC does not set limits on the increase over existing levels due to a project.

As discussed in section 14.2.2.3, Oregon sets limits on project-related sound levels and on the potential increase over existing levels. The limits on project-related noise levels at residential receiving locations are essentially the same in Oregon as in Washington (i.e., 50 dBA during nighttime hours). In addition, for locations with no existing industrial or commercial facilities, Oregon limits the increase over the existing L_{50} sound levels to 10 dBA.

Model-calculated A-weighted sound levels with the equipment listed above are presented in **Table 14-7**. As shown in the table, the model-calculated sound levels would comply with the most restrictive nighttime noise limits at all off-site receivers nearest the site in both Washington and Oregon. The calculated increases in sound levels over existing levels would also comply with Oregon's noise standards.

Table 14-7. Model-Calculated Hourly Sound Levels – CR Alternative (dBA, Hourly Leq/L25/L50)

Receptor	Existing Noise Level	Project Level [a]	Nighttime Noise Limit [b]	Comply?	Cumulative [c]	Increase	Comply? [d]
Sportsmans 1	48-61	42	50 (WA)	Y	49-61	0-1	N/A
Sportsmans 2	48-61	47	50 (WA)	Y	51-62	0-3	N/A
SE1	52-69	46	50 (WA)	Y	53-69	0-1	N/A
SE2	52-69	44	50 (WA)	Y	52-69	0-1	N/A
Camp Kalama	66-72	45	50 (WA)	Y	66-72	0	N/A
NE1	61-67	48	50 (WA)	Y	61-67	0	N/A
NE2	61-67	47	50 (WA)	Y	61-67	0	N/A
NE3	40-52	47	50 (WA)	Y	47-53	1-8	N/A
NE4	40-52	46	50 (WA)	Y	47-53	1-8	N/A
NE5	40-52	46	50 (WA)	Y	47-53	1-7	N/A
NE6	40-52	44	50 (WA)	Y	46-52	1-6	N/A
Prescott1	44-54	50	50 (OR)	Y	51-55	1-7	Y
Prescott2	44-54	49	50 (OR)	Y	50-55	1-7	Y

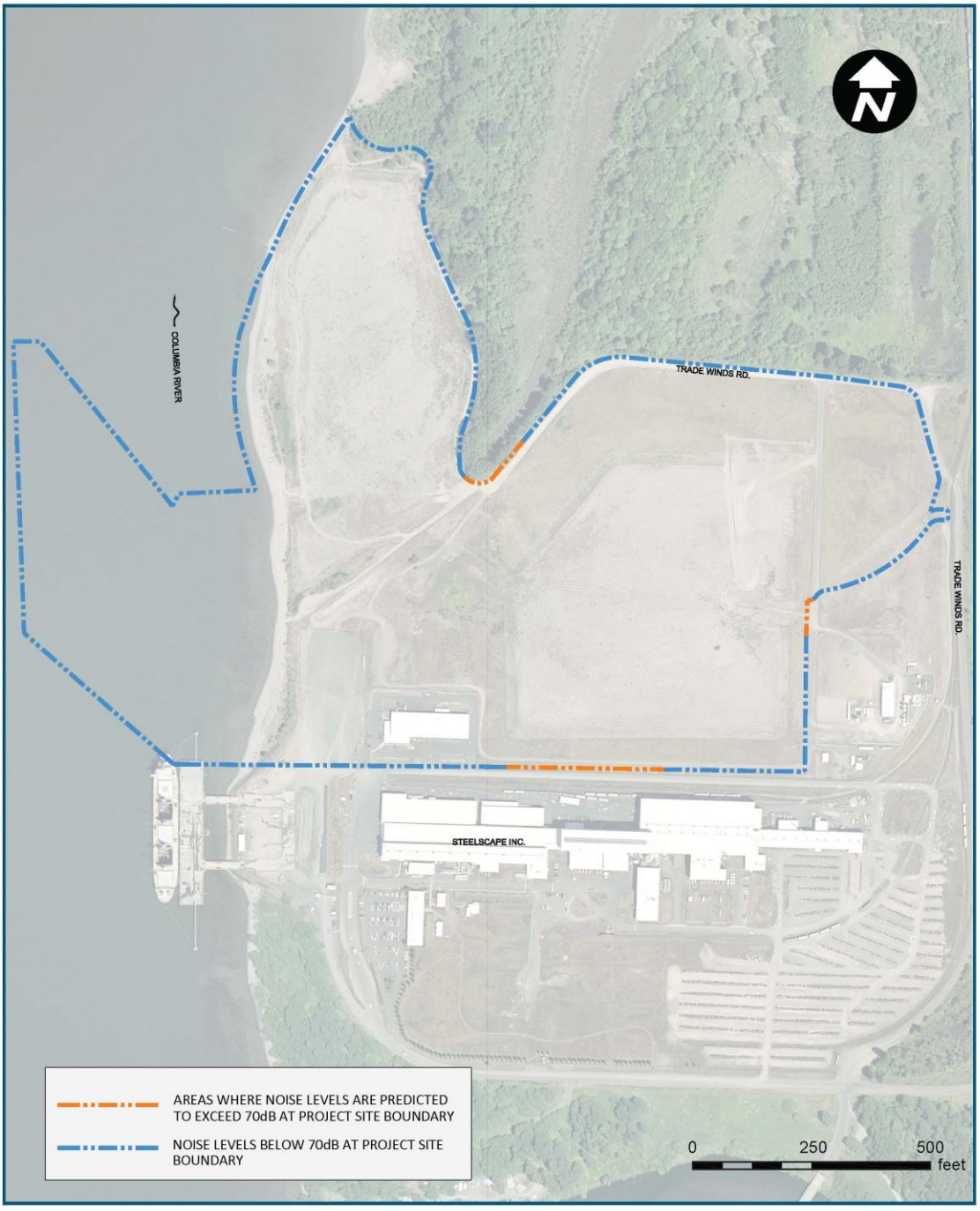
[a] The model-calculated sound levels are displayed as hourly Leqs. Although the actual noise limits are based on the hourly L25 (WAC) or L50 (Oregon), the on-site noise sources were assumed to operate continuously over an hour period, so the hourly Leq, L25, and L50 would be expected to be very similar. Therefore, the Leq can be used to estimate the potential L25 or L50 due to on-site sources. The Project Level represents the model-calculated sound level of project noise only and does not include the existing sound level.

[b] The limit shown is for nighttime hours (i.e., 10 p.m. to 7 a.m.). The daytime noise limit is 10 dBA higher. However, since peak hourly operations could occur anytime day or night, the more limiting 50 dBA was used for considering potential compliance.

[c] The Cumulative sound level includes both the Existing Noise Level and the Project Level.

[d] The WAC does not set a limit on potential noise increases over existing sound levels due to a project. Oregon sets a limit of 10 dBA on the increase over existing sound levels for sites where there is not an existing industrial or commercial use.

This assessment also evaluated noise limit compliance at the project site boundary. The project site is bounded by the Columbia River to the west; by Tradewinds Road, the Air Liquide industrial facility, and the Port's industrial wastewater treatment plant to the east; by Port property primarily used for open space, recreation, and wetland mitigation to the north; and by the existing Steelscape manufacturing facility to the south. For this assessment, the CadnaA noise model was used to predict cumulative hourly sound levels from the CR Alternative operations. This analysis predicted that the 70-dBA WAC noise limit could be exceeded along portions of the eastern, southern, and northern project site boundary (see **Figure 14-2**). The adjacent receiving properties on the eastern and southern boundaries are industrial land uses, and the adjacent receiving property to the north is undeveloped and unoccupied. The receiving property to the north is also owned by the Port of Kalama and not expected to be developed. The noise modeling was based on conservative assumptions and estimates of equipment sound levels. The Port of Kalama would work with its industrial tenants on these properties to address noise levels in the event an adjacent tenant raises concerns about noise impacts. Several measures could be used to reduce the noise levels if determined necessary during project operation. Potential noise control measures include construction of noise barriers, equipment enclosures, specifications for quieter equipment, or relocation or reorientation of equipment. While noise levels at the project site boundary may be adverse, they would not rise to the level of significance.



CR Alternative - Predicted Noise Levels at Project Site Boundary
Figure 14-2

KALAMA SEPA
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14.4.2 Ultra-Low Emissions Alternative

14.4.2.1 Construction Impacts

Potential noise impacts during the construction phase of the Ultra-Low Emissions (ULE) Alternative are expected to be similar to those anticipated to occur with construction of the CR Alternative. The overall construction duration, tasks, and equipment would be similar under both the ULE Alternative and the CR Alternative. No significant adverse noise impacts were identified for construction of the CR Alternative. Therefore, no significant adverse noise impacts are expected during construction of the ULE Alternative.

14.4.2.2 Operational Impacts

The primary noise sources associated with the ULE Alternative would be similar to the sources identified with the CR Alternative, with the addition of combustion turbines to generate power. The ULE Alternative would consist of the following major noise-emitting components:

- Two methanol production lines;
- Two ASUs to provide gas for the industrial processes;
- Two combustion turbine (CT)/combustion turbine generator (CTG) sets;
- One steam turbine package;
- Cooling towers for industrial cooling water cooling;
- Flare system for the disposal of flammable gases;
- Various pumps; and
- A marine terminal, including a single berth and a dock with methanol loading equipment.

As with the CR Alternative, the ULE Alternative is designed around the production process for methanol and its support needs. In general, the methanol production and power generation facilities would be located on the southern half of the project site, the ASUs in the middle of the site, the cooling towers in the northwest portion of the site, and the product storage and support components in the northern half of the project site. Transfer of the finished product to marine vessels would occur at the new marine terminal on the Columbia River.

14.4.2.3 ULE Alternative Noise Sources and Assumptions

The noise impact assessment was based on assuming full operation of the ULE Alternative, with all major on-site equipment operating simultaneously and continuously, 24 hours a day.

The on-site equipment and activities expected to be the dominant noise sources associated with the ULE Alternative are identified in **Table 14-8**. The table identifies the number of units expected with full operation and the approximate sound level 100 feet from each source (as estimated from the sound power level). The noise modeling for the proposed methanol manufacturing facility was based on conservative assumptions and estimates of equipment sound levels.

As with the CR Alternative, other equipment on the site (e.g., employee vehicles) and vessel and tugboat activity is expected to provide a negligible contribution to the overall sounds generated on the site, and such sources were not considered in this noise assessment.

Table 14-8. ULE Alternative Facility Noise Sources

Source	Data Source	Number of Units	Approximate Sound Level at 100 ft (dBA)
Enclosed Flare	1,2	1	70 (Adjacent to windscreen, 15 feet from outside wall of flare)
Cooling Tower			
Cooling Tower Fan	1	12	64
Cooling Tower Water Cascading	1	4 sides	68
Crude Methanol Pump	3	1	59
Methanol Loading Pump	3	4	69
Flare KO Drum Pump	3	1	48
Raw Water Booster Pump	3	2	60
Demineralized Water Plant Feed Pump	3	2	48
De-aerator Feed Pump	3	2	48
Cooling Water Pump	3	12	73
Ship Vent Scrubber Pump	3	1	45
Topping Column Primary Condenser	1	2	71
Recovery Column Reflux Condenser	1	2	71
Natural Gas Compressor	1	2	60
Syngas Compressor	1	2	60
Loop Circulator	1	2	60
LT Saturator Circ Pump	3	2	69
HT Saturator Circ Pump	3	2	64
Topping Column Reflux Pump	3	2	53
Topping Column Bottom Pump	3	2	60
Refining Column Reflux Pump	3	2	60
Fuse Oil Pump	3	2	56
Recovery Column Reflux Pump	3	2	57
Recovery Column Bottom Pump	3	2	57
Boiler Feedwater (BFW) Pump	3	4	65
Process Condensate Pump	3	2	64
Startup BFW Pump	3	2	66
Product Transfer Pump	3	2	62
BFW Pump Turbine	4	4	72
Power Generation			
CT/CTG Package	5	2	74

Source	Data Source	Number of Units	Approximate Sound Level at 100 ft (dBA)
Steam Turbine	6	1	67
Heat Recovery Steam Generator/ Once-Through Steam Generator	6	2	73
Stack	6	2	62
Air Separation Unit (ASU)			
ASU Equipment (combined)	7	2	77
ASU Air Inlet	7	2	48

Information Sources:
1. URS Corporation, 2007
2. DataKustik's CadnaA (v. 4.1.145) Sound Emission and Transmission (SET) module, 2015
3. Calculation techniques from Malcolm J. Crocker, Handbook of Acoustics, Chapter 69, 1998
4. Sound levels for the combustion turbine package were provided by client and included the following accessory equipment: fin fan cooler, water injection, and fuel gas filter skid. All of the equipment was assumed to be located outside.
5. Sound level of heat recovery steam generator and stack estimated from previous power project noise assessments conducted by ENVIRON personnel.
6. Sound power levels (SWLs) for various equipment associated with the ASU were provided by client. All of the equipment was assumed to be located outside. Spectrum levels were estimated from similar types of equipment.

Note: Engineering and equipment selection has not been finalized and the sound levels listed above are reasonable, worst-case assumptions. They were used in this analysis to represent a reasonable estimate of overall future sound levels from the project.

Model-Calculated Sound Levels

The noise assessment of the ULE Alternative's operational noise sources evaluated the compliance of the project relative to the applicable Washington and Oregon noise limits. The assessment also evaluated the potential for noise impacts based on the project-related changes in the acoustic environment. Both aspects of the analysis are discussed below.

Compliance with Applicable Noise Limits

The noise limits are different for receiving locations east of the Columbia River in Washington and those west of the river in Oregon. Compliance with the appropriate standard was assessed for each of the receiver locations.

As discussed in section 14.2.2.1, the WAC sets specific noise limits on project-related noise for daytime and nighttime. Nighttime noise limits are 10 dBA lower than daytime limits for residential receivers. Because the ULE Alternative would operate 24 hours a day, the more stringent nighttime noise limits were used for the evaluation of compliance. The WAC does not set limits on the increase over existing levels due to a project.

As discussed in section 14.2.2.3, Oregon sets limits on project-related sound levels and on the potential increase over existing levels. The limits on project-related noise levels at residential receiving locations are essentially the same in Oregon as in Washington (i.e., 50 dBA during nighttime hours). In addition, for locations with no existing industrial or commercial facilities, Oregon limits the increase over the existing L_{50} sound levels to 10 dBA.

Model-calculated A-weighted sound levels with the equipment listed above are presented in **Table 14-9**. As shown in the table, the model-calculated sound levels would not comply with the most restrictive nighttime noise limits at off-site receivers nearest the project site in Oregon,

and the calculated increases in sound levels over existing levels would exceed the 10 dBA limit on increases over the existing L50 sound levels in Oregon.

Table 14-9. Model-Calculated Hourly Sound Levels – ULE Alternative (dBA, Hourly Leq/L25/L50)

Receptor	Existing Noise Level	Project Level [a]	Nighttime Noise Limit [b]	Comply?	Cumulative [c]	Increase	Comply? [d]
Sportsmans 1	48-61	41	50 (WA)	Y	48-61	0-1	N/A
Sportsmans 2	48-61	45	50 (WA)	Y	50-61	0-2	N/A
SE1	52-69	43	50 (WA)	Y	52-69	0-1	N/A
SE2	52-69	42	50 (WA)	Y	52-69	0	N/A
Camp Kalama	66-72	44	50 (WA)	Y	66-72	0	N/A
NE1	61-67	47	50 (WA)	Y	61-67	0	N/A
NE2	61-67	47	50 (WA)	Y	61-67	0	N/A
NE3	40-52	45	50 (WA)	Y	46-53	1-7	N/A
NE4	40-52	45	50 (WA)	Y	46-53	1-6	N/A
NE5	40-52	44	50 (WA)	Y	45-52	1-6	N/A
NE6	40-52	44	50 (WA)	Y	45-52	1-5	N/A
Prescott1	44-54	56	50 (OR)	N	56-58	1-12	N
Prescott2	44-54	52	50 (OR)	N	52-56	1-9	Y

Notes: Shaded cells indicated modeled values that exceed the applicable noise limits.

[a] The model-calculated sound levels are displayed as hourly Leqs. Although the actual noise limits are based on the hourly L25 (WAC) or L50 (Oregon), the on-site noise sources were assumed to operate continuously over an hour period, so the hourly Leq, L25, and L50 would be expected to be very similar. Therefore, the Leq can be used to estimate the potential L25 or L50 due to on-site sources. The Project Level represents the model-calculated sound level of project noise only and does not include the existing sound level.

[b] The limit shown is for nighttime hours (i.e., 10 p.m. to 7 a.m.). The daytime noise limit is 10 dBA higher. However, since peak hourly operations could occur anytime day or night, the more limiting 50 dBA was used for considering potential compliance.

[c] The Cumulative sound level includes both the Existing Noise Level and the Project Level.

[d] The WAC does not set a limit on potential noise increases over existing sound levels due to a project. Oregon sets a limit of 10 dBA on the increase over existing sound levels for sites where there is not an existing industrial or commercial use.

As noted in Chapter 2, Proposed Project and Alternatives, the proposed project may elevate the northwestern portion of the project site up to 10 feet higher than the rest of the site. A sensitivity analysis was conducted to determine whether this potential change in elevation would result in substantially different noise levels compared to those presented in **Table 14-9**. The analysis concluded that the increase in elevation in the northwestern portion of the project site would result in a decrease in the model-calculated project sound level at receptor Prescott1 from approximately 56 dBA to approximately 52 dBA, and the increase in the cumulative noise level compared to existing levels would be up to 9 dBA, compared to 12 dBA as shown in **Table 14-9**. This increase in the cumulative noise level would comply with Oregon's limit on project-related noise increases over existing levels. At receptors Sportsmans1, Sportsmans2, and SE1, the model-calculated sound levels identify an increase of less than 1 dBA with the higher elevation as compared to the levels shown in **Table 14-9**. Overall, the higher elevation in the northwest portion of the project site would not substantially change the projected noise

levels or noise increases, nor would they result in the need for different mitigation than that identified below.

Compliance with Applicable Noise Limits – With Mitigation

Because the initial assessment of compliance for the ULE Alternative indicated that the proposed project with this Technology Alternative, as modeled, would not comply with Oregon's noise limits, mitigation measures were considered for the ULE Alternative's cooling water pumps and methanol loading pumps. Two mitigation options for each type of equipment were identified:

- Cooling water pump mitigation options:
  - Option 1 - Limit the sound level of the cooling water pumps to 65 dBA or less at a distance of 100 feet. The sound power level used in the initial assessment was 73 dBA at 100 feet).
  - Option 2 - Install the cooling water pumps on the east side of the cooling tower (the initial assessment conservatively assumed they would be installed on the south end of the cooling tower). Installation on the east side of the cooling tower would provide shielding to reduce the noise exposure in Oregon.
- Methanol loading pump mitigation options:
  - Option 1 - Construct a noise wall around the north, west, and south sides of the pad containing the methanol loading pumps. The wall should be 2 feet taller than the pumps.
  - Option 2 - Limit the sound level for each pump to 59 dBA or less at 100 feet. The initial assessment assumed a sound level of 69 dBA at 100 feet.

Selection of one mitigation option for the cooling water pump and one mitigation option for the methanol loading pump would reduce the projected noise to levels that would comply with the applicable regulations. The modeled sound levels with the mitigation measures are displayed in **Table 14-10**.

Table 14-10. Model-Calculated Hourly Sound Levels – ULE Alternative with Mitigation (dBA, Hourly Leq/L25/L50)

Receptor	Existing Noise Level	Project Level [a]	Nighttime Noise Limit [b]	Comply?	Cumulative [c]	Increase	Comply? [d]
Sportsmans 1	48-61	39	50 (WA)	Y	48-61	0-1	N/A
Sportsmans 2	48-61	43	50 (WA)	Y	49-61	0-1	N/A
SE1	52-69	42	50 (WA)	Y	52-69	0	N/A
SE2	52-69	41	50 (WA)	Y	52-69	0	N/A
Camp Kalama	66-72	42	50 (WA)	Y	66-72	0	N/A
NE1	61-67	46	50 (WA)	Y	61-67	0	N/A
NE2	61-67	46	50 (WA)	Y	61-67	0	N/A
NE3	40-52	45	50 (WA)	Y	46-53	1-7	N/A
NE4	40-52	45	50 (WA)	Y	46-53	1-6	N/A

Receptor	Existing Noise Level	Project Level [a]	Nighttime Noise Limit [b]	Comply?	Cumulative [c]	Increase	Comply? [d]
NE5	40-52	44	50 (WA)	Y	45-52	1-6	N/A
NE6	40-52	43	50 (WA)	Y	45-52	1-5	N/A
Prescott1	44-54	50	50 (OR)	Y	51-56	1-7	Y
Prescott2	44-54	50	50 (OR)	Y	50-55	1-7	Y

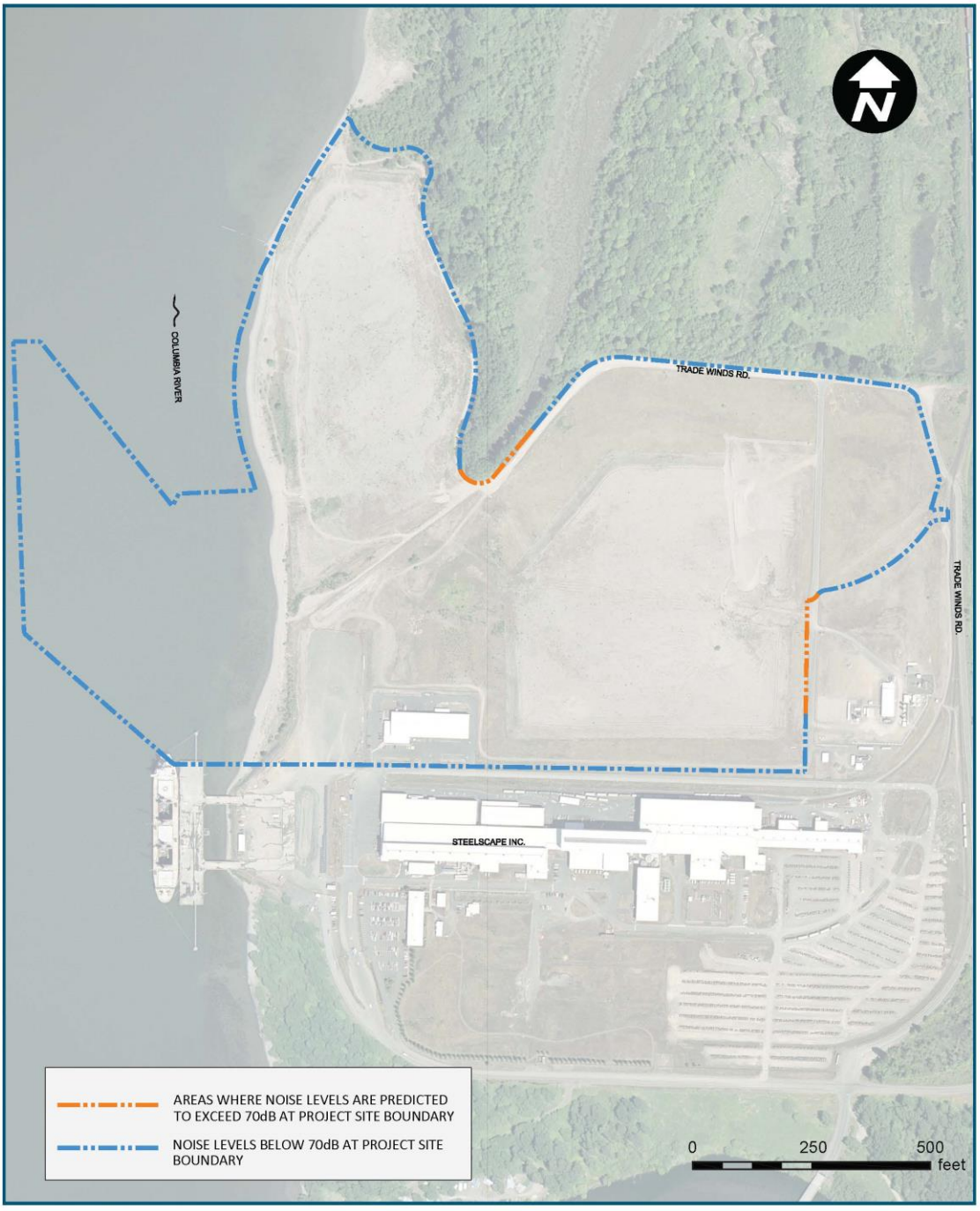
[a] The model-calculated sound levels are displayed as hourly Leqs. Although the actual noise limits are based on the hourly L25 (WAC) or L50 (Oregon), the on-site noise sources were assumed to operate continuously over an hour period, so the hourly Leq, L25, and L50 would be expected to be very similar. Therefore, the Leq can be used to estimate the potential L25 or L50 due to on-site sources. The Project Level represents the model-calculated sound level of project noise only and does not include the existing sound level.

[b] The limit shown is for nighttime hours (i.e., 10 p.m. to 7 a.m.). The daytime noise limit is 10 dBA higher. However, since peak hourly operations could occur anytime day or night, the more limiting 50 dBA was used for considering potential compliance.

[c] The Cumulative sound level includes both the Existing Noise Level and the Project Level.

[d] The WAC does not set a limit on potential noise increases over existing sound levels due to a project. Oregon sets a limit of 10 dBA on the increase over existing sound levels for sites where there is not an existing industrial or commercial use.

This assessment also evaluated noise limit compliance at the project site boundary. As with the assessment of the CR Alternative, the CadnaA noise model was used to predict cumulative hourly sound levels from the ULE Alternative operations. This analysis predicted that the 70-dBA WAC noise limit could be exceeded along portions of the eastern and northern project site boundary (see **Figure 14-3**). Both adjacent receiver properties are non-residential land uses. The noise modeling was based on conservative assumptions and estimates of equipment sound levels. The Port of Kalama would work with its industrial tenants on these properties to address noise levels in the event an adjacent tenant raises concerns about noise impacts. Several measures could be used to reduce the noise levels if determined necessary during project operation. Potential noise control measures include construction of noise barriers, equipment enclosures, specifications for quieter equipment, or relocation or reorientation of equipment. Adjacent uses include undeveloped parcels and industrial uses that are not sensitive receptors like a residential use. Therefore, the noise levels at the project site boundary may be adverse but would not rise to the level of significance.



ULE Alternative - Predicted Noise Levels at Project Site Boundary
Figure 14-3

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14.4.3 Marine Terminal Alternatives

The Marine Terminal Alternatives primary noise would be the methanol loading equipment, which is accounted for in the analysis of the CR and ULE Alternatives above. Other aspects of the both Marine Terminal Alternatives' design would have no effect on overall noise levels for the proposed project. Therefore, either Marine Terminal Alternative would not result in significant adverse noise impacts.

14.4.4 Related Action

14.4.4.1 Kalama Lateral Project

The Kalama Lateral Project (the proposed pipeline) is undergoing a separate permitting and environmental review process under the jurisdiction of the Federal Energy Regulatory Commission (FERC). The following discussion is based on information contained in the FERC Environmental Assessment for the proposed pipeline project (FERC Docket No. CP15-8-000) and in Appendix 6E, "Blasting Plan," in Resource Report 6, "Geological Resources," for the project.

Construction Impacts

Blasting

As part of construction of the pipeline, blasting may be required where hard bedrock occurs within the trench profile and is not removable by other mechanical methods. Blasting would only be used when other methods for removing the rock fail. Depending on the location of each blast, substantial levels of blasting-related noise could affect nearby residences. However, there are numerous mitigation measures that can be used to direct most of the blast energy into the rock, instead of into the air. This results in both a more effective blast and lower sound levels. Blast noise mitigation methods might include the following:

- Drill small charge holes on tight centers
- Leave approximately 3-4 feet of soil on top of the blast area during initial mechanical excavations
- Use blast mats on top of the soil on the blast area
- Use timing delays for charges
- Blast small horizontal and vertical sections
- Stem the blast holes with dense sand
- Time charges to direct blast vibration away from sensitive receivers

Most of the mitigation measures identified above are intended to focus the blast energy into the rock instead of into the air, increasing the effectiveness of the blast while reducing airborne sound levels. Although noise during blasting activities may be noticeable and intrusive, it is expected to be infrequent and intermittent, and would occur during daytime hours only. As discussed in the FERC environmental assessment, the implementation of the proposed pipeline's blasting plan would reduce potential impacts from any necessary blasting during construction by requiring mitigation for both blast noise and blast vibration based on the physical design of blasting and charges, use of physical barriers between blasting areas and noise sensitive areas, and use of blast mats. Vibration from blasting events would also be monitored. Noise from construction activities are also exempt from the noise limits during daytime hours (WAC 173-60-050). Based on the temporary and localized nature of

construction activities for the proposed pipeline, and the commitment to reduce noise and vibration during blasting activities, the noise associated with blasting would not result in significant adverse noise impacts to nearby residences.

Horizontal Directional Drilling

For installation of the pipeline under I-5 and the BNSF railway, a construction technique called horizontal directional drilling would be used. This method entails drilling a path under the freeway and pushing/pulling pipes in graduated sizes through the void. This method requires large engines, fans, mud pumps, shakers, and other equipment that can emit high levels of noise. In addition, horizontal directional drilling activities tend to be conducted continuously, day and night, once begun. The noise study for the proposed pipeline considered noise from this activity and determined that unmitigated noise could exceed Washington's nighttime noise limits and increase the sound levels by a substantial amount (i.e., more than 9 dBA for locations with existing sound levels greater than 55 dBA L_{dn}). The noise study, therefore, recommended several noise mitigation measures (as detailed in Section 6.2 of the Kalama Lateral Project Environmental Assessment, FERC Docket No. CP15-8-000, see **Appendix B**) to comply with the noise limits and reduce the potential for substantial noise increases. The implementation of these mitigation measures would reduce noise impacts to a level less than significant.

Operational Impacts

Noise from the operation of the proposed pipeline would be negligible. No significant adverse noise impacts would result from operation of the proposed pipeline.

The proposed project would also require new transmission lines to be installed on existing poles to provide electricity to the project site. Cowlitz County Public Utility District No. 1 (Cowlitz PUD) also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing transmission line on the east side of I-5 to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. New equipment would also be installed at the Kalama Industrial Substation within the existing footprint of that facility. These activities would constitute a related action on the part of the Cowlitz PUD. These transmission lines and substation would generate minimal noise except for a limited duration during construction activities and would not result in significant adverse noise impacts.

14.4.5 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed on the project site, however, it is expected the Port would pursue future industrial or marine terminal development of the site. Although no specific estimates of noise related to development are available, the expected noise implications of development are considered qualitatively below.

14.4.5.1 Construction Impacts

No significant adverse noise impacts were identified for construction of either the CR or ULE Alternatives. If a different water-dependent industrial development is advanced under the No-Action Alternative, it is likely that construction-related noise impacts would be similar to those assessed for the CR and ULE Alternatives. Thus, any development under the No-Action Alternative would likely result in the same findings.

14.4.5.2 Operational Impacts

If the project site were developed for other water-dependent industrial uses, industrial-type levels of noise would be also expected to be emitted from the site. Given the site's highway, rail, and waterfront access, it is likely that transportation noise sources would also contribute to noise from the project site and surrounding area. Noise from industrial sites affecting the nearby residential receivers would be subject to the same noise limits as apply to the CR and ULE Alternatives, and future noise levels would be expected to be similar to those identified. If any other use would entail a heavier use of rail, highway, or vessel transportation modes, transportation-specific noise impacts could be greater than those identified for the CR or ULE Alternatives.

14.5 Mitigation Measures

14.5.1 Project Mitigation

The design features and best management practices the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits are assumed to be part of the project and have been considered in assessing the environmental noise impacts and are listed below.

14.5.2 Design Measures

Using conservative assumptions and modeling techniques, the noise assessment for the ULE Alternative identified project-related sound levels that would not comply with Oregon's noise limits. Potential noise mitigation measures were considered for the ULE Alternative's cooling water pumps and methanol loading pumps. Two mitigation options for each type of equipment were identified:

- Cooling water pump mitigation options:
  - Option 1 - Limit the sound level of the cooling water pumps to 65 dBA or less at a distance of 100 feet.
  - Option 2 - Install the cooling water pumps on the east side of the cooling tower.[4]
- Methanol loading pump mitigation options:
  - Option 1 - Construct a noise wall around the north, west, and south sides of the pad containing the methanol loading pumps. The wall should be 2 feet taller than the pumps. Such a wall would reduce the sound levels at residential receptors to the west (in Oregon) and south (at the Sportsmans Club), and would not adversely affect residences to the east.
  - Option 2 - Limit the sound level for each pump to 59 dBA or less at 100 feet.

Other noise mitigation measures could also be considered if determined to be equally effective at reducing noise levels associated with the ULE Alternative. With implementation of the appropriate noise mitigation measures, sound levels associated with the ULE Alternative would comply with applicable noise limits and regulations and would not result in significant adverse noise impacts.

[4] It should be noted that moving the pumps to the east side of the cooling tower would result in higher sound levels on the hillside to the northeast, resulting in increases over existing levels up to 10 dBA. This would result in moderate, but not severe, noise impacts to three receptors on the hillside to the northeast of the facility.

The CR Alternative would not result in significant adverse noise impacts during construction or operation. Therefore, no additional design mitigation measures are proposed for the CR Alternative.

14.5.3 Additional Mitigation

There are no significant adverse noise impacts with either Technology Alternative; therefore, no additional mitigation measures are identified.

14.6 Unavoidable Significant Adverse Impacts

The proposed project, with either Technology Alternative and either Marine Terminal Alternative, would not result in unavoidable significant adverse noise impacts.

14.7 References

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Chapter 15 Cumulative Impacts

15.1 Introduction

This chapter evaluates and summarizes the potential cumulative impacts of the proposed project. Cumulative impacts are impacts that could result from the incremental consequences of an action (in this case, the proposed project) when added to other past, present, and reasonably foreseeable future actions. When impacts of an action are viewed individually, they may appear minor but, when considered collectively (cumulatively) with the impacts of other actions, especially over a period of time, the impacts can be more significant. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed project, including the proposed project's incremental contribution to cumulative impacts on the environment.

15.2 Regulatory Context

The Washington State Environmental Policy Act (SEPA) directs lead agencies to consider the direct, indirect, and cumulative impacts of proposed actions. This cumulative impact analysis is prepared in accordance with SEPA (Chapter 43-21C of the Revised Code of Washington [RCW]), the SEPA Rules (Chapter 197-11-060 and 197-11-792 of the Washington Administrative Code [WAC]), and the SEPA Handbook.

The Council on Environmental Quality publication "Considering Cumulative Effects Under the National Environmental Policy Act (NEPA)" was also considered for additional guidance where NEPA cumulative impact review is consistent with SEPA requirements.

15.3 Methodology

This analysis provides a broad assessment of potential cumulative impacts related to implementing the proposed project. A wide array of other past, present, and reasonably foreseeable future actions near the project site and along the Columbia River were reviewed. The cumulative impact analysis used the following approach:

1. **Identification of geographic boundaries (i.e., the study area):** The preceding chapters of this environmental impact statement (EIS) describe the potential impacts of the proposed project on environmental resources. As discussed in those chapters, the study areas are the areas where the proposed project has the potential to affect environmental resources. In general, the study areas include the project site and surrounding areas, as well as the Columbia River for the marine terminal and vessel traffic related to the proposed project. The cumulative impact assessment uses the same study areas, as those study areas represent the areas where the proposed project, in combination with other past, present, or reasonably foreseeable future actions, could result in cumulative impacts.
2. **Identification of time-based boundaries:** The proposed project does not have a stated lifespan. Therefore, this assessment accounts for all reasonably foreseeable projects that could be constructed or operational during the same period as the proposed project.
3. **Identification of reasonably foreseeable future projects and actions within the geographic and time-based boundaries:** Section 15.4 below identifies the reasonably foreseeable future projects considered in this cumulative impact analysis. Reasonably foreseeable future projects considered include public and private projects.

4. **Evaluation of the potential cumulative impacts of the proposed project in combination with other reasonably foreseeable future projects:** Section 15.5 below evaluates the potential cumulative impacts of the proposed project.

15.4 Identification of Projects Considered in the Cumulative Impact Analysis

Reasonably foreseeable future projects generally include actions underway (i.e., current actions), as well as future actions that are formally proposed or planned, or highly likely to occur, based on available information.

The present and future projects assessed are those that could result in cumulative impacts as a result of the projects' close proximity to the proposed project – i.e., the present and future action would occur near the proposed project and, in combination with its construction and/or operation, could have cumulative impacts. Cumulative impacts could also result from the addition of vessel traffic on the Columbia River. Therefore, the future projects considered include those in the vicinity of the proposed project site, as well as those that may be farther away but that would increase vessel traffic on the Columbia River. Various sources (as noted in **Table 15-1**) were used to obtain information about present and potential future development.

Past projects in proximity to the proposed project are accounted for in the affected environment discussions for each resource area in the EIS. The potential environmental impacts of the proposed project, therefore, account for the effects of past actions on the surrounding environment.

Table 15-1 identifies future actions that, in combination with the proposed project, could contribute to cumulative impacts on environmental resources. The future projects are divided into two categories – those in the project vicinity and those along the Columbia and Willamette rivers that are expected to contribute additional vessel traffic to the Columbia River. The locations of these future projects are shown on **Figure 15-1** and **Figure 15-2**.

Table 15-1. Future Development Projects Accounted for in Cumulative Impacts Analysis

Map ID No.	Project Name	Location	Description	Maximum Estimated Additional Vessel Calls Per Year[1]
In Project Vicinity				
1	Spencer Creek Business Park	Kalama River Road and Old Pacific Highway	Development of 500,000 square feet of light industrial, office, commercial, and retail uses. (Port of Kalama 2015)	0
2	WSDOT Kelso-Martin's Bluff Rail Improvements (Task 5)	BNSF Railway in Kalama (from Milepost 110 to Kalama River)	Construction of 4.1 miles of new main line track to east of existing double track and related improvements to improve intercity passenger rail service. (WSDOT 2014)	0
3	Port of Kalama Maintenance Dredging	Columbia River	Ongoing maintenance dredging at existing Port marine terminals under existing local, state, and federal approvals. Includes dredged material disposal via flow lane placement in Washington and Oregon, beach nourishment, and upland disposal (Port of Kalama 2015)	0

Map ID No.	Project Name	Location	Description	Maximum Estimated Additional Vessel Calls Per Year[1]
4	USACE Columbia River Channel Maintenance Dredging	Columbia River	Ongoing maintenance dredging of Columbia River navigation channel and anchorages as necessary.	0
5	Steelscape Steel Coil and Paint Warehouse	222 Kalama River Road, Kalama, WA	New 45,000-square-foot steel coil storage warehouse and 17,500-square-foot paint warehouse on southwest portion of existing site. No new employment anticipated. (pers. comm. Eric Yakovich 2015)	0
6	Port of Kalama Small Vessel Dock	1285 NW Third Avenue, Kalama, WA	New floating dock and access trestle for use by small commercial vessels that serve the oceangoing vessels on the Columbia River	0
7	Port of Kalama Marina Renovation	380 West Marine Drive, Kalama, WA	Phased project consisting of maintenance and repair activities, a new visitors dock and connection bridge, and an expanded launch float	0
Along the Columbia River and Willamette River				
8	Canpotex	Marine Terminal 5, Port of Portland	Proposed expansion of potash export facility; in permitting. Includes new storage building, shiploader, and conveyor system improvements. (Canpotex 2014)	Unknown at this time
9	Pembina Pipeline	Marine Terminal 6, Port of Portland, OR[2]	Proposed propane export terminal.[2] (Pembina 2015)	36
10	Global Partners - Columbia Pacific Bio-Refinery	Port Westward Industrial Park, Clatskanie, OR	Proposed expansion of crude oil and ethanol export facility to as much as 1,839,600,000 gallons per year. Crude oil and/or ethanol would be received by rail, transferred to storage tanks, and exported on marine vessels. (Global Partners 2013) (ODEQ 2013)	130
11	Millennium Bulk Terminals Longview	Longview, WA	Proposed coal export terminal with new upland facilities, rail improvements, docks, and dredging activities. Coal would be received by rail, stored in stockpiles, and exported by marine vessel. (Ecology 2015)	840
12	Arc Logistics	Port of Portland, OR	Conversion of the Portland Terminal, an existing rail/marine export facility on the Willamette River to crude-by-rail facility with marine export. (Arc Logistics Partners 2014)	Unknown at this time
13	NWIW Manufacturing and Marine Export Facility	Port Westward Industrial Park, Clatskanie, OR	Proposed natural gas-to-methanol production facility and marine export terminal. (NWIW 2015)	72

Map ID No.	Project Name	Location	Description	Maximum Estimated Additional Vessel Calls Per Year[1]
14	Morrow Pacific	Port of Morrow, Boardman, OR/Port Westward, Clatskanie, OR	Proposed coal export facility. Coal would be shipped by rail to Port of Morrow, where it would be stored and then shipped on barge down Columbia River to Port of St. Helens' Port Westward Industrial Park and transferred to oceangoing Panamax vessels. At full capacity, 12 barge tows/week from Morrow to Port Westward and 3 Panamax vessels per week from Port Westward to Asia.[3] (Ambre Energy 2015)	156 Panamax vessels; 624 barges
15	Oregon Liquefied Natural Gas	Warrenton, OR	Proposed LNG import/export terminal. Facilities would include feed gas pretreatment facilities, two liquefaction trains, two 160,000-cubic-meter LNG storage tanks, regasification facilities, accessory facilities, and marine berth for one LNG carrier. Natural gas would be transported to the terminal via 86-mile natural gas pipeline through Clatsop, Tillamook, and Columbia counties in Oregon from Washington. (FERC 2015)	125
16	CHS/TEMCO	Port of Kalama, WA	Grain export terminal expansion completed in 2015.[4] (The Daily News 2014)	48
17	Woodland Marine Terminal	Woodland, WA	Proposed marine off-loading facility for calcium carbonate stone delivered by barge, off-loaded, and stored upland. (Cowlitz County 2015)	24 barges
18	Vancouver Energy	Port of Vancouver, WA	Proposed crude-by-rail terminal. Crude oil would be delivered by rail, stored on site, and exported via marine vessel. Facilities would include rail unloading facility, transfer pipelines, storage tanks, modifications to existing marine terminal and dock, and accessory support facilities. (EFSEC 2015)	365
19	Washington Energy Storage and Transfer	Port of Longview, WA	Proposed liquefied petroleum gas (i.e., propane and butane) export facility. Facility would receive LPG by rail and store/export it by marine vessel. (Waterside Energy 2015a)	48
20	Riverside Refinery	Port of Longview, WA	Proposed refinery using crude oil (delivered by rail) and renewable biofuels (would arrive via two to three vessels per month). Refined product would move to local/regional markets on existing barges or larger vessels on Columbia River. Atmospheric residuals may be shipped to other West Coast refiners. (Waterside Energy 2015b)	Unknown at this time

Map ID No.	Project Name	Location	Description	Maximum Estimated Additional Vessel Calls Per Year[1]
21	NuStar Terminals Conversion to Crude Oil	Port of Vancouver, WA	Proposed retrofit of existing bulk liquid storage and transfer facility to crude oil service. Crude oil would be received by rail and exported by vessel/barge using existing marine loading rack. (SWCAA 2014)	18
Vessel Trip Projection Summary				
1. Cumulative Projects - Total Additional Trips (not including barge trips)				**1,838**
2. Cumulative Projects - Total Inbound and Outbound Transits				**3,676**
3. Proposed Project – Total Additional Trips				**72**
4. Proposed Project – Total Inbound and Outbound Transits				**144**
Total Projected Additional Trips (1 + 3)				**1,910**
Total Projected Additional Inbound and Outbound Transits (2 + 4)				**3,820**
Baseline Vessel Trips				
2014 Vessel Entry Transits[5] (Ecology 2015b)				**1,581**
2014 Vessel Inbound and Outbound Transits				**3,162**
Recent Peak – 1999 Vessel Entry Transits[5]				**2,269**
Recent Peak – 1999 Vessel Inbound and Outbound Transits				**4,538**

Notes

1 Each vessel call involves two river transits – one inbound and one outbound.

2 Project is stalled, but is included here for the sake of completeness and a conservative analysis.

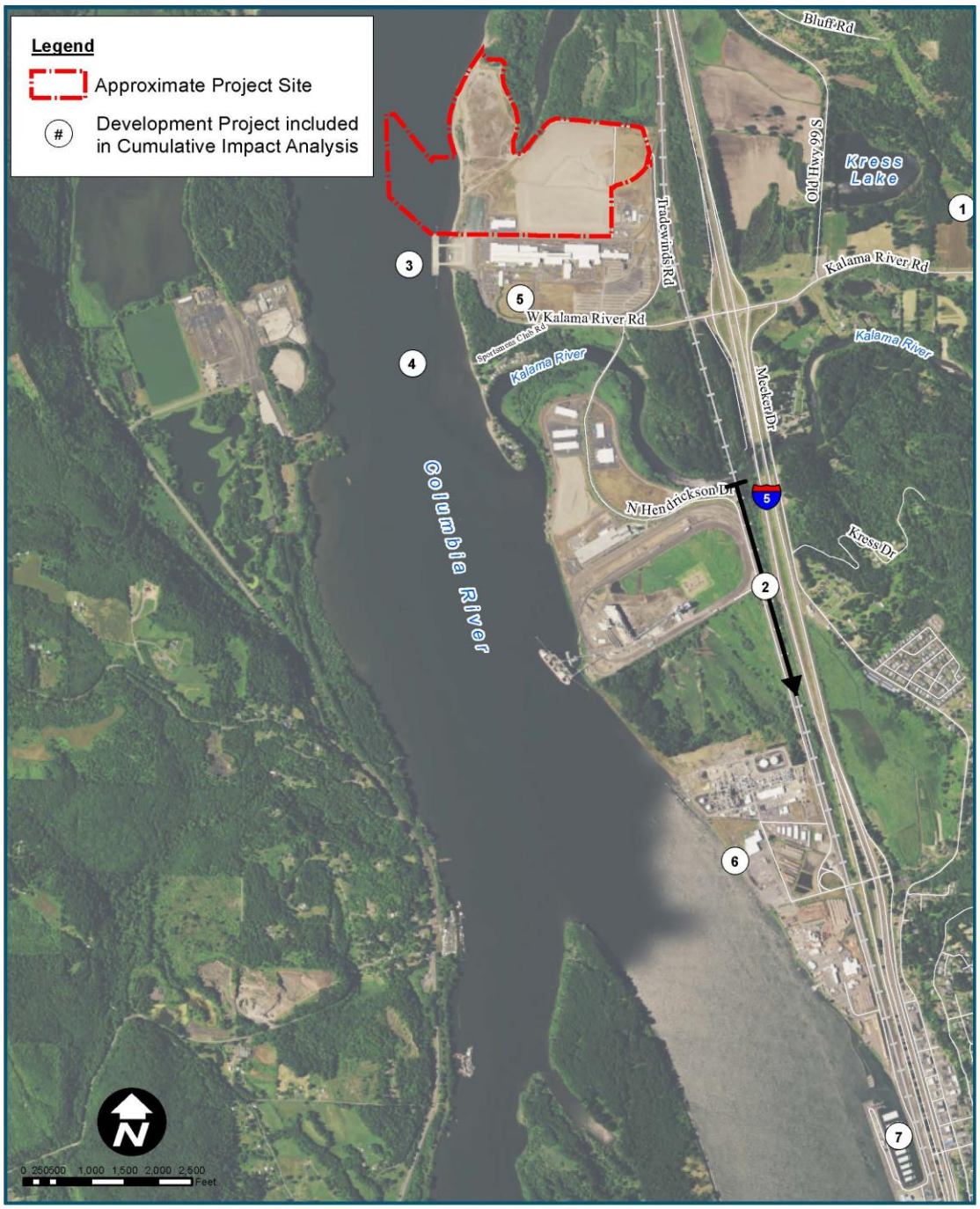
3 Permit application has been denied but the developer has not stated publicly that the project is canceled. Project is included here for the sake of completeness and a conservative analysis.

4 Project is included because vessel traffic associated with the expansion is not included in the baseline vessel traffic volumes for the Columbia River.

5 Includes cargo and passenger vessels, tank ships, and articulated tug barges.

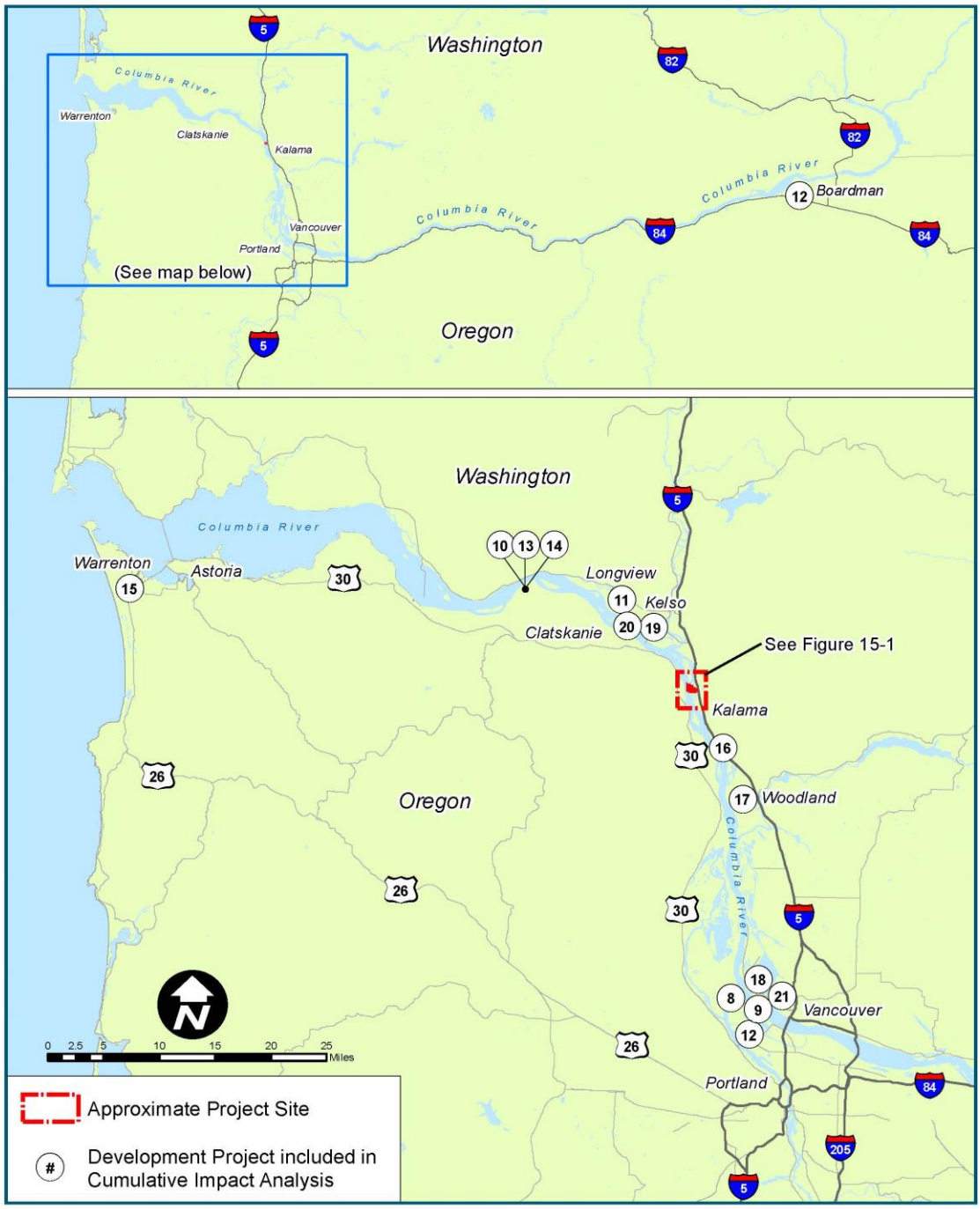
Ecology = Washington State Department of Ecology; EFSEC = Energy Facility Site Evaluation Council; FERC = Federal Energy Regulatory Commission; LNG = liquefied natural gas; LPG = liquefied petroleum gas; NWIW = Northwest Innovation Works, LLC – Kalama; ODEQ = Oregon Department of Environmental Quality; SWCAA = Southwest Clean Air Agency; USACE = U.S. Army Corps of Engineers; WSDOT = Washington State Department of Transportation

As shown in **Table 15-1**, the reasonably foreseeable future projects are expected to contribute approximately 1,838 vessel trips (3,676 vessel transits) on the Columbia River, not including additional barge traffic. The Morrow Pacific project would add 624 barge trips or 1,248 one-way transits between the Port of Morrow and Port Westward and the Woodland Marine Terminal would add 24 barge trips. The Columbia River has a federally authorized navigation channel maintained to a depth of -43 feet and a width of 600 feet. The federally authorized and maintained navigation channel begins at the mouth of the Columbia River and extends 106.5 miles to the Interstate 5 (I-5) bridge crossing at Vancouver, Washington (the portion between the Vancouver railroad bridge and the I-5 bridge crossing is only maintained to a depth of 35 feet).



Projects Included in Cumulative Impact Analysis in Project Vicinity
Figure 15-1

KALAMA SEPA
Manufacturing & Marine Export Facility



Projects Included in Cumulative Impact Analysis along Columbia River

Figure 15-2

KALAMA SEPA
Manufacturing & Marine Export Facility

15.5 Potential Cumulative Impacts of the Proposed Project

This section evaluates the potential cumulative impacts of the proposed project in combination with the other reasonably foreseeable projects identified above for each area of the environment discussed in this draft EIS (DEIS). Each section is divided into potential cumulative impacts near the project site and potential impacts due to increased vessel traffic along the Columbia River.

15.5.1 Earth

Project Site Vicinity

As discussed in Chapter 3, Earth, the study area for the assessment of potential impacts related to earth and geology is the project site. The assessment also considers the potential for local geologic hazards to affect the proposed project. The reasonably foreseeable development projects in the vicinity of the proposed project would not alter regional or local geological processes, nor would they affect earth and geology (e.g., erosion, slope stability, etc.) on the project site. The proposed project will involve the removal of up to 325,000 cubic yards of dredged material. The Spencer Creek Business Park and Kelso-Martin's Bluff projects will likely involve grading and fill activities but quantities are not known (Port of Kalama 2013) (US DOT 2015). Based on the size and location, these projects are not likely to require the same level of material removal as they do not contain dredged materials and cumulative impacts would be minor. The other projects in **Table 15-1** are too far removed from the project to result in cumulative impacts related to grading and fill activities. Therefore, the proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts related to earth and geology.

Vessel Transportation

Increased marine vessel traffic has the potential to affect soil erosion caused by wakes generated by vessels. However, the Columbia River is subject to existing vessel wakes from current marine traffic, as well as waves generated by wind and tidal forces. The U.S. Army Corps of Engineers (USACE) found that it was impossible to estimate ship wake erosion separately from erosion caused by other forces and there would be no measureable increase in erosion caused by additional ship traffic (USACE 1999). More recent work has indicated that erosion from ship wakes can occur resulting in environmental impacts but is limited in area because of existing bank conditions (EFSEC 2015). The cumulative vessel traffic along the Columbia River associated with the proposed project and other reasonably foreseeable development projects is likely to result in an increase in erosion. The extent of erosion is not readily determined and the project vessels are not anticipated to create wakes differently than current deep draft vessels using the federal navigation channel. The extent of impacts is not known and should be further studied, and agencies responsible for overall management of the navigation channel are best positioned to address mitigation for this issue.

15.5.2 Air Quality and Greenhouse Gas Emissions

Air Quality

Project Site Vicinity

As discussed in Chapter 4, Air Quality and Greenhouse Gas Emissions, the proposed project would not result in significant adverse impacts related to air pollutant or greenhouse gas (GHG) emissions during construction or operation. There is the potential for cumulative impacts related to air quality near the project site if the other reasonably foreseeable future actions are

constructed at the same time as the proposed project. The potential for impacts related to concurrent construction is greatest for projects close to the project site, because air quality is highly localized and pollutants disperse in air. Concurrent operation of local facilities is unlikely to result in cumulative air quality impacts due to the permitting review requirements for such sources that take into account emissions from other sources in the vicinity.

During construction, those projects identified in **Table 15-1** as *In Project Vicinity* would be close enough to the proposed project to have the potential for cumulative air quality impacts. If the projects are constructed at the same time as the proposed project, it could result in minor cumulative increases in air pollutants from construction equipment and from dust and particulate matter during earth-moving activities for the land-based activities. However, these increases would be temporary for the duration of overlapping construction and would be localized. Each project would also be required to comply with air quality regulations that include proper emission control on construction equipment and dust control.

The air quality analysis completed for the project (Chapter 4) considered estimated existing levels of air pollution in the vicinity of the project site from all sources and thus considered the potential cumulative impacts of the proposed project and air pollutant emissions from existing sources affecting the project area. As shown, the project, in conjunction with existing air pollutants sources, is consistent with regulatory requirements and would not have significant adverse environmental impacts to air resources. Similarly, projects in **Table 15-1** that involve emissions, such as the proposed Riverside Refinery, would be required to consider emissions from existing sources in their permit review. Cumulative impacts from emissions of all existing sources are, therefore, incorporated into each individual emissions source air permit review.

The reasonably foreseeable future projects near the project site as shown in **Table 15-1** would not be expected to introduce new large sources of air pollutant emissions or toxic air pollutants once operational, based on the nature of those projects. The Steelscape warehouse project would likely only have negligible new emissions from fossil fuel-fired heating and cooling systems. The Spencer Creek Business Park is expected to house office, light industrial, commercial, hotel, and dining uses (Port of Kalama 2015a). These uses typically do not generate significant pollutants during operations. In addition, the business park project would be over 4,000 feet away and pollutants would be expected to disperse over that distance.

Therefore, the proposed project, in combination with other reasonably foreseeable future projects in the vicinity, would not be expected to result in significant adverse impacts to air quality.

Vessel Transportation/Air Impacts

The proposed project, in combination with the other reasonably foreseeable future projects that would add vessel traffic to the Columbia River, could result in cumulative increases in air emissions from vessels. These emissions would be from mobile sources and dispersed over large areas and, therefore, unlikely to result in significant cumulative air quality impacts.

Air pollution from large vessels is controlled by the International Maritime Organization (IMO) through Annex VI of the International Convention for the Prevention of Marine Pollution from Ships (MARPOL). Annex VI of the MARPOL Convention sets limits on sulfur oxide (SOx) and nitrogen oxide (NOx) emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances, and more stringent standards for SOx, NOx, and particulate matter apply in designated emission control areas (ECAs). The waters off the North American coasts are designated as an ECA. Large vessels that enter the Columbia River to serve the proposed

project or other reasonably foreseeable future projects would be required to meet the more stringent standards that apply to ECAs. Specifically, vessels will be required to use engines that meet the most advanced technology-forcing standards for NOx emissions beginning in 2016 (i.e., Tier 3 for new engines), fuel with a sulfur content not exceeding 10,000 parts per million in the first phase of the program (July 2010), and 1,000 parts per million in the second phase of the program (January 2015).

With these requirements, it is expected that emissions of NOx, SOx, and particulate matter will be reduced over time. The U.S. Environmental Protection Agency (EPA) estimates that emissions of NOx, fine particulate matter (PM2.5), SOx would be reduced by 23 percent, 74 percent, and 86 percent, respectively, below levels in 2020 without the ECA requirements (EPA 2010). Therefore, the cumulative increase in emissions due to the increase in vessel traffic would be partially offset by the reduction in emissions from individual vessels due to the IMO standards.

Greenhouse Gas Emissions

The climate of the earth is primarily influenced by the combination of incoming energy from the sun and reflected energy from the earth's surface. GHGs can trap outbound radiation in the earth's atmosphere. This phenomenon occurs through natural means, such as aerobic respiration or organic decomposition. GHGs are also released through human activities, such as changes to land use, deforestation, fossil fuels combustion, industrial processes, and agricultural production activities. Unlike other emissions, the potential impact of GHG emissions is not limited to any particular geographic proximity, but rather is evaluated and addressed on a global scale. This fact, coupled with the breadth of human activity that can result in GHG emissions and ongoing efforts to reduce GHG emissions from existing sources, makes identifying a specific list of reasonably foreseeable projects that might add to (or reduce) GHG emissions not feasible. Additionally, while many potential projects with potential for additional GHG emissions are announced, or in some cases are under permit review, it remains to be seen whether each project will actually be constructed and operated. Particularly in the fossil fuel energy industries, many proposed projects subsequently are abandoned or denied, such as the proposed propane terminal at the Port of Portland. For all of these reasons, GHG cumulative impacts are considered on a qualitative rather than a quantitative basis, relying primarily on Washington State projections and goals for GHG targets and reductions.

Total GHGs emitted in Washington State were estimated at 91.7 million tonnes of CO2e (Mt CO2e) in 2011, the most recent year for which the Washington Department of Ecology (Ecology) has published data. According to Ecology, GHG emissions fluctuate yearly (primarily due to the electricity sector emissions) but are on a downward trend overall (Ecology 2011). Washington State has adopted the following GHG emission reduction goals (RCW 70.235.020):

- By 2020, reduce overall emissions of GHGs in the state to 1990 levels;
- By 2035, reduce overall emissions of GHGs in the state to 25 percent below 1990 levels;
- By 2050, reducing overall emissions to 50 percent below 1990 levels, or 70 percent below the state's expected emissions that year.

The World Resources Institute maintains an online database, known as CAIT, of overall estimated global GHG emissions. The database is developed using a consistent method to estimate emissions for the GHGs. Calculations in the CAIT process draw on data from the

Carbon Dioxide Information Analysis Center, CIA World Factbook, Food and Agriculture Organization of the United Nations, International Energy Agency, World Bank, UNFCCC Secretariat, U.S. Census Bureau, U.S. Department of Commerce, U.S. Energy Information Administration and the EPA. In 2011, global emissions were estimated by CAIT to be 45,379.27 Mt CO2e.

Existing development, the proposed project, and other proposed projects in Washington State could all generate GHGs that could lead to an increase in overall emissions and contribute to cumulative impacts to air quality and climate change through the continuing introduction of GHGs. A few examples of proposed projects in Washington State that may result in significant emissions of GHGs per Ecology's SEPA policy (25,000 metric tonnes per year) include the planned Tacoma Manufacturing and Marine Export Facility,[1] Tacoma LNG, Shell Puget Sound Refinery Rail Improvements, Gateway Pacific Terminal in Whatcom County, Vancouver Energy Terminal, Vancouver Transportation Logistics Project, three crude by rail facilities in Grays Harbor and Millennium Bulk Terminals in Longview. However, because each of these projects may or may not be developed, and because other GHG emissions may be eliminated or reduced through changes in technology, it is speculative for this document to quantify cumulative GHG emissions within the state. One specific example of pending GHG emission reductions is the TransAlta Centralia coal-fired power plant scheduled for closure beginning in 2020. For these reasons, this cumulative impacts discussion relies primarily on state projections and targets to identify expected future conditions and cumulative effects.

The approximately 976,445 tonnes per year of GHGs identified in Chapter 4 from the Ultra-Low Emissions Technology Alternative operation would represent an approximately 1.1 percent increase from the 2011 statewide GHGs total of 91.7 Mt CO2e and a 0.0022 percent increase from the 2011 global GHGs of 45,379.27 Mt CO2e. The approximately 1,423,397 tonnes per year of GHGs from the CR Technology Alternative operations would represent an approximately 1.6 percent increase from the 2011 statewide GHGs total of 91.7 Mt CO2e and a 0.0031 percent increase from the 2011 global GHGs of 45,379.27 Mt CO2e. This does not indicate that there would be a specific increase to state or worldwide GHG emissions if the project is built, because other sources of GHG emissions may be reduced over time consistent with Washington State goals and programs. As noted above, the state has established GHG emission reduction goals and has also implemented executive orders regarding GHG emission reductions and is in the rulemaking process to develop a regulatory cap on carbon emissions. It also does not indicate that if the project is not built that GHG emissions will stay the same or be reduced as other projects may be built and increase state or global GHG emissions. This analysis also does not take into account NWIW's stated objective of reducing global GHG emissions by supplanting coal to methanol manufacturing in China, which produces substantially greater levels of GHG than the process used by the project.

In conclusion, the project, together with other future projects in the state of Washington, have the potential to increase GHG emissions in the state. Additionally, changes in technology and closure of some existing sources of GHG emissions (such as the TransAlta coal-fired power plant in Centralia), have the potential to reduce GHG emissions. The State of Washington is a policy leader in addressing GHG emissions, has adopted strong goals for reduction of GHG emissions in the state. With successful implementation of these policy efforts at the statewide level, cumulative GHG impacts are expected to be within the range acceptable in light of these state targets.

[1] This project is the methanol manufacturing facility proposed by NWIW at the Port of Tacoma, Washington.

15.5.3 Water Resources

Project Site Vicinity

Potential cumulative impacts to surface water include increased turbidity and sediment and pollutants entering waterways from stormwater runoff during construction activities. The proposed project would prepare and adhere to a detailed construction stormwater pollution prevention plan (SWPPP) during construction, and the plan would include best management practices (BMPs) designed to reduce erosion and sediment delivery to surface waters. Other reasonably foreseeable development projects that disturb at least 1 acre of land would also be required to prepare an SWPPP to manage stormwater discharges during construction. Pollutant discharges could also occur during construction from spills and leaks of petroleum products and lubricants, but the proposed project and other reasonably foreseeable projects would implement spill prevention, control, and countermeasure plans appropriate to the substances being handled and in accordance with applicable regulations. Furthermore, any accidental releases would likely be small and localized and would not have the potential for cumulative impacts.

The Steelscape, Kelso-Martin's Bluff, and Spencer Creek Business Parks are all located in close proximity to the project site. If these projects were constructed at the same time, there is a potential for a cumulative impact, but the impact would only be during construction and temporary for the duration of the construction activity.

Operational activities would similarly use capture and treatment systems from activities that can release contaminants to stormwater (i.e., industrial and vehicle parking lots) in accordance with applicable federal, state, and local surface water quality regulations. Wastewater discharges (sanitary and otherwise) would be permitted within the capacity of existing public sewer system capacities or would require individual treatment and disposal systems that would be reviewed and approved under applicable regulations. The proposed project will infiltrate stormwater generated on site. Therefore, there would be no cumulative impacts due to stormwater discharge to surface water. The reasonably foreseeable projects would be required to comply with state and local standards that are protective of surface and groundwater quality. Under these development conditions, wastewater or stormwater discharges would not cause a cumulative impact.

The proposed project would involve dredging activities, as would the two reasonably foreseeable dredging projects near the project site. If these activities occur at the same time and in the direct vicinity of the project site, there could be localized and temporary increases in turbidity near the project site caused by dredging and in-water disposal of dredged materials. While it is reasonable to assume that dredging of the adjacent North Port berth could occur at the same time, it is unlikely as the Port has only needed to perform maintenance dredging at this berth infrequently (BergerABAM 2013). Maintenance dredging of the Columbia River navigation channel by the USACE occurs only on shoals (shallow sand formations) that have formed in a reach (straight stretch of a river), not the entire reach, and although many reaches of the navigation channel are annually dredged, other reaches may require dredging on a less frequent basis depending upon the hydrographic surveys and flow conditions (USACE 2014). Based on current channel conditions, significant maintenance dredging in the reach adjacent to the project site is not anticipated (USACE 2015). If the dredging for the proposed project were to take place at the same time as the other reasonably foreseeable dredging projects, all dredging activities would implement BMPs (e.g., work timing, equipment operating procedures, and water quality monitoring, among others). The BMPs would reduce sediment loss and turbidity generation and minimize the potential for adverse cumulative impacts. Under

these development conditions, dredging activity would not cause a cumulative impact on water resources.

Groundwater use by the proposed project and other reasonably foreseeable projects (for construction and operations supply) would only be from permitted sources with sufficient capacity to provide water. Impacts on groundwater would only occur on other projects in close proximity to the proposed project site. None of the reasonably foreseeable projects in close proximity would likely use significant amounts of water during construction or operation. The proposed project, the Steelscape warehouse project, and the Spencer Creek Business Park project are all expected to receive water service from the City of Kalama water supply. As discussed in Chapter 13, City of Kalama representatives indicate that the system has sufficient supply and reservoir capacity to serve the water service area for six years and sufficient water rights for a 20-year period; cumulative impacts would, therefore, not occur.

The proposed project would result in the construction of the proposed recreation access improvements within a regulatory wetland buffer, and would provide mitigation to offset this impact. If the other reasonably foreseeable development projects result in impacts to wetlands, they would be required to mitigate for those impacts in accordance with local ordinances and critical areas reviews. Therefore, there would not be cumulative impacts to wetlands.

The proposed project would result in new construction within the floodplain, including the access road to the recreation area, infiltration pond, wastewater treatment facility, and new marine terminal. These marine terminal structures are not expected to affect the elevation of the water surface measurably as the floodplain at this location is large (more than a mile wide); in addition, the volume of fill (inclusive of structures) would be negligible in comparison to the size of the Columbia River floodplain basin (West Consultants 2015). If the other reasonably foreseeable development projects require filling in floodplains, they would be required to conduct analyses, including determining cut/fill volumes, as well as no-net rise studies, and to offset any loss of floodplain capacity in accordance with local ordinances and critical area reviews. Therefore, it is not anticipated that any of the proposed activities would further degrade or create limitations upon the floodplains along the Columbia River. Therefore, there would not be cumulative impacts to floodplains.

Vessel Transportation/Erosion Impacts

Increases in vessel traffic with the proposed project and other reasonably foreseeable development projects could increase erosion caused by vessel wakes, which could increase turbidity and result in localized water quality effects, particularly in areas where the shoreline is not strengthened with riprap or other armoring. The vessel traffic associated with the proposed project and reasonably foreseeable development projects could result in cumulative impacts to wetland communities from increased bank erosion generated by vessel wakes. However, the Columbia River is subject to existing vessel wakes from current marine traffic, as well as waves generated by wind and tidal forces. It is impossible to estimate ship wake erosion separately from erosion caused by other forces and there would not likely be a measureable increase in erosion caused by additional ship traffic (USACE 1999). Recent work has indicated that erosion from ship wakes can occur resulting in environmental impacts but is limited in area because of existing bank conditions (EFSEC 2015). The cumulative vessel traffic along the Columbia River associated with the proposed project and future development projects would likely result in an increase in erosion. The extent of erosion is not readily determined and the project vessels or those from proposed projects are not anticipated to create wakes differently than current deep draft vessels using the federal navigation channel. The extent of impacts is

not known and should be further studied and agencies responsible for overall management of the navigation channel are best positioned to address mitigation for this issue.

Increases in vessel traffic with the proposed project and other reasonably foreseeable development projects would not contribute to any loss or alteration of floodplains. The potential for additive cumulative effects with other past, present, and reasonably foreseeable projects is absent or negligible. Vessel transport has a very limited potential to impact groundwater supplies because groundwater generally flows toward a body of water. In tidal areas, there is some potential for surface water to impact groundwater quality, but this impact is generally limited to shoreline areas and is not widespread. Past, present, and future projects using the Columbia River navigation channel and the open ocean for the receipt and delivery of cargoes would have no foreseeable cumulative impact on groundwater quantity or quality.

Potential cumulative impacts to water resources due to spills, inadvertent releases, or other incidents on the project site or during vessel loading or transport are discussed in section 15.5.6, Environmental Health and Safety.

15.5.4 Plants and Animals

Project Site Vicinity

As discussed in Chapter 6, Plants and Animals, the proposed project would have the potential to affect plant and animal resources, but with the proposed mitigation measures would not result in significant adverse impacts to these resources. The other reasonably foreseeable development projects that are considered also have the potential to affect plant and animal resources.

As discussed in Chapter 6, past and present development and land uses have altered the native vegetation communities within the project vicinity. These activities include upland placement of dredge material, existing Port industrial development, and road and rail construction, and are accounted for in the assessment of plants and animals in Chapter 6 as baseline conditions. Other projects could potentially result in further impacts to native vegetation communities or vegetation resources. The Spencer Creek Business Park, WSDOT Kelso-Martin's Bluff rail improvements, and Steelscape warehouse projects could all affect vegetation resources near the project site. However, vegetation resources are of limited quality at all of these project sites, primarily consisting of ruderal upland grass/forbs and/or agricultural lands in close proximity to existing industrial or transportation land uses. As discussed in Chapter 6, the project site provides only a very small amount of low-quality vegetation, and impacts to vegetation resources associated with the proposed project would be minimal.

Wildlife and fisheries habitat within the project vicinity has been similarly altered from its historic conditions as a result of past and present development and land use activities. As described above, the project site and much of the vicinity have been used as a site for dredge material placement, which limits their suitability as habitat for most species of terrestrial wildlife. However, portions of the proposed site may provide potentially suitable habitat for Endangered Species Act (ESA)-listed streaked horned lark and Columbian white-tailed deer. As discussed in Chapter 6, Plants and Animals, both have been previously documented on and in the vicinity of the project site (ENVIRON 2015; U.S. Fish and Wildlife Service [USFWS] 2013b). The streaked horned lark has been previously documented on portions of the project site with approximately 3 acres of potentially suitable nesting habitat for streaked horned lark, which is located in the northern section of the proposed site, on an area of dredge material that was placed as part of the USACE Columbia River Navigation Channel project. The remainder

of the project site does not provide suitable nesting habitat for streaked horned lark. The USACE conducted an ESA Section 7 consultation for their project. According to their biological assessment analysis, approximately 3 acres of the project site is expected to remain as suitable habitat for larks only through the end of the 2015 nesting season; after which time, it is expected to be "unsuitable" for lark nesting habitat due to vegetation succession (USACE 2014; USFWS 2014). This was confirmed by the USFWS in their biological opinion (USFWS 2014). Further, the USACE and USFWS stated that larks that might otherwise attempt to nest at the site would be expected to find suitable habitat on islands in the vicinity (USACE 2014; USFWS 2014).

With the exception of the USACE maintenance dredging project, none of the reasonably foreseeable projects in close proximity to the project will impact critical habitat for streaked horned lark. The maintenance dredging project may include disposal of dredged material on lark critical habitat reducing currently available lark habitat. It is not anticipated that the proposed project nor any of the other foreseeable future projects would further degrade lark habitat because the habitat on the proposed project site will become unsuitable after the 2015 nesting season, and the other project sites do not provide suitable habitat. Therefore, there would not be cumulative impacts to critical habitat for streaked horned lark.

While Columbian white-tailed deer have been previously documented at the project site and within the vicinity, the project site and areas in the immediate vicinity provide little suitable habitat for the deer because of the amount of human activity in the area, both recreational and port-related, as well as the poor forage quality of the vegetation and low amount of cover. Because the project site contains little cover, browse, or other forage habitat, it is likely that any deer present at the site would be those passing through to habitat north of the project site. As a result, it is not anticipated that the proposed project or any of the other foreseeable future projects would degrade Columbian white-tailed deer habitat because the habitat on the proposed project site and that on the foreseeable project sites is not suitable habitat. Therefore, there would not be cumulative impacts to critical habitat for Columbian white-tailed deer. See Chapter 6, section 6.5.2.1, for additional information on these species.

In addition to impacts to terrestrial vegetation communities, the aquatic environment has also been affected by activities, such as dredging and deepening the Columbia River federal navigation channel, streambank armoring, and waterfront and floodplain development. The proposed project would result in impacts to the aquatic environment, as well as to portions of the riparian and wetland buffers at the project site. Reasonably foreseeable future development activities in the project vicinity also have the potential to result in impacts to wildlife and/or fish habitats. Impacts, such as vegetation removal and conversion of pervious to impervious surfaces, would eliminate areas of potentially suitable habitat and could further fragment terrestrial habitats.

Other projects may also have in-water disturbance and water quality impacts that may affect habitat. For instance, construction activities (e.g., pile installation and fill placement) have the potential to directly remove fish habitat by replacing aquatic or benthic habitat with built environment, and new in-water structures can impair habitat suitability by creating shaded areas where predator species can thrive. Proposals that include these activities would be required to mitigate for habitat loss in accordance with local critical areas ordinances and to implement controls and treatment systems to protect surface and groundwater quality. Any newly proposed development would also be held to current environmental standards for impact avoidance and minimization and the provision of compensatory mitigation. Within the project vicinity, the proposed project and the Port's Small Vessel Dock and Marina Renovation projects would

result in new in-water structures. The new overwater structures are small in comparison to the project alternative, and would result in a minor increase in cumulative impacts. With respect to dredging, the proposed project's dredging activities would occur in deep water and are not expected to result in habitat impacts greater than those resulting from naturally occurring hydraulic action[2]. Therefore, the proposed project's dredging activities would not result in cumulative impacts in combination with the other reasonably foreseeable dredging projects. Given that the impacts attributable to the proposed project would be minimal and would be mitigated, a cumulative impact to wildlife and fisheries resources would not result.

Vessel Transportation

The proposed project would add an incremental increase to existing vessel traffic on the Columbia River and, in combination with other reasonably foreseeable development projects on the Lower Columbia River, could result in cumulative impacts to vegetation, wildlife, and/or fisheries resources.

Vessel traffic associated with the proposed project, as well as with the reasonably foreseeable future projects on the Lower Columbia River identified in this analysis, could result in effects to vegetation resources that include increased bank erosion generated by vessel wakes and propeller wash. These impacts would have the potential to contribute incrementally to this impact. Impacts would likely be greater in areas where shoreline armoring is not present. The increase in vessel traffic could also add incrementally to the risk of inadvertent release of materials in aquatic environments resulting in impacts to riparian and aquatic vegetation.

Increased vessel traffic would have the potential to result in cumulative impacts to wildlife and fisheries resources, including increased potential for the introduction of invasive species, ship strikes, and wake stranding. For those reasonably foreseeable projects that propose to transport liquid bulk materials by vessel, there is also a potential for increased risk of navigation incidents that may have the potential to release material to surface waters. The extent of impacts associated with each project varies greatly and depends on factors that include the number of trips, vessel sizes, and type and volume of materials transported. Any of the projects, however, if constructed, could generate additional vessel trips that could contribute incrementally to cumulative impacts to wildlife and fisheries habitat and species.

To address potential cumulative effects of wake stranding, it is necessary to consider past, present, and reasonably foreseeable actions within the Lower Columbia River Basin. Ecology's Vessel Entries and Transits data indicate that the total number of cargo and tank vessels transiting through the Lower Columbia River has decreased by approximately 33 percent since 1993 (Ecology 2014a). Total vessel entry transits ranged from a high of 2,269 in 1999 to a low of 1,397 in 2009, with a 20-year average of 1,837 vessel entry transits. The proposed action would add between 36 and 72 entry transits (or between 72 and 144 total transits) per year. The reasonably foreseeable projects plus the proposed project could result in an estimated additional 1,910 vessel entry transits (3,820 total transits) per year, not including additional barge traffic.

Changes in the number of fish strandings would be driven by increases or decreases in the numbers of ship passages and the dimensions of the ships (Pearson 2011). Assuming at least some moderate growth occurs in the region (and that the Columbia River federal navigation channel is properly maintained), it is likely that there would be some increase in vessel dimensions and transits in the Lower Columbia River, relative to existing conditions. It is, therefore, likely that additional wake stranding would occur as additional and/or larger vessels

[2] Naturally occurring turbidity caused by currents moving sediment within the river system.

transit through the river as some or all of the projects are brought on line. Changes in stranding probabilities would be driven by changes in the mix of ship types and the associated ship characteristics, river conditions, and fish availability. It is likely that the proposed project, in conjunction with the other reasonably foreseeable development projects, could contribute incrementally to wake stranding on the Lower Columbia River. However, based on current understanding and available information, it is not possible to quantify potential impacts associated with wake stranding accurately. Additionally, because potential impacts due to wake stranding are not unique to project vessels, but are similar for all deep draft vessel traffic on the river, both existing and projected cumulative traffic, any plan or program to address these impacts should be addressed collectively under the direction of agencies responsible for maritime traffic on the river.

15.5.5 Energy and Natural Resources

Project Site Vicinity

The proposed project would contribute to increased energy and natural resources consumption at the same time as other reasonably foreseeable development projects in the area. Construction of the proposed project and the other development projects would use traditional building materials, such as steel, concrete, and sand and gravel. As discussed in Chapter 7, Energy, these resources are not expected to be in short supply.

The proposed project and other development projects would also consume energy in the form of electricity and natural gas. The proposed project would receive natural gas via the proposed Kalama Lateral Project (the proposed pipeline) that would provide dedicated natural gas transportation service to the project site, while most other users in Kalama receive natural gas from the Cascade Natural Gas system. As discussed in Chapter 7, Energy, natural gas production is increasing in the United States and Canada. Therefore, the proposed project would not have the potential to result in cumulative impacts on natural gas supply or delivery in combination with other development projects. With respect to electricity, the Cowlitz County Public Utility District No. 1 (Cowlitz PUD) has stated that it can support the proposed project's energy demand with improvements to its system. These improvements are anticipated as a related action to the proposed project. With these improvements, the Cowlitz PUD would be able to provide adequate service to the proposed project and other customers – including other reasonably foreseeable development projects – in the area. Therefore, the proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts to energy and natural resources.

Vessel Transportation

The vessel traffic associated with the proposed project and other reasonably foreseeable development projects would consume fuel for their operation. However, transportation fuel availability is not constricted, either locally or regionally. The cumulative transportation-related fuel consumption associated with these projects in combination with the proposed project is not expected to impact fuel availability for other uses. In addition, regulations designed to reduce emissions would likely result in increased efficiency over time as older vessels are replaced. The cumulative vessel traffic would not have the potential to result in significant adverse cumulative impacts to energy and natural resources.

15.5.6 Environmental Health and Safety

Project Site Vicinity

The other reasonably foreseeable projects in the vicinity of the project site would not result in environmental health and safety risks beyond those typical of construction and dredging activities and the operation of commercial, light industrial, and rail uses. Risks to workers and the public from the proposed project in combination with the reasonably foreseeable future actions are not expected to result in cumulative impacts related to environmental health and safety beyond those already discussed in Chapter 8, Environmental Health and Safety.

Vessel Transportation

The proposed project and reasonably foreseeable future projects would increase vessel traffic along the Columbia River. The increase in vessel traffic could result in cumulative impacts related to increased potential for general navigation incidents, such as collisions. However, large vessels would use a pilot service to enter, transit, and exit the Columbia River and would be under the control of trained and licensed mariners familiar with local navigational conditions. Vessel traffic on the Columbia River is monitored through the Lower Columbia Vessel Traffic Information System, which is used by pilots, vessel and tug operators, the USACE, and the U.S. Coast Guard to collectively monitor vessel traffic, manage anchorages, and maintain awareness of current conditions. These measures would reduce, but not eliminate, the potential for increased risk of vessel incidents.

A vessel incident could result in an inadvertent release of methanol, fuels, oil, or other hazardous material to the Columbia River. Although available data addresses only oil spills, it is assumed to represent the potential risk for vessels carrying other liquids. Historical information shows the following:

- Ecology identifies five spills with a volume of oil greater than 10,000 gallons on the Columbia River and near its mouth between 1971 and 1996.
- The largest spill on the Columbia River was the SS Mobil Oil tanker spill in 1984 (Ecology 1997 rev. 2007; Ecology 2015c). This spill resulted when the loaded 618-foot tanker lost steering because of an equipment malfunction and grounded on the riverbank approximately 1 mile upstream from St. Helens, Oregon; approximately 200,000 gallons of oil were spilled.
- From 1995 to 2008, tanker vessels spilled a total of 13,709 gallons (326 barrels) of oil in the waters of Washington in 14 incidents (ERC 2009).

The potential impacts to environmental health and safety in the event of an inadvertent release could vary widely depending on the size of the release, the type of material, local conditions, and other factors. Increased vessel traffic on Columbia River resulting from the project and proposed projects could increase the potential risk of incidents due to vessel collisions. However, serious incidents involving deep draft vessels on the Columbia River are rare with most incidents involving grounding of vessels on sandy shoals (USACE 1999). More recent studies have indicated that additional marine traffic will increase the overall risk of incidents and spills (Ecology 2015c) (EFSEC 2015). The increase in vessel traffic due to project and proposal projects will increase the likelihood of a vessel incident with a spill. Changes in vessel traffic management systems, pilotage requirements, and the addition of new anchorages and the decreasing age of the shipping fleet will all serve to reduce the potential for serious incidents. In the unlikely event of an incident, the Maritime Fire and Safety Association would provide

fire safety and oil spill response and communication coordination to fire and spill incidents involving commercial vessels in the Columbia River from the Portland/Vancouver area to Astoria.

15.5.7 Land Use and Shoreline Use, Housing, and Employment

Project Site Vicinity

The proposed project would not result in any significant adverse impacts to land use and shoreline use, as discussed in Chapter 9, Land Use and Shoreline Use, Housing, and Employment. Past and present projects have resulted in changes to land use in accordance with zoning ordinances and comprehensive plans in place at the time of their approval, and it is expected that future projects would continue to affect growth and development at the Port of Kalama and in other surrounding areas. The proposed project would be compatible with surrounding land and shoreline uses and consistent with zoning and applicable land use plans and public policies, as would the other reasonably foreseeable development projects in the vicinity of the proposed project. The dredging projects would maintain the Columbia River for vessel navigation and berthing. The Steelscape warehouse and Kelso-Martin's Bluff rail improvement projects would be continuations of existing uses and would not affect land and shoreline use adversely. The Spencer Creek Business Park has been subject to an established environmental review process that was required to consider land use impacts and has been determined to be consistent with local land use plans, zoning, and development regulations. Furthermore, the Spencer Creek Business Park would be developed pursuant to a master plan approved by the City of Kalama Planning Commission. Therefore, the proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts to land and shoreline use.

As discussed in Chapter 9, the proposed project would result in only a negligible increase to the overall population of the study area (i.e., a 12-county region around the project site) even if all employees were new to the area. The proposed project's contribution to the population of the study area would be even smaller when growth associated with the other reasonably foreseeable development projects is taken into account. Furthermore, with a 7 percent vacancy rate in the study area, it is anticipated that any increase in households could be absorbed into the current housing market. Therefore, the proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts to population and housing.

Vessel Transportation

The vessel traffic associated with the proposed project and other reasonably foreseeable development projects would occur on the Columbia River. Surrounding land uses have developed alongside this vessel corridor and with the existing levels of vessel traffic. Additional vessel traffic along the Columbia River is not anticipated to result in significant adverse cumulative indirect impacts to land and shoreline use, nor would it have the potential to impact population and housing conditions.

15.5.8 Aesthetics and Visual Resources

Project Site Vicinity

Reasonably foreseeable projects in the vicinity of the proposed project would result in additional changes to the visual resources. As indicated in Chapter 10, Aesthetics and Visual Resources, the degree of viewer sensitivity to visual change depends on a number of factors, including viewer type, exposure and orientation, duration, and viewer awareness. Impacts from

these projects occurring during construction could contribute to short-term, adverse effects on visual resources in the viewshed if construction periods were to overlap and sensitive viewers are present in locations where multiple construction sites are visible.

In general, viewers would be unlikely to notice an overall increase in industrial activity during operations because of the limited scale of the dredging projects and the Steelscape warehouse and Kelso-Martin's Bluff rail improvement projects. However, in combination with the proposed project, portions of the Spencer Creek Business Park may be visible to some residential viewers. For viewers with low sensitivity, such as workers at industrial sites near the project site or travelers on southbound I-5, the visual change in the viewshed would not represent an adverse, cumulative impact because their attention is typically focused on work or driving. Viewers with moderate or high sensitivity, such as recreational and residential viewers, may notice an overall increase in development in the viewshed and subjectively relate this to a cumulative impact. However, views combining both the proposed project and Spencer Creek Business Park are expected to be available to a limited number of viewers. Views combining both the proposed project and the Port's Small Vessel Dock and Marina Renovation projects would not be expected because of the distances between the projects. Additionally, these projects would not alter views of the Columbia River and Columbia River valley, which are defining features of the affected viewshed. Therefore, the proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts to visual resources.

Vessel Transportation

The reasonably foreseeable projects would result in increased vessel traffic on the Lower Columbia River. The proposed project would contribute, in an incremental manner, to this increased vessel traffic. However, viewers already experience ship traffic along the Columbia River and additional vessel traffic would not substantially alter existing views. Therefore, it is not expected that increased vessel traffic would result in cumulative visual impacts.

15.5.9 Historic and Cultural Resources

Project Site Vicinity

As discussed in Chapter 11, Historic and Cultural Resources, the area of potential effect (APE) for the purpose of considering potential impacts to cultural resources resulting from the proposed project was defined as the project site and the wooden pile structures in the Columbia River and sloughs north of the project site. There are no cultural resources listed on or eligible for listing on the National Register of Historic Places or Washington Heritage Register within the proposed project's APE. Because there are no listed or eligible cultural resources within the proposed project's APE, in combination with the other reasonably foreseeable development projects on other sites, the project would not have the potential to result in significant adverse cumulative impacts to cultural resources.

Vessel Transportation

As noted above, there are no listed or eligible cultural resources within the proposed project's APE. The vessel traffic associated with the proposed project and other reasonably foreseeable development project would occur within an established navigation channel and would not have the potential to impact historic and cultural resources directly. Increased erosion resulting from increased ship wakes from the project and proposed projects could impact cultural resource sites if the sites are located in close proximity to the navigation channel and in areas that are

susceptible to erosion. Because of the existing channel configuration and bank conditions, these areas are limited and located in the lower river.

15.5.10 Transportation

Project Site Vicinity

Reasonably foreseeable development projects in the vicinity of the proposed project would result in trip generation that would affect area roadways. Reasonably foreseeable projects distant from the project site and served by different roadway systems would not have the potential to result in cumulative impacts to vehicular transportation with the proposed project.

During construction, short-term impacts would potentially occur from construction traffic if other nearby proposals, such as the Steelscape warehouse project, and the proposed project are constructed at the same time. This could result in additional congestion at nearby intersections, such as Kalama River Road and Tradewinds Road.

As discussed in Chapter 12, Transportation, the transportation analysis considered existing baseline traffic information and future growth in analyzing the impacts of the proposed project. Specifically the analysis included the trip generation from the planned Spencer Creek Business Park and an additional 2.5 percent annual growth rate to the 2019 analysis year. Therefore, the transportation analysis already accounts for the potential cumulative impacts of the proposed project with the Spencer Creek Business Park, and any additional trips that might be generated by the Steelscape warehouse would be accounted for by the background annual growth rate. The dredging projects and Kelso-Martin's Bluff rail improvement project would not generate vehicular traffic during operation. The Port's Small Vessel Dock and Marina Renovation projects would not generate significant vehicle trips during operations and would not likely direct trips to the intersections impacted by the proposed project. The transportation analysis for the proposed project concluded that the proposed project, including the trips associated with the Spencer Creek Business Park and the background growth rate, would not result in significant adverse cumulative impacts to transportation facilities.

Vessel Transportation

The vessel traffic associated with the proposed project and other reasonably foreseeable development projects would not affect surface transportation networks. Water bodies that would experience additional vessel transits from the other future development projects and the proposed project are not crossed by surface transportation structures that may be interrupted by vessel traffic. The only such crossings are over the Columbia River (I-5 drawbridges and the rail bridge at Vancouver) upstream from the proposed project.

If all of the future projects are developed as anticipated, there could be up to an additional 1,838 vessel entry transits (3,676 total vessel transits) on the Columbia River, not including additional barge traffic. The proposed project would contribute up to an additional 72 vessel entry transits (144 total vessel transits) per year, for a total of 1,910 vessel entry transits (3,820 total vessel transits). This would represent a 121 percent increase over the 2014 vessel entry transits baseline of 1,581 (cargo and passenger vessels, tank ships, and articulated tug barges), and an 84 percent increase over the recent peak of 2,269 vessel entry transits in 1999.

This increase in vessel traffic could result in increased demand for vessel pilots and tug assist services. However, the reasonably foreseeable future projects would likely be built out over time and vessel trips would not likely reach peak levels upon opening, and it is expected that

vessel pilots and new tugs would be added as necessary to meet growing demand and maintain adequate service levels.

15.5.11 Public Services and Utilities

Project Site Vicinity

Along with the proposed project, the other reasonably foreseeable projects would contribute toward the demand for public services and utilities, such as water supply and wastewater treatment, police services, and fire protection and emergency medical services in the vicinity of the project site. However, the Steelscape warehouse project is an expansion of an existing use and would not result in new demands on public service and utility providers. The dredging projects and WSDOT Kelso-Martin's Bluff rail improvement project are infrastructure improvements and would not require the provision of public services. The environmental assessment for the WSDOT Kelso-Martin's Bluff rail improvement project concludes that the project could result in short-term temporary disruptions to utility service during construction, but otherwise would not result in short- or long-term effects to public services and utilities. The Spencer Creek Business Park project would result in new development, but because it would house typical light industrial, office, commercial, and retail uses, it is not expected to generate unique or substantial demands on public service providers. Therefore, the cumulative demand from the proposed project and other reasonably foreseeable development projects is not expected to exceed the capacity of the service providers. The proposed project, in combination with the other reasonably foreseeable development projects, would not result in significant adverse cumulative impacts to public services and utilities.

Reasonably foreseeable projects would likely generate additional economic benefits from construction spending, taxes, and fees. Some of the foreseeable future actions would involve employment for construction only, such as the Kelso-Martin's Bluff rail improvement project, while other existing and future actions would involve employment for both construction and operations, such as the Spencer Creek Business Park project. Also, substantial indirect and induced employment would occur from the proposed project in combination with past, present, and reasonably foreseeable future actions, leading to increased beneficial cumulative impacts for socioeconomics.

It is expected that all employment for the project would come from within a 90-minute driving radius of the proposed project and includes a total labor market of 1.4 million workers and would result in no significant impacts for housing and population. Construction and long-term housing needs for reasonably foreseeable projects would not be substantial based on anticipated construction time and locations.

Vessel Transportation

Vessel transportation does not typically require the provision of public services. However, vessels require the provision of licensed river and bar pilots. A substantial increase in vessel transport could exceed the available bar and river pilots and require additional pilots to serve the anticipated vessel traffic. The pilots indicate that the number of available pilots and current vessel management systems are sufficient to handle the anticipated growth (Worley Parsons 2014). Therefore, the vessel traffic associated with the proposed project and other reasonably foreseeable development projects would not result in cumulative impacts to public services and utilities.

Increased vessel traffic from the project and reasonably foreseeable projects with additional ship traffic is not likely to result in cumulative impacts to economic resources. It is likely that

some additional benefit would be generated from fees associated with pilotage, tug assists, ship provisioning, and other activities.

15.5.12 Noise

Project Site Vicinity

Cumulative noise impacts can occur in situations where multiple projects affect the same receivers. In order for this to happen, the projects must be relatively close to each other and to the sensitive receivers. Thus, only those projects in the vicinity of the proposed project could result in a cumulative contribution to the noise landscape. However, the Port of Kalama Spencer Creek Business Park and the Steelscape warehouse projects would not generate substantial noise during operation and would not be major contributors to noise levels in the context of existing roadways, highways, and industrial uses near the project site. If construction of all these projects were to occur simultaneously, there could be some increase in sound levels. As discussed in Chapter 14, section 14.2.1, on the logarithmic noise scale, a doubling of sound-generating activities causes a 3-dB increase in the average sounds produced by the sources, and not a doubling of the loudness of the sound (which requires a 10-dB increase). Should construction activities take place at the same time, the noise would not increase linearly, and such an increase might not be discernible in a typical outdoor environment.

The maintenance dredging by the Port of Kalama and USACE would be intermittent and would not contribute to daily noise levels. The environmental assessment for the WSDOT Kelso-Martin's Bluff rail improvement project states that the project has the potential to result in noise impacts within approximately 500 feet of the rail line; beyond this distance, there is very limited potential for noise impacts as noise levels decrease as the distance from the noise source increases (WSDOT 2014). None of the receptors analyzed for the proposed project are within 500 feet of the WSDOT Kelso-Martin's Bluff rail improvement project. Therefore, the reasonably foreseeable development projects in the vicinity of the proposed project would not have the potential to result in significant adverse cumulative noise impacts.

Vessel Transportation

Vessel traffic is generally not a major contributor to existing noise levels when other noise sources are accounted for, such as railroads on either side of the river, interstate and state highways, or industrial sources, among others. Sensitive receivers near the river are not expected to be affected by the cumulative increase in vessel traffic. The cumulative vessel traffic would not have the potential to result in significant adverse cumulative noise impacts.

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