7. MARINE AND NEARSHORE RESOURCES

This chapter discusses the regulatory setting, study area, affected environment and potential direct and indirect impacts on marine and nearshore resources present or in close proximity to the proposed project. For this chapter, marine and nearshore resources are defined as resources that occur in predominately saltwater systems that are not significantly diluted by freshwater runoff. Existing marine and nearshore resources that could potentially be impacted by the construction and operation of the proposed project include marine vegetation, wildlife and their habitats.

This chapter presents an evaluation of potential impacts related to construction and operation and maintenance of the proposed project on marine and nearshore resources. This chapter also evaluates potential impacts to marine and nearshore resources from spills and associated spill response activities. Potential impacts to freshwater resources are addressed in Chapter 5, Freshwater Resources, and potential impacts to terrestrial vegetation and wildlife are addressed in Chapter 6, Terrestrial Vegetation and Wildlife.

7.1. Laws, Regulations, and Guidance for Marine and Nearshore Resources

Table 7-1 provides a summary of the laws, regulations and guidance applicable to marine and nearshore resources. The state of Washington has primary jurisdiction over the management of coastal and ocean natural resources within three miles of its coastline (RCW 43.143). From three miles seaward to the boundary of the two hundred mile exclusive economic zone, the federal government has primary jurisdiction (RCW 43.143, 33 CFR 2.30).

Table 7-1: Laws, Regulations, and Guidance for Marine and Nearshore Resources

Regulation, Policy, or Guideline	Description
Federal	
Endangered Species Act (ESA) (16 USC 1531 et seq.)	The ESA regulates the protection and management of federally-listed threatened or endangered species and designated critical habitat for these species covered under ESA provisions 16 USC 1531 et seq.; 50 CFR Parts 17 and 222. Section 9 of the ESA prohibits the “take” of any fish or wildlife species listed as threatened or endangered under the ESA unless authorized. Take, as defined by the ESA, means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Harm includes “…significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.” Harass includes “…an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly impair normal behavioral patterns including breeding, feeding, or sheltering.” The USFWS and NMFS are jointly responsible for implementing the ESA and for designating critical habitat for ESA-designated species. The USFWS is responsible for terrestrial and freshwater species; NMFS is responsible for marine species.

Regulation, Policy, or Guideline	**Description**
Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), as amended by the Sustainable Fisheries Act of 1996 (Public Law 94-265)	The Magnuson-Stevens Act (MSA) is the primary law governing management of marine fisheries in U.S. waters. The MSA provides marine fisheries management through the implementation of fishery management plans (FMPs). The act mandates that FMPs specify the essential fish habitat (EFH) for the fishery, and that adverse impacts on the EFH be minimized. An assessment of the potential impacts on EFH is required for species managed under a federal FMP. Pertinent to the area of the proposed project, FMPs have been developed for three fish assemblages that use the Puget Sound estuary: Pacific salmon, groundfish, and coastal pelagic species. The EFH regulations of the MSA (50 CFR 600) recommend that regional fishery management councils evaluate specific areas of EFH referred to as habitat areas of particular concern (HAPC) when they develop FMPs. Restoration is the ultimate goal of identifying HAPCs, and no regulatory processes are added by designating a HAPC for a given species. However, since they highlight areas of high ecological importance, federal projects with the potential to adversely impact a HAPC would be more carefully scrutinized during the EFH consultation process.
Marine Mammal Protection Act (MMPA), of 1972, as amended in 1994	The MMPA protects marine mammals within U.S. waters. This includes, with exceptions, the prohibition of hunting, killing, capture, as well as "harassment of any marine mammal; or, the attempt at such." Harassment is defined by the MMPA as "any act of pursuit, torment, or annoyance which has the potential to (a) injure a marine mammal in the wild; or (b) disturb a marine mammal by causing disruption of behavioral patterns, which includes, but is not limited to, migration, breathing, nursing, breeding, feeding, or sheltering." Jurisdiction is shared by the USFWS and NMFS for enforcing the MMPA. NOAA released updated Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals in July 2016. The guidance defines acoustic thresholds for the onset of permanent and temporary threshold shifts (PTS and TTS, respectively).
Rivers and Harbors Appropriations Act (RHA) of 1899 (33 USC §403).	Section 10 of the RHA gives authority to the USACE to approve construction of structures in or affecting navigable waters of the U.S. This includes construction or installation of a pier, wharf, or bulkhead; dredging and excavation; or installation of structures over or in a navigable water. The proposed project would trigger regulation under this law for placing facilities on the refinery's wharf system (DSU and natural gas line), operation of the spud barge adjacent to the wharf and causeway, and associated work over Fidalgo and Padilla bays, which are both navigable waters of the U.S.
Clean Water Act (CWA) of 1972 (33 USC 1251 et seq.)	The CWA establishes the basic structure for regulating pollutant discharges into U.S. waters. Section 402 of the CWA authorizes discharges of pollutants, such as storm water from point sources into waters of the U.S. through the NPDES permitting program. The USEPA and states with delegated authority administer the NPDES permitting program. Washington Department of Ecology, Water Quality Program, is delegated by the USEPA as the state water pollution control agency. Refer to the description of state regulations: Water Pollution Control Act (RCW 90.48).
33 CFR Part 151: Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal Or Commercial Waste, and Ballast Water	Enforces regulations on the management of multiple non-cargo waste streams and ballast water from vessels (MARPOL 73/78 Annexes I, II and V).
State	
Ocean Resources Management Act (ORMA) (RCW 43.143)	The ORMA establishes that the state of Washington maintain primary jurisdiction for coastal and marine natural resources within 3 miles of its coastline.

Regulation, Policy, or Guideline	Description
RCW 79: Public Lands	RCW 79 identifies the Washington DNR as the manager of aquatic lands, including state-owned tidelands, shorelands, harbor areas and beds of navigable waters. RCW 79.105 requires that aquatic lands be managed to provide a balance of the public benefits for all citizens of the state, including by encouraging direct public use and access, fostering water-dependent uses, ensuring environmental protection and utilizing renewable resources. The Washington DNR manages a number of aquatic reserves within the marine vessel transportation route (see Section 7.3.2).
Water Pollution Control Act (WAC 173), RCW 90.48: Water Pollution Control	The Washington Department of Ecology (Ecology) is the agency charged with enforcing the Water Pollution Control Act, and is also the state water pollution control agency for all purposes of the federal CWA (including administration of NPDES permits). Title 173 WAC contains several important chapters for implementing water pollution control for marine environments under RCW 90.48: Water quality standards are established for surface waters, including freshwaters and marine waters, in chapter 173-201A (see Table 7-2 of this chapter); sediment management standards are established in chapter 173-204 WAC; and procedures for issuing general NPDES permits are stated in chapter 173-226 WAC. The refinery maintains a current NPDES permit (No. WA0000761) from Ecology and would obtain a general construction NPDES permit to regulate stormwater discharges associated with construction activities.
Endangered, threatened, and sensitive wildlife species classification (WAC 232-12-297)	The WDFW permanent regulation on endangered, threatened, and sensitive wildlife species (WAC 232-12-297) identifies and classifies native wildlife species that require protection and/or management to ensure they remain as free-ranging populations in the state of Washington. This regulation defines the process for listing, management, recovery, and delisting of identified species.
Washington State Hydraulic Code (WAC 220-660; RCW 77.55)	The Washington State Hydraulic Code (RCW 77.55) charges the WDFW to review, condition, and approve or deny "any construction activity that will use, divert, obstruct, or change the bed or flow of State waters." A Hydraulic Project Approval was submitted to the WDFW as part of the Joint Aquatic Resource Permit Application (JARPA) for the project. In addition, the JARPA included an Aquatic Use Authorization application to the WDNR and a 401 permit application to Ecology. The WDNR requires an Aquatic Use Authorization application for projects located waterward from the ordinary high water mark (OHWM) to determine jurisdiction and requirements in state-owned aquatic lands. The WDFW defines times of the year when in-water works may occur, based on the avoidance of sensitive life stages for fish species (such as spawning, incubation, juvenile migration, rearing, and feeding) within each Tidal Reference Area (WAC 220-660-310). The code identifies saltwater habitats of special concern, and notes that the presence of saltwater habitats of species concern may restrict project type, design, location, and timing.
Washington State Coastal Zone Management Program (CZMP)	The Department of Ecology administers the CZMP. Under the program, projects that are likely to affect state coastal resources or uses must be consistent with the CZMP's enforceable policies found in the Shoreline Management Act (SMA), Clean Water Act, Clean Air Act, SEPA, Energy Facility Site Evaluation Council, Law and Ocean Resources Management Act.
Washington State Shoreline Management Act (RCW 90.58; WAC 173-26, 173-27)	The Shoreline Management Act provides a statewide framework for managing, accessing, and protecting shorelines of the state. Jurisdiction includes land and wetlands within 200 feet of the OHWM. Under this act, local jurisdictions containing "shorelines of the state" are required to adopt and administer Shoreline Master Programs that foster appropriate shoreline development and manage resources within the shoreline environment. Skagit County and the city of Anacortes contain "shorelines of the state" within their respective jurisdictions and are therefore subject to the requirements of the Shoreline Management Act.

Regulation, Policy, or Guideline	Description
RCW 77.120: Ballast Water Management	Establishes protections from the potential economic and environmental damage to the state that could be caused by the introduction of nonindigenous species from ballast water. Implemented by WAC 220-150 Ballast Water Management.
WAC 317-40 Bunkering Operations	Enforces regulations on the management of multiple non-cargo waste streams and ballast water from vessels (MARPOL 73/78 Annexes I, II, and V).
Local	
Skagit County Shoreline Management Master Program (SCC 14.26) City of Anacortes Shoreline Master Program (AMC 18.16)	The Skagit County and Anacortes Shoreline Master Programs are comprised of local land use policies and regulations that are designed to manage shoreline use. The SMPs protect natural resources for future generations, provide for public access to public waters and shores, and plans for water-dependent uses. The SMPs were created in partnership with the local community and Ecology and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.
Skagit County Critical Areas Ordinance (SCC 14.24)	Local development regulations designed to protect environmentally sensitive areas and ecosystems that are designated for protection and management under the Growth Management Act. Critical Areas relevant to this chapter are fish and wildlife habitat conservation areas. Specifically, the habitat conservation areas defined in the Critical Areas Ordinance that are related to this chapter are: • Areas with which endangered, threatened, and sensitive species have a primary association (see Section 7.3.3) • All public and private tidelands suitable for shellfish harvest (see Section 7.3.3.2) • Kelp and eelgrass beds, herring and smelt spawning areas (see Section 7.3.3.1) • Areas with which anadromous fish species have a primary association (see Section 7.3.3.3 and Section 7.3.3.8) • State natural area preserves and natural resource conservation areas (see Section 7.3.2) • State priority habitats and areas associated with State priority species as defined in WAC 365-190-080 (see Section 7.3.3)

A number of regulations in Table 7-1 identify species and habitats that require special consideration for impact assessment and management at the state and federal level. For the purposes of this report, these are referred to collectively as special status species and special status habitats.

Special status species include the following categories of species:

- Species listed as state endangered, state threatened, state sensitive, or state candidate on the Washington State Species of Concern Lists (WDFW 2016).
- Species listed on the federal List of Endangered and Threatened Wildlife (50 CFR 17.11).
- Species listed on the federal List of Endangered and Threatened Plants (50 CFR 17.12).
- Species harvested in tribal usual and accustomed areas that are identified as particularly relevant for impact assessment, based on the economic, spiritual or cultural importance to the Coast Salish people.

Special status habitats include the following identified habitats:

- Designated critical habitat for threatened and endangered species under the Endangered Species Act (ESA)
- Essential Fish Habitat (EFH), as identified in a Fisheries Management Plan (FMP), for a fish species likely to occur in the study area
- Saltwater habitats of special concern, as defined in WAC 220-660-320

7.1.1. Water Quality

Ecology has developed specific numerical criteria for different marine water quality parameters (WAC 173-201A), which are provided in Table 7-2. Ecology's numeric water quality criteria are based on developing standards to prevent adverse impacts using specific data and scientific assessments. Physical conditions like water temperature and dissolved oxygen (DO) or specific limits and ranges for chemical concentrations are used to evaluate impacts on species. Numeric criteria are usually evaluated and reported as concentrations over a given period of time. In general, exposure for a short period of time (1 hour) is considered acute and exposure for a long period of time (4 days) is considered chronic. However, the duration of exposure classified as acute and chronic varies across chemicals and species (WAC 173-201A-240).

Narrative water quality criteria have been adopted to supplement the numeric criteria. The narrative criteria include the use of statements in situations where numeric criteria are difficult to specify and where pollutants offend the senses; example statements include waters being free from pollutants like oil and scum, color, and odor (WAC 173-201A). Use designations for water bodies are used to determine if numeric or narrative criteria are implemented to ensure protection. Four criteria classes are used to designate the water quality of surface waters in the state of Washington (WAC 173-201A-030): Extraordinary, Excellent, Good, and Fair. Table 7-2 provides the criteria Ecology uses to designate the water quality of surface waters in Washington State (WAC 173-201A-030).

Table 7-2: Washington State Surface Water Quality Criteria – Marine

Criteria	Extraordinary Quality	Excellent Quality	Good Quality	Fair Quality
Temperature	13°C (55.4°F)	16°C (60.8°F)	19°C (66.2°F)	22°C (71.6°F)
Dissolved oxygen	7.0 mg/L	6.0 mg/L	5.0 mg/L	4.0 mg/L
Turbidity	Turbidity must not exceed: • 5 NTU over background when the background is 50 NTU or less • A 10% increase in turbidity when the background turbidity is more than 50 NTU	Same as Extraordinary Quality Criteria	Turbidity must not exceed: • 10 NTU over background when the background is 50 NTU or less • A 20% increase in turbidity when the background turbidity is more than 50 NTU	Same as Good Quality Criteria
pH	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 units.	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.	Same as Excellent Quality Criteria	pH must be within the range of 6.5 to 9.0 with a human-caused variation within the above range of less than 0.5 units.
	Primary Contact Recreation		**Secondary Contact Recreation**	
Bacteria	Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 milliliter (mL), with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 208 colonies/100 mL.		Enterococci organism levels must not exceed a geometric mean value of 70 colonies/100 mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 208 colonies/100 mL.	

NTU = nephelometric turbidity units

7.1.2. Fish Work Window Compliance

The WDFW and the USACE define times of the year when in-water work may occur. These times are defined to avoid the periods during which sensitive life stages, such as spawning, incubation, and juvenile migration typically occur for each species. Table 7-3 presents the WDFW and USACE in-water work windows (i.e., periods when in-water work is permitted) for Tidal Reference Area 9. The specific in-water work windows that apply to the proposed project would be determined as part of the hydraulic project approval process.

Table 7-3: WDFW and USACE In-water Work Windows

Species/Habitat	Application	Approved Work Windows
WDFW (WAC 220-660-310)		
Juvenile salmonid migration, feeding, and rearing areas	Applies to all work seaward of the OHWL.	August 1 - February 15
Herring spawning beds	Applies to work within documented intertidal forage fish spawning areas, and work adjacent to documented forage fish spawning bed unless an intertidal forage fish spawning bed survey is undertaken.	April 15 - January 31
Surf smelt spawning beds	Applies, except if a WDFW-trained biologist conducts a spawning survey that shows eggs are not present. In that case, the person must start work within 72 hours.	Authorization is conditional upon inspection, because year-round spawning occurs.
Pacific sand lance spawning beds	Applies to projects in or adjacent to documented Pacific sand lance spawning beds.	March 1 - October 15
Juvenile lingcod settlement and nursery areas	Applies to projects in or adjacent to juvenile lingcod settlement and nursery areas.	October 15 - May 15
Lingcod nests	Applies to projects in or adjacent to juvenile lingcod settlement and nursery areas.	April 1 - December 31
Juvenile rockfish settlement and nursery areas	Applies to projects in or adjacent to juvenile rockfish settlement and nursery areas.	September 30 - March 15
USACE (2015)		
Salmon	Applies to work in salmon habitat.	July 2 - March 2
Pacific herring (*Clupea pallasii*)	Applies if forage fish are present in the project area. Presence can be confirmed by contacting the USACE.	April 15 - January 31
Surf smelt	Applies if forage fish are present in the project area. Work may occur if the restriction is released for a short period of time (typically two weeks) after the Washington State Department of Fish and Wildlife (WDFW) Habitat Biologist has confirmed that no forage fish are spawning on the beach.	Year round
Pacific sand lance	Applies if forage fish are present in the project area. Presence can be confirmed by contacting the USACE.	March 2 - October 14
Bull trout (*Salvelinus confluentus*)	Applies to work in bull trout habitat.	July 16 - February 15

7.2. Study Area and Methodology

This section describes the boundaries of the areas that were assessed for impacts and the specific procedures used to identify potential impacts of the proposed project on marine and nearshore resources.

7.2.1. Study Area

The marine study area evaluated in this assessment includes marine and nearshore resources immediately adjacent to the proposed project area and waters associated with the marine vessel transportation route detailed in Chapter 2, Proposed Action and Alternatives.

Specifically, the marine and nearshore resources study area encompasses the following areas:

- Fidalgo and Padilla bays, which are immediately adjacent to the wharf system where marine species or habitat could be impacted by construction or operation activities associated with the proposed project, or in the event of a marine spill of xylenes or reformate.
- The marine vessel transportation route and adjacent waters and shorelines from the Tesoro Anacortes Refinery wharf structure to the edge of U.S. territorial waters in the Pacific Ocean, approximately 12 nautical miles seaward of the entrance to the Strait of Juan de Fuca (see Figure 2-3 in Chapter 2, Proposed Action and Alternatives). The study area extends to the mean higher high water (MHHW) level because, due to the non-viscous characteristics of xylene and reformate (see Section 7.4.3.2), these materials would be unlikely to be tracked upland of the MHHW in the event of a marine spill.

Coastal freshwater wetlands located on islands surrounding the marine vessel transportation route are not included in the marine and nearshore resources study area because coastal freshwater wetlands are above the MHHW level and hydraulically isolated from the marine environment. Freshwater wetlands within the refinery are discussed in Chapter 5, Freshwater Resources.

7.2.2. Methodology

The methodology used to determine potential impacts involved identifying marine and nearshore resources within the study area, and evaluating potential impacts on those marine and nearshore resources.

7.2.2.1. Identification of Marine and Nearshore Resources

Baseline conditions were documented from proposed project plans and procedures (Chapter 2, Proposed Action and Alternatives), public records, and scientific studies. Desktop data were used to understand the marine and nearshore resources in the marine vessel transportation route portion of the study area. These sources are referenced throughout this document.

The following field surveys were undertaken specific to the causeway:

- A habitat reconnaissance survey for eelgrass and macroalgae was performed on June 18, 2015 (Marine Surveys and Assessments 2015a).
- A more detailed habitat survey was performed July 20 to 24, 2014, on 5.7 acres of subtidal land on the eastern side of the causeway (Marine Surveys and Assessments 2015b).

Special status species that may occur in the study area were identified by the following reviews:

- Use of the IPaC (Information for Planning and Conservation) tool (USFWS 2016a), which identifies the federally-listed species relevant to a search area
- Review of each marine species listed on the Washington State Species of Concern Lists (WDFW 2016) to identify which state-listed species have ranges overlapping the study area

Special status habitats that may be present in the study area were identified by reviewing the following sources:

- Designated critical habitat information available through the Environmental Conservation Online System (ECOS) (USFWS 2017)
- FMPs to identify EFH that may be present in the study area
- Items listed as saltwater habitats of special concern, to identify those likely to occur in the study area

7.2.2.2. Impact Evaluation for Marine and Nearshore Resources

Potential impacts on marine and nearshore resources that were evaluated as part of this analysis were determined through a public scoping process and by considering the proposed project's potential to impact these resources. Potential impacts on marine and nearshore resources that could occur during both construction (short term) and operations (long term) of the proposed project were considered in the analysis.

A series of scoping meetings were conducted during the scoping period for the proposed project, with the public, tribes, and government agencies providing verbal and written comments. The primary issues related to marine and nearshore resources that are addressed in this section include:

- Injury, mortality, or harassment of marine wildlife due to the proposed project
- Loss of habitat or degradation of habitat due to the proposed project including water quality degradation, marine vegetation, benthic habitat, or coastal wetlands
- The introduction of an invasive species or propagation of an existing invasive species

These potential impacts may result from either construction or operation activities. During construction, potential impacts may result from the following disturbances:

- Operation of the spud barge
- Vessel strikes due to operation of a tugboat and spud barge (together referred to as an articulated tug and barge [ATB]) and safety boat
- Vessel wakes due to operation of an ATB and safety boat
- Release of sediment in stormwater due to construction activities within the refinery
- Noise generated from activities on the wharf, operation of marine vessels (ATB and safety boat), and deployment of spuds to stabilize the spud barge

During operation, potential impacts may result from the following disturbances:

- Marine vessel strikes due to marine vessel operation
- Damage to marine vegetation due to marine vessel operation
- Marine vessel wakes due to marine vessel operation

- Increased volumes of WWTP effluent discharged to Fidalgo Bay
- Invasive species potentially introduced in ballast water
- Noise generated from marine vessel operation

In addition, impacts could occur as a result of unplanned events, which includes marine spills and spill responses.

A significant impact on marine or nearshore resources was defined as an impact that would result in one of the following:

- Injury, mortality, or harassment of a species in such amounts that could cause a reduction in the viability of a population of a species, where the impacts would not resolve within a few breeding cycles.
- Loss or degradation of habitat used for foraging, reproduction, migration, or refuge to an extent that would reduce the viability of a population of a species, where the impacts would not resolve within a few breeding cycles. Degradation of water quality to an extent that would reduce the viability of a population of a species, or result in a violation of an applicable water quality standard, where impacts would occur beyond the construction phase.
- The introduction of an invasive species that would result in a reduction in the viability of a population of a species, where the impacts would not resolve within a few breeding cycles.
- Specific to special status species and habitats:
  - Injury, mortality, or harassment of a threatened or endangered species (defined under the ESA as a ‘take’), or marine mammal, as protected by the MMPA
  - Loss or degradation of critical habitat designated under the ESA, where the impacts would be permanent without human intervention
  - Loss or degradation of saltwater habitats of special concern, to the extent that would alter the ecosystem function of those habitats such that special status species would be directly or indirectly impacted, where the impacts would be permanent without human intervention

For each of the above impacts, the geographic extent that would trigger a significant impact would depend on the species or habitat types being impacted.

The results of the analysis are summarized by characterizing the significance for each potential impact on marine and nearshore resources. The process for characterizing the significance of each potential impact involved analyzing the magnitude, geographic extent, and duration of the impact (see Chapter 1, Section 1.7, Methodology). Based on the results of this analysis, the significance of each potential adverse impact was then assigned to one of two categories: less than significant or potentially significant. Criteria for assessing the significance of potential adverse impacts on marine and nearshore resources are included in Table 1-B.5 in Appendix 1 B, Impact Criteria Tables.

In addition to the potential impacts that could occur during regular and routine construction and operation activities over the life of the proposed project, impacts may also result from an unplanned event. In the case of this chapter, marine spills at the refinery wharf or along the marine vessel transportation route fall into this category. The methodology for evaluating impacts related to unplanned events follows the same methodology as for planned events–impacts are characterized as to their potential magnitude, geographic extent, and duration. However, for unplanned events, if the impact of the unplanned event is potentially significant, then the likelihood, or probability, of an event occurring is assigned using a qualitative scale of probability categories described as Negligible, Low, Medium, or High (see Chapter 1, Section 1.7, Methodology).

7.3. Affected Environment

The study area is located in the Salish Sea, a network of inland marine waterways that include the southwest portion of British Columbia to the north and Puget Sound to the south. The Salish Sea is characterized by shallow sills and deep channels. The study area is located in the mid-latitudes of the Salish Sea, and includes Padilla and Fidalgo bays, the southern part of Rosario Strait, and the full length of the Strait of Juan de Fuca. These waterbodies are navigable waters of the U.S., as described in the CWA.

The eastern portion of the study area, around the proposed project area and east of Rosario Strait, contains shallower marine habitats, estuaries, and bays. The study area's eastern portion is semi-enclosed, and is fed limited freshwater from rivers in WRIA 3, including the Fraser, Skagit, Nooksack, and Samish rivers.

The study area's western portion, further from the proposed project area and west of Rosario Strait, contains more open marine habitats. The deepest waters are in the Strait of Juan de Fuca (600 to 820 feet in the west and 180 feet in the east) (Davenne and Masson 2001) and Rosario Strait (500 feet in mid-channel) (NOAA OCS 2010). Waters in the study area's western portion are fed from the rivers that drain from the Olympic Mountains, including the Dungeness and Elwah rivers.

The affected environment sections provide the following information:

- An overview of the marine and nearshore ecosystem within the study area, including water quality, biological productivity in the water column, and coastal wetlands
- A description of the protected areas within the study area
- A description of the special status species and habitats present, or likely to be present, within the study area

Table 7-4 outlines some key terms used in the affected environment description.

Table 7-4: Key Terms

Term	Explanation
Microorganism	Microscopic organisms, such as phytoplankton, zooplankton, and the larval stage of larger animals and bacteria
Phytoplankton	Microscopic marine plants
Zooplankton	In general, microscopic organisms that cannot fix carbon from inorganic sources
Macrophyte	A plant large enough to be seen by the naked eye
Benthic	The bottom-most layer of the water column adjacent to and including the seabed's sediment layer
Pelagic	Areas of open water that are not adjacent to land and are not adjacent to the seabed

7.3.1. Ecosystem Overview

7.3.1.1. Water Quality

Ecology has assessed water quality in four locations within the study area. Ecology concluded that these areas have extraordinary quality water (Padilla Bay) and excellent quality water (North Puget Sound, South Puget Sound through Admiralty Inlet, and the Strait of Juan de Fuca), based on the criteria presented in Table 7-2.

The study area's eastern portion is influenced by tides with a mean range of 5.2 feet, and a spring tide range of 8.5 feet (Bulthuis 2013). Tides occur twice daily (semi-diurnal) and are the primary source of measurable freshwater to Padilla and Fidalgo bays. Padilla Bay and the surrounding area have polyhaline waters[1] with a salinity range of 25 to 30 practical salinity units (PSU) (Bulthuis 2013). Salinity gradients are present in the study area's eastern portion near Padilla and Fidalgo bays.

The study area's western portion has salinity concentrations at approximately 30 to 33 PSU (Masson and Cummins 2004). Salinity in this area has minimal to no horizontal gradients due to the shallow depth, tidal range, and low volume of direct freshwater inputs.

7.3.1.2. Characteristics of the Water Column

The water column includes all marine and nearshore habitats from the MHHW mark to benthic habitats throughout the study area. An overview of biological productivity in the study area (including microorganisms, marine vegetation, and marine wildlife) is described below for three layers of the water column:

- Surface layer: 0 to 1 feet
- Subsurface layer: 1 to 20 feet
- Deep layer: greater than 20 feet

Surface Layer

Boundary layers occur in areas where substances with different densities interface. The surface layer of the water column has an approximate 1-inch boundary layer where air–water interface occurs. This boundary layer provides habitat for species of viruses, bacteria, phytoplankton,

[1] Term to characterize water with salinity of 18 to 30 parts per thousand, due to ocean salts

zooplankton, and the pelagic larvae of marine invertebrates and fishes (McManus and Woodson 2012). Intense biological activity can be concentrated in boundary layers; up to 75 percent of the biomass in the water column has been shown to be concentrated in boundary layers (Holiday et al. 2010, Sullivan et al. 2010). Growth conditions for phytoplankton are often optimized in these areas.

In the study area, the density and abundance of microorganisms is anticipated to be higher in the study area's eastern portion due to gradients from freshwater inputs and tidal interactions in the estuarine areas of Padilla and Fidalgo bays near the proposed project area. Marine vegetation, including species of kelp and mats of dislodged vegetation are present throughout the surface layer. The structure of the marine vegetation provides additional habitat for marine species that occupy the surface layer. Mammals and birds also frequently interact with the surface layer to forage, breathe, travel, and rest.

Subsurface Layer

The subsurface layer is located in the photic zone of the water column (i.e., the zone that has enough light penetration to allow photosynthesis). The photic zone includes subsurface waters in the middle of channels away from nearshore or shallow estuarine habitats. In addition to phytoplankton, macrophytes (eelgrass, kelp, and macroalgae) are found throughout the subsurface layer in nearshore environments and they contribute to primary production when appropriate substrate is available. Macro species are present throughout the pelagic and benthic portions of the subsurface layer. These include forage fish, coastal pelagic fish, rockfish, and Pacific salmon in the pelagic habitats, and macroinvertebrates and crustaceans in the benthic habitats. As a result, marine mammals and sea birds are present to feed on the prey species that occupy these habitats.

Deep Layer

The deep layer of the water column is defined by habitats deeper than 20 feet. The deep layer includes the remaining portion of the productive photic zone, as well as the aphotic zone (i.e., the zone that lacks enough light for primary production to occur).

The majority of habitat in the study area within the deep layer is located in the Strait of Juan de Fuca and Rosario Strait. Phytoplankton is found where enough light penetrates to enable photosynthesis. Macro species such as coastal pelagic fish, Pacific salmon, rockfish, benthic invertebrates, and foraging marine mammals also use deep layer habitats.

7.3.1.3. Coastal Marine Wetlands

Coastal marine wetlands provide habitat for marine organisms, play an important role in the nearshore food web, and stabilize substrate. Coastal marine wetlands are characterized by relatively dry and free-draining soils with high organic content, tidal inundation, shifting substrate, and disturbance from wave action (Brennan 2007). Coastal marine wetlands contain highly specialized salt-tolerant plant species. Aquatic vegetation within coastal wetlands include kelp, eelgrass and macroalgae (see Section 7.3.3.1). Common vegetation in marine riparian areas include dune wildrye (*Elymus mollis*), seaside arrowgrass (*Triglochin maritima*), seaside plantain

(*Plantago maritima*), pickleweed (*Salicornia virginica*), gumweed (*Grindellia integrifolia*), saltweed (*Atriplex patula*), and fleshy jaumea (*Jaumea carnosa*) (Brennan 2007).

The study area includes estuarine and marine wetlands mapped on the National Wetland Inventory V2 (USFWS 2016b). These wetlands are located throughout shorelines of the study area, from Padilla and Fidalgo bays out along the straits to the mouth of the Strait of Juan de Fuca.

7.3.2. Protected Areas

Two protected areas (Padilla Bay and Fidalgo Bay Aquatic Reserve) are located close to the proposed project area. Padilla Bay is a major area of estuarine habitat directly east of March Point. A large portion of the bay is part of the National Estuarine Research Reserve System. The bay supports diverse habitats including approximately 9,400 acres of eelgrass. A large portion of the bay is inter-tidal, and extensive mud flats are exposed at low tide (Bulthuis 2013).

The Fidalgo Bay Aquatic Reserve is a highly diverse, productive, and unique ecosystem directly west of March Point. The reserve contains salt marshes, sand and gravel beaches, and expansive native eelgrass beds. The inner bay tide flats are composed of mixed fine clays, silts, and sands. These habitats are recognized as essential contributors to the reproductive, foraging, and rearing success of many marine species within and outside the reserve, including Dungeness crab (*Metacarcinus magister*) and various hardshell clams that are harvested in the area (WDFW 2014).

Fidalgo Bay has been impacted by dredging and filling of shoreline areas, reduced sediment input from bulkheading, and shading of eelgrass beds by overwater structures (such as piers and the railroad trestle) (Williams et al. 2003). Contaminants have been detected in sediments in Fidalgo Bay at concentrations similar to or only slightly higher than those in reference sediments from Samish Bay (Johnson 2000). Despite these impacts, the area continues to provide important habitat for migratory and resident organisms.

Also, the following protected areas are located near waters of the marine vessel transportation route:

- USFWS Refuges (Dungeness National Wildlife Refuge, Protection Island National Wildlife Refuge, and San Juan Islands National Wildlife Refuge)
- Washington DNR Aquatic Reserves (including Cypress Island, Smith and Minor Islands, and Protection Island)
- Tongue Point Marine Life Sanctuary managed by Clallam County

7.3.3. Special Status Species and Habitats

This section describes the special status species and habitats known, or expected to occur within the study area. The section is structured by species group and, for each species group, a summary table is provided to identify the following relevant listings for each species:

- Species listed under the ESA

- Critical habitat, as designated under the ESA, within the study area
- Species listed in the state of Washington
- EFH, as described in an FMP
- Saltwater habitats of special concern, as described in the Hydraulic Code Rules

7.3.3.1. Marine Vegetation

Marine vegetation in the study area includes eelgrass, kelp, and macroalgae. The Hydraulic Code Rules identify seagrass beds (*Zostera marina*, *Ruppia maritima,* and *Phyllospadix* spp.), kelp beds (order Laminariales), and macroalgae species used by Pacific herring as a spawning substrate, as saltwater habitats of special concern. In addition, eelgrass and some kelp species are identified as culturally important to the Coast Salish people (Gaydos et al. 2015). The distribution of kelp and eelgrass in the study area is shown on Figures 7-1, 7-2, and 7-3. The shorelines in the area include eelgrass, non-floating kelp, floating kelp, and a non-native brown algae sargassum (Berry et al. 2001).

Kelp

Kelp includes floating and non-floating species. Non-floating species of kelp are distributed throughout the nearshore habitats of the study area, specifically in intertidal and subtidal habitats. Non-floating kelp attach to various solid substrates, ranging from bedrock to pebbles (Gabrielson et al. 2006 as cited in Mumford 2007). Juvenile salmon and surf smelt appear to use kelp beds preferentially over non-vegetated habitats. A survey of aquatic habitat near the proposed project area identified low densities (less than 5 percent) of brown kelp (*Saccharina latissima*) adjacent the wharf (Marine Surveys & Assessments 2015a).

Eelgrass

Eelgrass habitats are critical components of estuarine ecosystems (Phillips 1984). Eelgrass provides habitat for many species including juvenile salmonids, Dungeness crab, and Pacific herring (*Clupea pallasi*) (Phillips 1984). Eelgrass provides habitat for prey species such as worms, shrimp, clams, and other invertebrates that are food for great blue herons, eagles, otters, seals, and fish, as well as humans (Stevens et al. 2015). Eelgrass is used by Pacific herring as a spawning deposition substrate and is used as corridors by out-migrating juvenile salmon as corridors. In addition, eelgrass stabilizes the sediment and mediates current flow (Mumford 2007).

Three species of eelgrass are found in the Salish Sea, including two indigenous species and one introduced species:

- Common eelgrass (*Zostera marina*), an indigenous low intertidal species
- Widgeon grass (*Ruppia maritima*), an indigenous high intertidal brackish water species
- Dwarf eelgrass (*Zostera japonica)*, an introduced species (Mach et al. 2010)

Padilla Bay contains extensive meadows of common eelgrass and dwarf eelgrass (Bulthuis 2013). Common eelgrass is also found throughout Fidalgo Bay (Ecology 2016). Depth ranges for eelgrass for different locations in the study area are presented in Table 7-5.

Table 7-5: Depth Ranges of Eelgrass by Regions

Region	Minimum Depth (feet)		Maximum Depth (feet)	
	Minimum Depth Observed	Range in Site Means	Maximum Depth Observed	Range in Site Means
North Puget Sound	+4.6	+2.0 to -3.3	-27.6	-7.5 to -21.7
San Juan/Straits	+4.9	+1.3 to -17.7	-34.4	-1.3 to -27.2

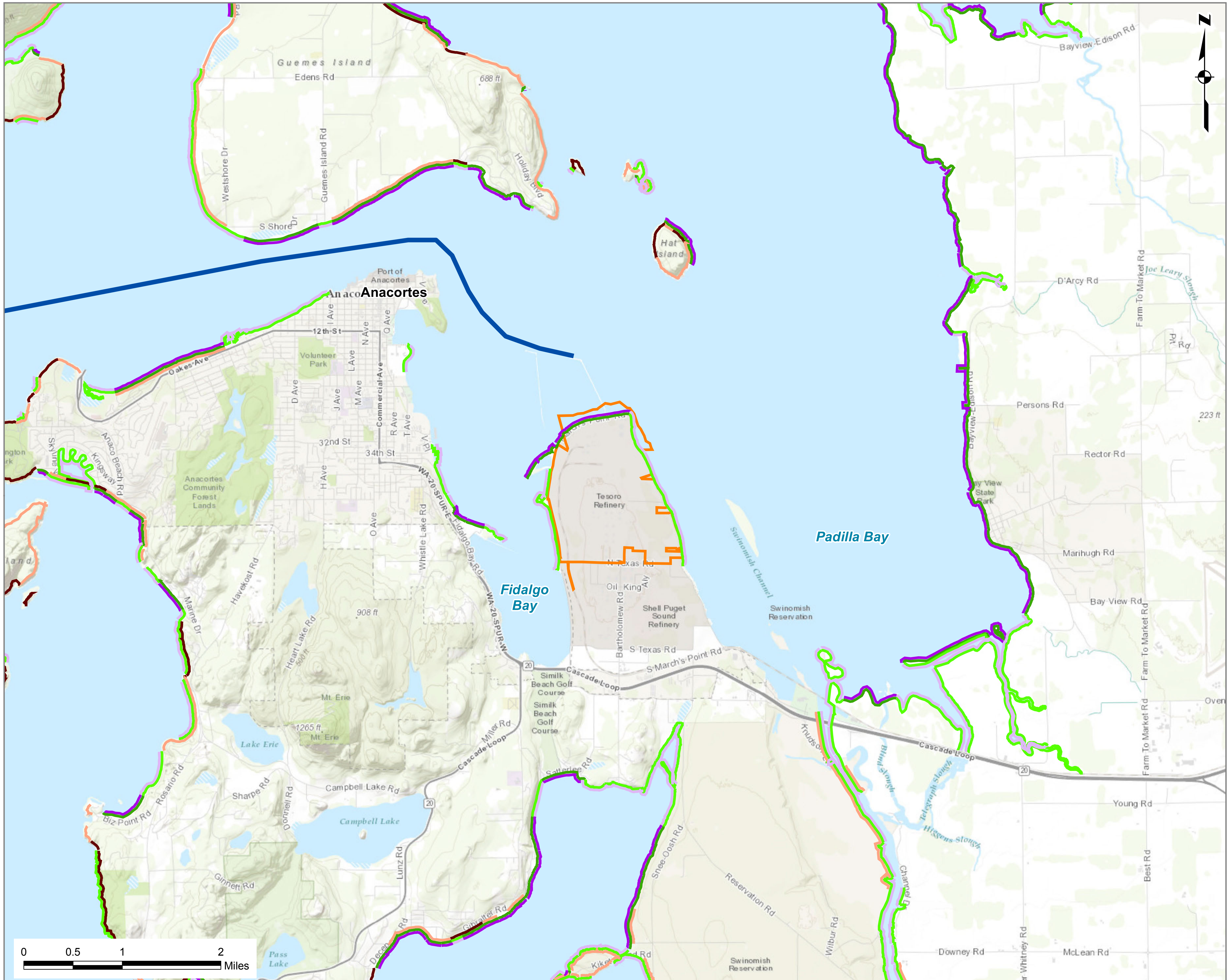
Source: Table 3-4 Gaeckle et al. 2007

A large and extensive bed of the common eelgrass is present between approximately 15 to 20 feet east of the causeway (see Figure 7-3). The common eelgrass bed persists along the entire length of the causeway until a depth of 12 feet MLLW. Marine Survey and Assessment (2015b) identified that the eelgrass bed was of low density, with average shoot densities of less than three shoots per square meter; however, the average lengths of the eelgrass blades were approximately 4 to 6 feet. The eelgrass bed was reported to be healthy, with many organisms such as Dungeness, helmet, and kelp crabs, as well as pile perches, gunnels, and other invertebrates observed within the bed (Marine Survey and Assessment 2015b).

7.3.3.2. Shellfish

A number of shellfish species in the study area are identified as culturally important to the Coast Salish people. These species occur in nearshore habitats throughout the study area and include: little neck clams (*Prototheca abrupta*), butter clam (*Saxidomus giganteus*), geoduck clam (*Panopea generosa*), Dungeness crab (*Metacarcinus magister*), blue mussels (*Mytilus edulus*), Olympia oyster (*Ostrea conchaphila*), red urchin (*Strongylocentrotus franciscanus*), and pinto abalone (*Haliotis kamstchatkana*) (Gaydos et al. 2015). Many of these species are also harvested for commercial and recreational purposes by non-native peoples. Evaluation of tribal fisheries and aquaculture is presented in Chapter 11, Social and Economic Environment.

Settlement areas for the Olympia oyster are considered a saltwater habitat of special concern under the WAC 220-660. The Olympia oyster occurs in intertidal habitats and is the only native oyster species in the Salish Sea. The study area's eastern portion historically had large beds of native oysters including Padilla Bay and Similk Bay (Blake and Bradbury 2012). Olympia oyster restoration projects have been undertaken in Fidalgo Bay since 2002 (Dinnel 2016). The projects have had high rates of growth and natural recruitment, and additional natural recruitment has been seen in Fidalgo Bay at areas outside the seed planting sites (Dinnel 2016). Trials are being undertaken in Padilla Bay and around Cypress Island (Dinnel 2016). The WDFW identifies proposed restoration sites at Similk, Fidalgo, Padilla, and Samish bays as part of the plan for rebuilding Olympia oyster populations in Puget Sound (Blake and Bradbury 2012). The study area's western portion historically had small to moderate-sized native oyster beds, and low densities of naturally occurring oysters are currently present in Discovery Bay and Kilisut Harbor.



Legend

- Marine Vessel Transportation Route
- Tesoro Refinery Boundary

Shorezone (WA DNR, 2001) Data

Seagrass (All Types)

- Continuous
- Patchy

Eelgrass

- Continuous
- Patchy

Kelp (all types)

- Continuous
- Patchy

Notes:
Shorezone 2001 data provided by Washington Department of Natural Resources, 8/23/2013.
Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-1
Marine Vegetation Adjacent to the Proposed Project Area
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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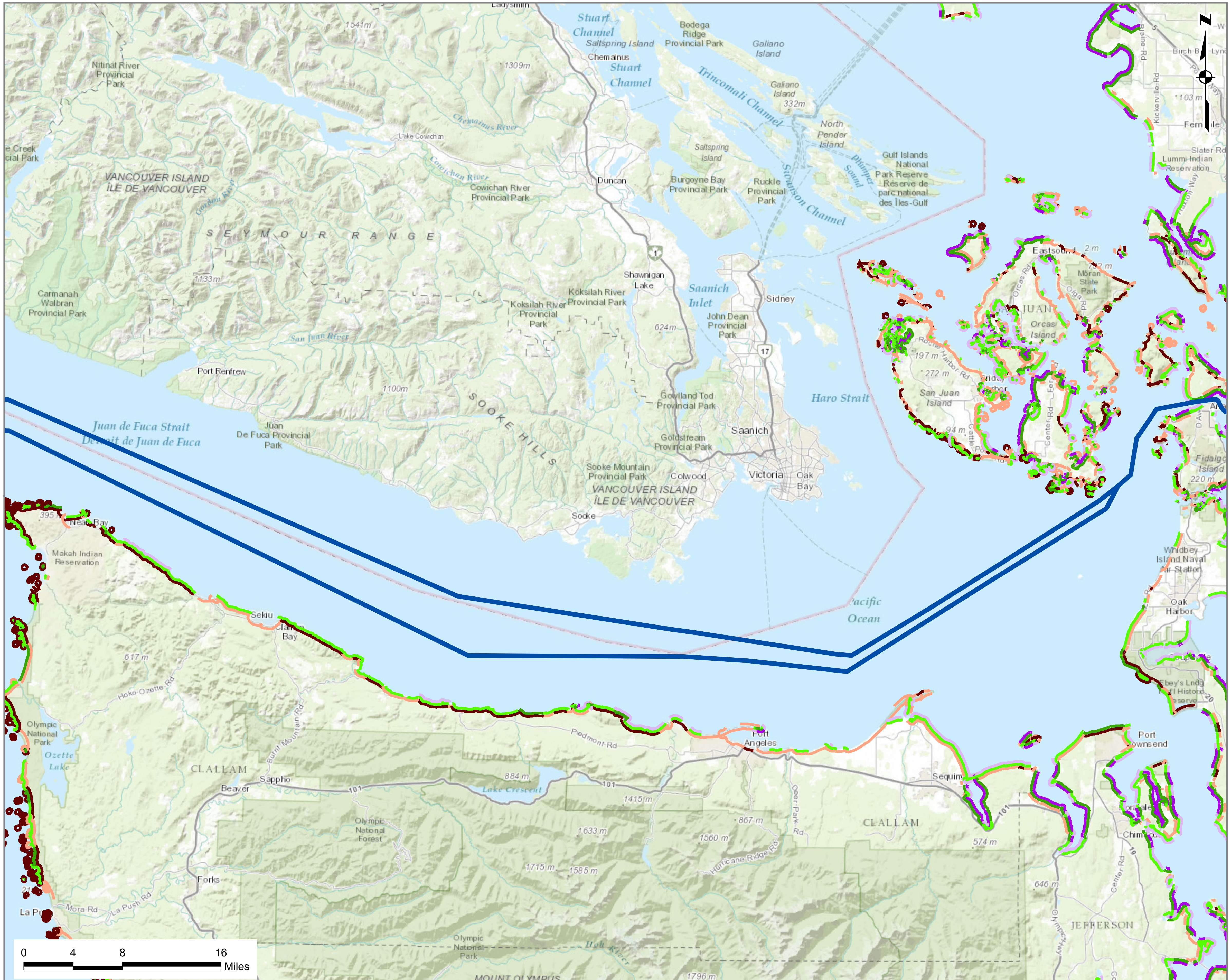

Notes:
Shorezone 2001 data provided by Washington Department of Natural Resources, 8/23/2013.
Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-2
Marine Vegetation in the Study Area
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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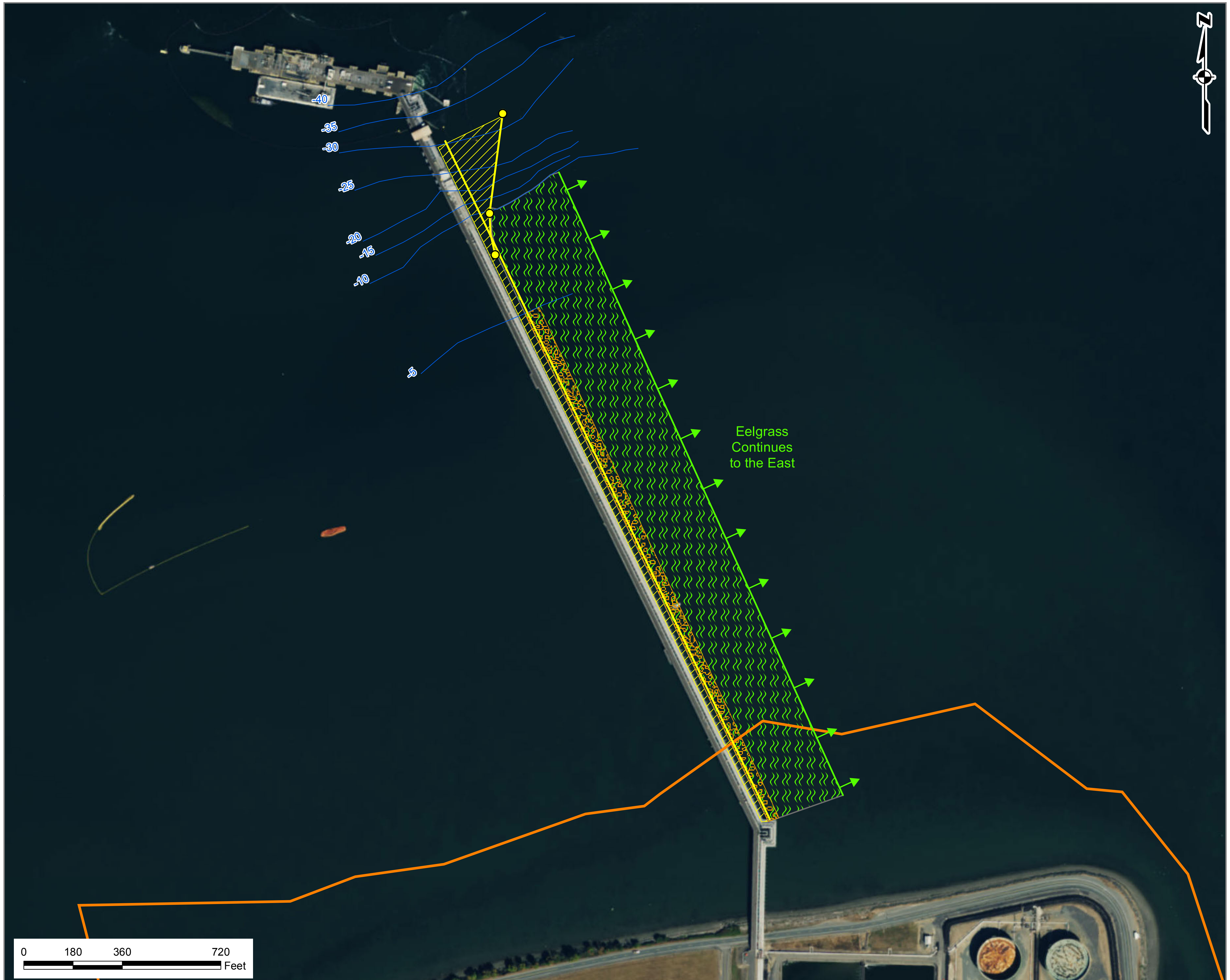

Legend

- Tesoro Refinery Boundary
- GPS Survey Points
- Reconnaissance Transect
- Depth Contour (ft. MLLW)
- Shell Hash
- Eelgrass Bed
- 5% Saccharina

Notes:
Eelgrass Survey results are from Tesoro East Pier Habitat Survey Report, June 26, 2015, by Marine Surveys & Assessments
Source:
Microsoft Imagery, flown 7/9/2010 at 1ft per pixel
NAD 1983 UTM Zone 10N

Figure 7-3
Eelgrass East of the Causeway
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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Pinto abalone is identified as a species of concern by NOAA, a non-statutory listing which aims to enable NOAA to take proactive measures to address conservation needs. The pinto abalone occurs in kelp beds, typically in the intertidal zone to 30 feet deep (NOAA 2007). The species has been recorded throughout the San Juan Islands, including the following locations within the study area: Long Island, Old Eagle Point, Deadman's Bay, and Williamson Rocks (NOAA 2007).

7.3.3.3. Pacific Salmon and Salmonids

A number of Pacific salmon species use the Salish Sea and the associated watersheds for spawning and rearing habitat (Fresh 2006). Nearshore habitats throughout the study area are favorable for salmon foraging. In particular, nearshore habitats in the vicinity of the proposed project area (Padilla and Fidalgo bays) provide especially favorable forage and rearing habitat for juvenile salmon. Table 7-6 outlines the special status species identified or managed under state and federal regulations. Pacific salmon species are managed under state and federal regulations and have cultural, spiritual and commercial significance to the Coast Salish people (Gaydos et al. 2015) (see Chapter 11, Social and Economic Environment). The distribution of critical habitat in the study area is shown on Figure 7-4.

Table 7-6: Special Status Pacific Salmon Potentially Present within the Study Area

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	ESA Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Chinook salmon *Oncorhynchus tshawytscha*	Threatened (Puget Sound ESU)	Yes	Candidate	Yes (full extent of study area)	Juvenile Chinook are likely to occur in nearshore habitats in the study area, in particular habitats in Padilla and Fidalgo bays, and west of the Elwha River in the Strait of Juan de Fuca. Adult Chinook would travel through the study area on return to streams.
Chum salmon *Oncorhynchus keta*	Threatened (Hood Canal Summer-run ESU)	Yes	Candidate	No	Juvenile chum may occur in nearshore habitats throughout the study area, and adults would travel through the study area on return to streams.
Coho salmon *Oncorhynchus kisutch*	Species of concern (Puget Sound)	No	NA	Yes (full extent of study area)	Juvenile coho may occur in nearshore habitats throughout the study area, and adults would travel through the study area on return to streams.
Steelhead *Oncorhynchus mykiss*	Threatened (Puget Sound DPS)	No	Candidate	No	The species may pass through the study area when migrating between freshwater habitats and the ocean; however, it is expected to be uncommon in the study area.
Pink salmon *Oncorhynchus gorbuscha*	NL	NL	NL	Yes (full extent of study area)	Pink salmon pass through the study area when migrating between freshwater habitats and the ocean (WDFW Undated). Juveniles may spend a few months in nearshore habitats (Page and Burr 1991).

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	ESA Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Sockeye salmon *Oncorhynchus nerka*	NL	NL	NL	Yes (not specific to sockeye)	Anadromous sockeye may pass through the study area when migrating between freshwater habitats and the ocean,

NA = Not applicable, because species is not eligible for listing; NL = Not listed.

The Pacific Coast Salmon FMP manages Chinook, coho, pink salmon, and sockeye salmon. The FMP contains detailed descriptions of the characteristics of EFH for Pacific coast salmon, related to the biology and life history of the species. Broadly, the spatial extent of Pacific coast salmon EFH extends from the extreme high tide line in nearshore and tidal submerged environments within state territorial waters, out to the full extent of the exclusive economic zone (PFMC and NMFS 2014). Therefore, EFH includes the full extent of the study area in the U.S.

The Hydraulic Code Rules (WAC 220-660) identify migration corridors, rearing areas, and feeding areas as saltwater habitats of special concern. These are common throughout estuarine, intertidal, and shallow subtidal saltwater areas of the state (WAC 220-660) and are likely to be present in the nearshore portions of the study area.

Further information on threatened and endangered salmon species is provided below.

Chinook Salmon

Chinook salmon spawn in main stem rivers and large streams. Juvenile Chinook out-migrating from the Skagit River and other drainages are likely to migrate and spend time rearing throughout the nearshore habitats found adjacent to the proposed project area (Fidalgo and Padilla bays). A study of Padilla Bay and the Swinomish Channel that connects the Skagit River with Padilla Bay identified the highest abundance of the species from February to May, with some juveniles present through October. Juvenile Chinook salmon have been documented in nearshore habitats west of the Elwha River in the Strait of Juan de Fuca (Shaffer et al. 2008). Adult Chinook would travel throughout the study area when migrating from the ocean to streams to breed. Critical habitat is comprised of all marine, estuarine, and river reaches accessible to Chinook salmon in the Salish Sea (Ruckelshaus et al. 2007) (see Figure 7-4).

Chum Salmon

Chum salmon eggs are deposited in streams in November to December, and fry emerge after approximately 6 weeks. The newly emerged fry immediately begin moving downstream to marine waters (WDFW 2017). Young chum typically spend time close to the shore before moving to deeper waters and migrating toward the open ocean (WDFW 2017). By mid- to late summer, juvenile chum typically reach ocean waters, although some will remain in nearshore marine waters until late in their second year (WDFW 2017). Adults spend three to five years in the open ocean before returning to streams to spawn (WDFW 2017). The study area provides suitable habitat for juvenile chum as they grow and prepare to migrate to the open ocean, and for adults migrating back to streams. Critical habitat for chum salmon is present in the study area, and is shown on Figure 7-4.

Coho Salmon

Coho salmon spawn in small tributary streams and juvenile coho salmon rear in freshwater for at least 1 year, typically in tributary streams and rivers (Quinn 2005). Smaller coho tend to remain in shallow shoreline areas and larger fish move into deeper channel areas of estuaries (Nightingale and Simenstad 2001). Research indicates juvenile coho use the Padilla Bay nearshore habitat for rearing (Beamer et al. 2007). Juvenile coho salmon in nearshore habitats feed on invertebrates, and adults feed on other salmon species, forage fish, and crab larvae.

Steelhead

Steelhead exhibit two life history types: winter run (ocean-maturing) and summer run (stream-maturing) (Quinn 2005). The Puget Sound DPS is primarily composed of winter steelhead stocks, as well as several small stocks of summer steelhead occupying limited habitat (NMFS 2005). The majority of steelhead smolts appear to migrate from freshwater habitats directly to the open ocean and do not rear extensively in the estuarine or coastal environments (Burgner et al. 1992). Surveys for the species in the Salish Sea nearshore captured very few steelhead (Mavros and Brennan 2000). This suggests that juvenile steelhead presence would be very rare in the nearshore habitat portions of the study area. Adult steelhead could be present at any time of year, but would likely only be present in offshore waters, and not in the shallow nearshore habitats.

7.3.3.4. Forage Fish

"Forage fish" loosely refers to schooling fishes that provide crucial links between the bottom of the food web (marine plankton species) and larger predatory species.

The Washington Hydraulic Code identifies spawning beds for three forage fish species (Pacific herring [*Clupea pallasi*], Pacific sand lance [*Ammodytes hexapterus*] and Surf smelt [*Hypomesus pretiosus*]) as saltwater habitats of special concern. Spawning habitat for these species adjacent to the proposed project area is shown on Figure 7-5. These species and one threatened species, eulachon (see Table 7-7), are described further below.

Table 7-7: Special Status Forage Fish Potentially Present within the Study Area

Species/Habitat	Federal Listing		State Listing		Occurrence in Study Area
	ESA	Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Eulachon *Thaleichthys pacificus*	Threatened	No	Candidate	NA	May occur in nearshore habitats throughout the study area, in particular, near the mouth of the Elwha River.

Note: NA = Not applicable, because species is not eligible for listing; NL = Not listed.

Pacific Herring

Pacific herring typically occur in deep water habitats, and move into shallow nearshore habitats to spawn. The species spawns almost exclusively on benthic marine macro-vegetation, such as eelgrass (Penttila 2007). Pacific herring have approximately 20 individual spawning stocks with discrete spawning locations throughout the Salish Sea. Five of these are within the study area: Samish Bay, Fidalgo Bay, Skagit Bay, interior San Juan Island, and Dungeness Bay (see Figure 7-5). Spawning at these locations occurs approximately between January and April. Pacific herring is identified as a culturally important species for the Coast Salish people (Gaydos et al. 2015). See Chapter 11, Social and Economic Environment, for discussion of tribal fisheries.

Surf Smelt

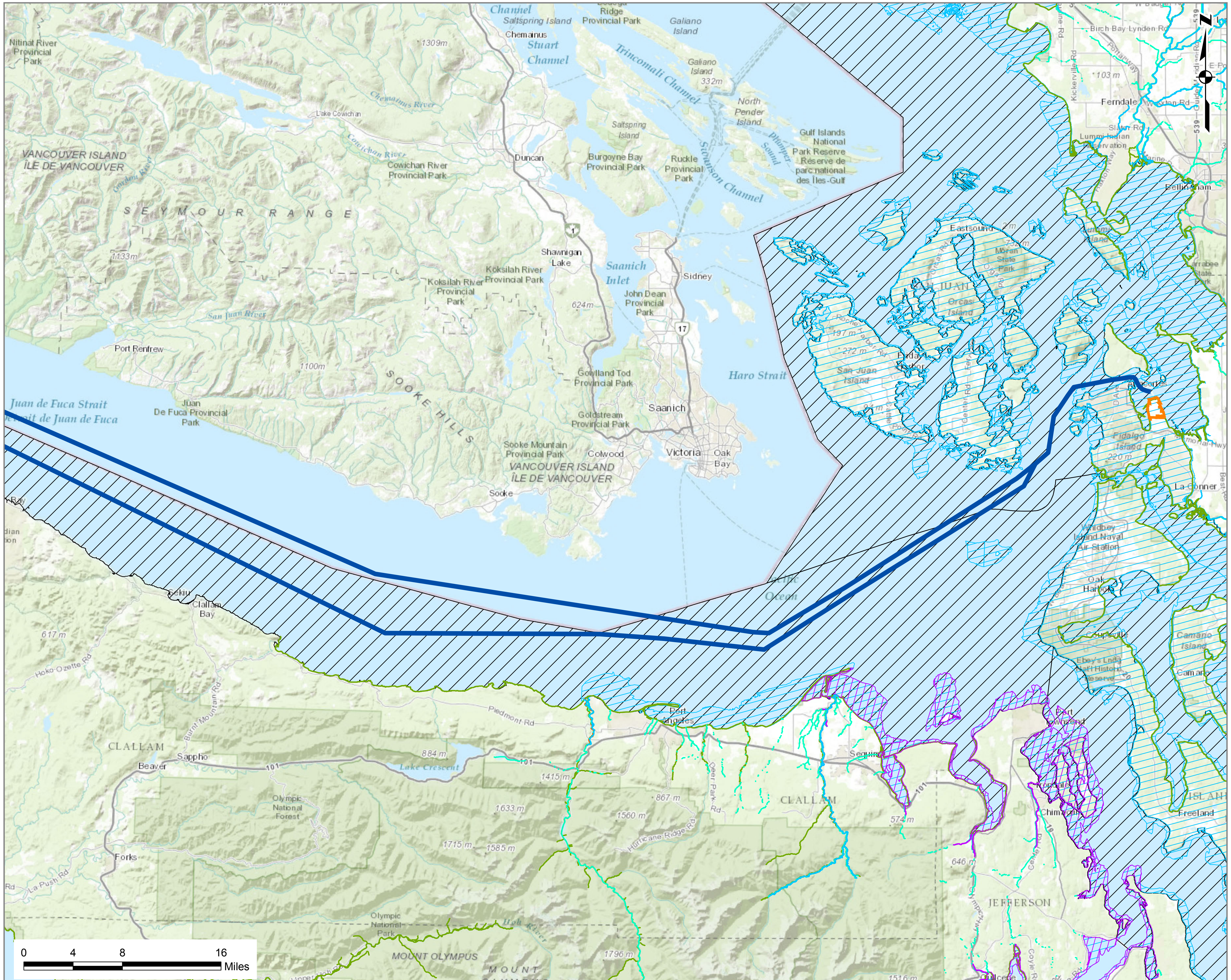
Surf smelt (*Hypomesus pretiosus*) spawn along shorelines throughout the Salish Sea, ranging from sheltered beaches to pebble beaches exposed to the open ocean on the outer coast. Spawning occurs in the high intertidal zone on mixed sand and gravel substrates (Penttila 2007). Surf smelt spawning is distributed throughout the Salish Sea and it occurs nearly year-round throughout the nearshore habitat in the study area (Penttila 2007). Documented surf smelt spawning occurs in the nearshore habitat in Fidalgo Bay extending around March Point (Penttila 2007) (see Figure 7-5).

Pacific Sand Lance

Pacific sand lance (*Ammodytes hexapterus*) is a common and widespread forage fish found in the nearshore habitats of the Salish Sea. Spawning has been documented in the nearshore habitat throughout the study area (Penttila 2007). Segmented areas of spawning have been documented in the nearshore habitat in Fidalgo Bay extending around March Point (Penttila 2007). The nearest mapped Pacific sand lance spawning area is located approximately one mile south of the wharf (see Figure 7-5).

Eulachon

Eulachon (*Thaleichthys pacificus*) are found in the northeastern Pacific Ocean, from California to the Bering Sea. The species spawns in rivers (typically between December and June) and spends most of its adult life in the ocean. Adult eulachon (older than one year) are most often encountered at depths between 164 and 656 feet by research trawl surveys (Gustafson 2016). The species is known to occur in the Elwah River, which drains to the study area (NOAA 2011), and the mouth of the Elwha River, within the study area, is mapped as critical habitat for the species (see Figure 7-4). Eulachon is identified as a culturally important species for the Coast Salish people (Gaydos et al. 2015).



Legend

- Tesoro Refinery Boundary
- Marine Vessel Transportation Route
- Chinook Salmon Critical Habitat
- Chinook Salmon Nearshore Critical Habitat
- Chum Salmon Critical Habitat
- Chum Salmon Nearshore Critical Habitat
- Steelhead Salmon Critical Habitat
- Eulachon Critical Habitat
- Bull Trout Critical Habitat Streams
- Southern Resident Killer Whale Critical Habitat

Notes:
Critical habitat data accessed through USFWS. Produced by National Marine Fisheries Service Protected Resources Division (2016), NOAA Fisheries West Coast Region (2014), NOAA Fisheries Northwest Region (2016), Rule and Bonkoski (2005), Rule (2005) and USFWS (2016a and 2016b).
Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-4
Critical Habitat
Tesoro Anacortes Refinery
Clean Products Upgrade Project
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Anacortes, Washington

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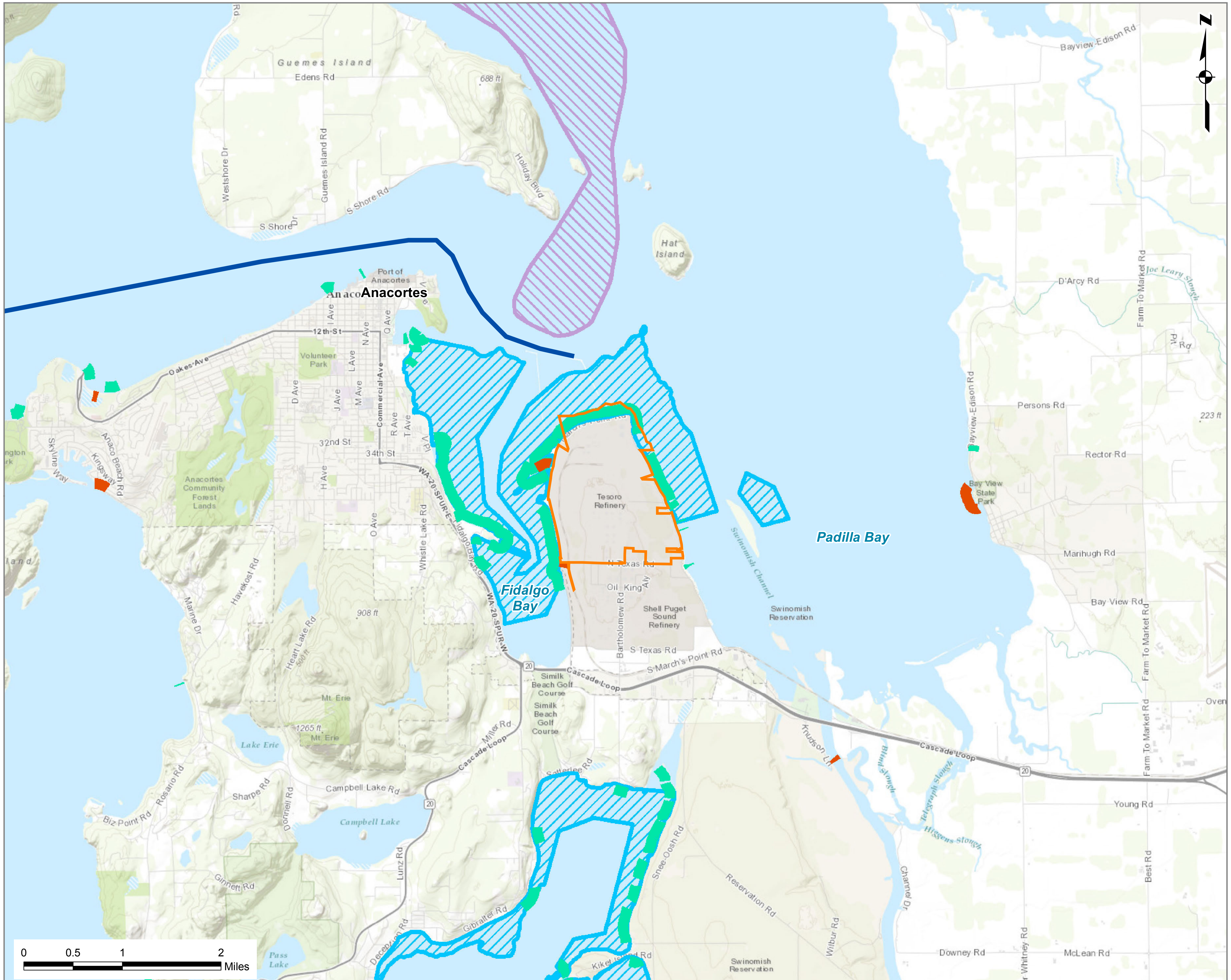

Legend

- Marine Vessel Transportation Route
- Tesoro Refinery Boundary
- Sand Lance Spawning
- Surf Smelt Spawning
- Herring Spawning
- Pre-spawner Herrring Holding Areas

Notes:
Forage Fish Spawning Areas data provided by Washington Department of Fish and Wildlife,(2016).

Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-5
Forage Fish Spawning Areas Adjacent to the Proposed Project Area
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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7.3.3.5. Coastal Pelagic Fish

The Coastal Pelagic Species FMP manages krill, market squid (*Doryteuthis opalescens*), and four finfish species (see Table 7-8). The FMP contains detailed descriptions of the characteristics of EFH as they relate to the biology and life history of these species. Broadly, the definition of EFH includes all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the exclusive economic zone and above the thermocline where sea surface temperatures range from 10°C to 26°C (PFMC 2016). This definition covers the full extent of the study area in the U.S.

Table 7-8: Special Status Coastal Pelagic Fish Potentially Present within the Study Area

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Krill (i.e., euphausiids)	NL	NA	NL	Yes	Krill occur throughout the study area.
Jack mackerel *Trachurus symmetricus*	NL	NA	NL	Yes	The species may occur in the study area, although is more often recorded offshore, up to 500 miles from the coast (Eschmeyer et al. 1983).
Market squid *Doryteuthis opalescens*	NL	NA	NL	Yes	The species is found throughout the Strait of Juan de Fuca and Puget Sound (Crone et al. 2009).
Northern anchovy *Engraulis mordax*	NL	NA	NL	Yes	The species occurs in Puget Sound, although biomass is currently below historic levels (USGS 2016).
Pacific mackerel *Scomber japonicus*	NL	NA	NL	Yes	The species does not typically spawn in the state of Washington (Crone et al. 2009) but adults may occur in the study area.
Pacific sardine *Sardinops sagax*	NL	NA	NL	Yes	The species occurs at depths to 200 m (Iwamoto and Eschmeyer 2010), and has potential to occur throughout the study area.

NA = Not applicable, because species is not eligible for listing; NL = Not listed.

7.3.3.6. Groundfish

More than two dozen rockfish species occupy the inland marine waters of the Salish Sea. Puget Sound treaty Indian tribes are co-managers of fisheries, including groundfish fisheries, along with the state of Washington in the Salish Sea. In general, the highest densities of juvenile rockfish species are found in areas with floating and submerged kelp (NMFS 2014). The proposed project area includes habitat suitable for all life stages of groundfish. This includes areas containing eelgrass, kelp, and algae, as well as subtidal areas that provide suitable substrate habitat for prey.

Table 7-9 outlines the special status rockfish species identified or managed under state and federal regulations.

Table 7-9: Special Status Groundfish Potentially Present within the Study Area

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Bocaccio *Sebastes paucispini*	Endangered (Puget Sound/ Georgia Basin DPS)	No	Candidate	Yes	May occur in areas dominated by non-rocky substrates throughout the study area.
Canary rockfish *Sebastes pinniger*	Threatened (Puget Sound/ Georgia Basin DPS)	Yes	Candidate	Yes	May occur throughout the study area, particularly in the Strait of Juan de Fuca.
Yelloweye rockfish *Sebastes ruberrimus*	Threatened (Puget Sound/ Georgia Basin DPS)	Yes	Candidate	Yes	Unlikely to occur in the proposed project area, however, may occur throughout other parts of the study area.
Various other species (approximately 90) listed under the Groundfish FMP.	NL	NA	NL	Yes	Other rockfish species identified in the Groundfish FMP have potential to occur in the study area.

NA = Not applicable, because species is not eligible for listing; NL = Not listed

EFH for groundfish is defined as all waters and substrate within areas with depths less than 3,500 meters (m) or the upriver extent of saltwater intrusion, seamounts in depths greater than 3,500 m, and additional areas designated as HAPC (NMFS 2016a). This definition encompasses the full extent of the study area in the U.S. HAPCs mapped in the FMP cover nearshore habitats in the study area and include areas of seagrass, canopy kelp, rocky reefs, estuaries, and other areas of interest (see Figure 7-6).

The Hydraulic Code Rules (WAC 220-660) identify groundfish settlement and nursery areas as a saltwater habitat of special concern. These areas are located in kelp and other macroalgae beds, seagrass beds, pinnacles, boulders, and other structurally complex habitats (WAC 220-660). These habitat types are present near the causeway, as well as other parts of the study area (see Figure 7-1 and Figure 7-2).

Further information specific to threatened and endangered species of rockfish is provided below. Critical habitat for these species is designated in nearshore areas and other shallower areas throughout the study area (see Figure 7-4). In addition, 13 rockfish species that could potentially occur in the study area are candidates for protection from the state of Washington.

Bocaccio

Bocaccio (*Sebastes paucispinis*) are a large Pacific coast rockfish found from Baja California to Alaska, most commonly between Oregon and northern Baja California. In the Salish Sea, bocaccio have been documented in areas dominated by non-rocky substrates such as sand and mud. Surveys conducted outside the DPS found bocaccio more frequently in more complex habitats (NMFS 2014).

Bocaccio are live-bearers, and larvae generally occupy the upper water column near the surface in open waters, although they may also occupy shallow nearshore, rocky areas or areas with eelgrass and sand (NMFS 2014). Juveniles and subadults are more common than adults in shallow waters (MacCall and He 2002) and adults typically occur deeper than 98 feet (Love et al. 2002 as cited in NMFS 2014; Yoklavich et al. 2000; Anderson et al. 2007).

Based on this information, adult and juvenile bocaccio could potentially be present throughout the nearshore and deepwater habitats throughout the study area. However, adult bocaccio would be rare in the nearshore habitat. Juvenile bocaccio would be more likely to occur in shallow waters dominated by sand and eelgrass, similar to the habitat near the proposed project area.

Canary Rockfish

Juvenile rockfish occur in shallow habitats for up to three years, including tide pools, rocky reefs, kelp beds, low rock, cobble areas, and shallow areas with eelgrass and sand (Boehlert 1980; Love et al. 1991; NMFS 2014). Adult canary rockfish (*Sebastes pinniger*) are generally associated with boulders, pinnacles, and rocky shelves, and typically occur from depths of 272 to 656 feet deep (Love et al. 2002 as cited in NMFS 2014). Canary rockfish have been caught throughout the Salish Sea; however, they are thought to be most abundant in the San Juan Islands and the Strait of Juan de Fuca (Drake et al. 2010). Juvenile canary rockfish may occur in nearshore habitats in the study area, while adult canary rockfish are more likely to occur in deeper habitats. A 2016 review of the species listing recommended that the species be delisted as a threatened species under the ESA (NMFS 2016b).

Yelloweye Rockfish

Yelloweye rockfish (*Sebastes ruberrimus*) are a large Pacific rockfish found from northern Baja California to the Aleutian Islands, Alaska, and are more common in the northern Salish Sea than the southern Salish Sea (Miller and Borton 1980). Adult yelloweye rockfish typically occur in waters at depths of 298 to 590 feet deep, although they can be found at depths of 49 to 1,801 feet deep (NMFS 2014). They are typically associated with high relief zones with crevices and complex rock habitats (Love et al. 1991). Yelloweye rockfish larvae can remain pelagic in the surface waters of the Salish Sea for up to two months (NMFS 2014). Based on depth and substrate preferences, yelloweye rockfish are considered unlikely to occur in the proposed project area; however, they could be present throughout other nearshore and deepwater habitats in the study area.

7.3.3.7. Bottomfish

The Hydraulic Code Rules identify lingcod (*Ophiodon elongates*) nesting areas and settlement and nursery areas as saltwater habitats of special concern. The lingcod nesting areas are located in high-relief rock, and settlement and nursery areas are located in beach and subtidal areas that have sand, seagrass beds, subtidal worm tubes, and other materials (WAC 220-660-320). Lingcod settlement and nursery areas may be present within nearshore habitats in the study area.

7.3.3.8. Other Fish

Two additional special status fish species are listed as threatened under the ESA (Table 7-10).

Table 7-10: Other Special Status Fish Potentially Present within the Study Area

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Bull trout *Salvelinus confluentus*	Threatened	Yes	Candidate	NA	The species has potential to occur in both deepwater and nearshore habitats in the study area.
North American green sturgeon *Acipenser medirostris*	Threatened (Southern DPS)	Yes	NL	NA	The species is known to occur in the Strait of Juan de Fuca and Puget Sound, although the Southern DPS does not spawn in Washington.

NA = Not applicable, because species is not eligible for listing; NL = Not listed.

Bull Trout

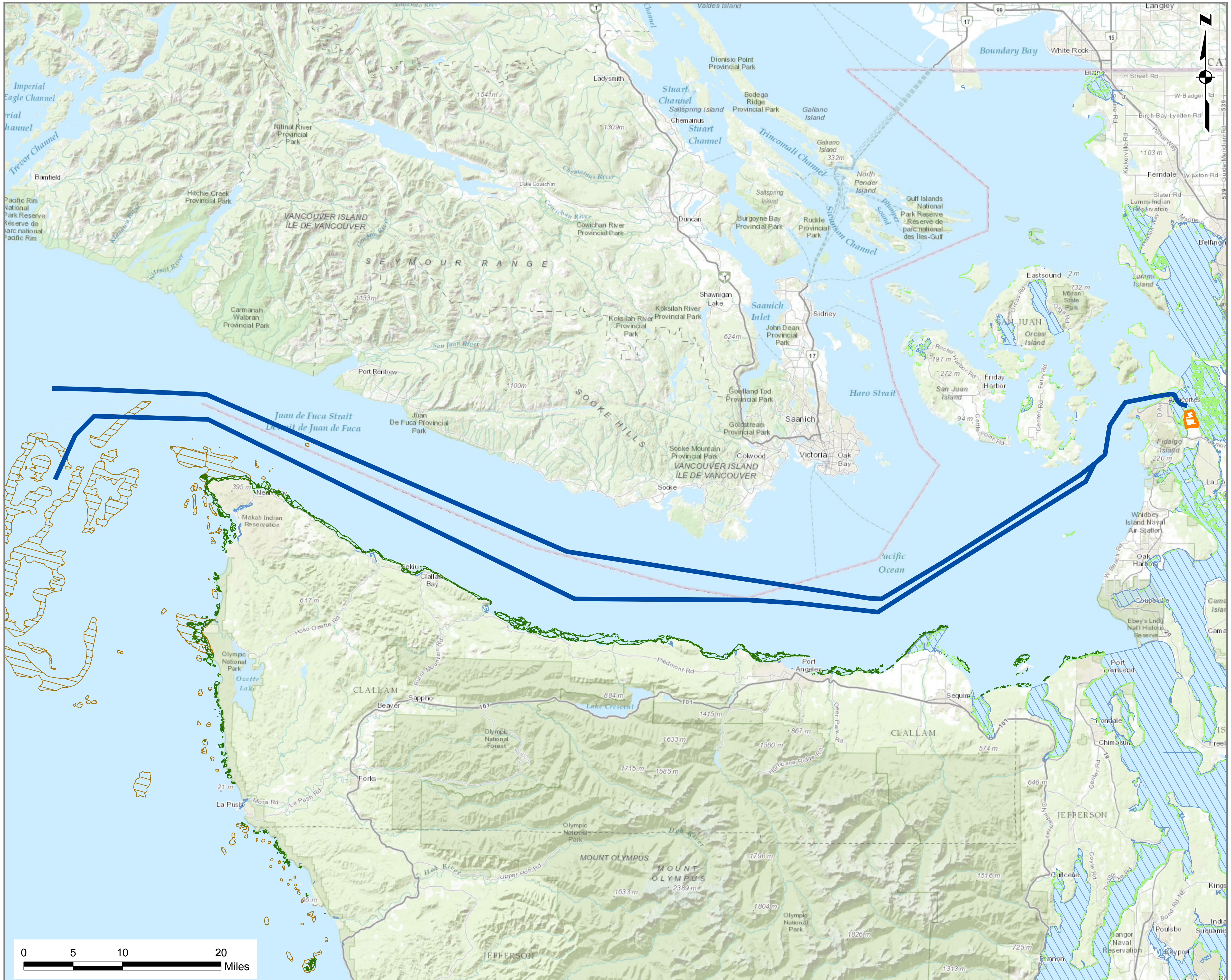
Anadromous bull trout (*Salvelinus confluentus*) juveniles migrate to estuarine and nearshore marine habitats during the spring (April through early June) and return to the lower portion of rivers and tributaries during the late summer and early fall (Nightingale and Simenstad 2001). While in nearshore environments, bull trout are typically found along the shoreline in less than 10 feet of water, although migrations across deeper areas are also undertaken (Nightingale and Simenstad 2001).

Therefore, the nearshore habitat adjacent to and including the proposed project area is conducive for bull trout presence. In addition, bull trout could be expected to use deep water habitats for migration and nearshore habitats for feeding and rearing throughout the study area.

Designated critical habitat for the species is defined as nearshore areas extending to the uppermost reach of the saltwater edge within tidally influenced freshwater heads of estuaries, and offshore to depths of 33 feet MLLW. Critical habitat for the species is present in the study area (see Figure 7-4).

North American Green Sturgeon

Green sturgeon (*Acipenser medirostris*) is an anadromous fish with a range that extends from Mexico to Russia, and from the Bering Sea to Ensenada, Mexico (Moyle 2002). Sub-adults and adults have been recorded in estuarine and marine habitats. The species typically occurs at depths of 40 m to 70 m (Erickson and Hightower 2007). The Southern DPS breeds only in California; however, adults occur in Puget Sound and the Strait of Juan de Fuca (NOAA 2009). Critical habitat for the Southern DPS is comprised of marine, coastal bay, estuarine, and freshwater areas. A portion of the study area is included in this designation, which extends from approximately Admiralty Inlet and the south end of San Juan Island west to the mouth of the Strait of Juan de Fuca.



Legend

- Tesoro Refinery Boundary
- Marine Vessel Transportation Route

Groundfish Habitat of Particular Concern

- Rocky Habitat
- Seagrass Habitat
- Kelp Habitat
- Estuary Habitat

Notes:
Groundfish Habitat of Particular Concern provided by NOAA Fisheries West Coast Region (2006)
Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-6
Habitat Areas of Particular Concern for Groundfish
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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7.3.3.9. Sea Turtles

One special status turtle species, the leatherback sea turtle (*Dermochelys coriacea*), was identified as having potential to occur in the study area (see Table 7-11). Leatherback turtles are found worldwide. On the west coast of the U.S., the species is primarily found in marine and nearshore habitats off the outer coasts of Washington, Oregon, and California, arriving from April to July and persisting until late November (Benson et al. 2011). The highest foraging activity and presence of leatherback turtles in Washington and Oregon has been recorded in continental shelf and slope habitat at a depth of 20 to 200 m, particularly for waters near the confluence of the Columbia River (Benson et al. 2011). The WDFW has designated state critical habitat for the species off the coast of the state of Washington, extending south from the Strait of Juan de Fuca (WDFW 2012). No state or federally designated critical habitat is mapped within the study area. Leatherback turtles may occur at the western limit of the study area, and may be uncommon visitors to other parts of the study area.

Table 7-11: Special Status Turtles

Species	Federal Listing		State Listing		Occurrence in Study Area
	ESA	Critical Habitat within Study Area	Species of Concern	EFH within Study Area	
Leatherback sea turtle *Dermochelys coriacea*	Endangered	No	Endangered	NA	The species may occur at the western limit of the study area, and may be uncommon visitors to other parts of the study area.

NA = Not applicable, because species is not eligible for listing

7.3.3.10. Marine Mammals

The MMPA protects all marine mammals. Examples of non-listed species that may occur in the study area include the following mammals:

- Pinnipeds such as the elephant seal (*Mirounga angustirostris*), California sea lion (*Zalophus californianus*), harbor seal (*Phoca vitulina*), and the eastern population of Steller sea lion (*Eumetopias jubatus*)
- Whales such as minke whales (*Balaenoptera acutorostrata*)
- Porpoise such as Dahl's porpoise (*Phocoenoides dalli*) and the harbor porpoise (*Phocoena phocoena*)
- The North American river otter (*Lontra canadensis*)

Marine mammals in the Salish Sea, some of which may be harvested by treaty tribes, include the sensitive and endangered species outlined in Table 7-12. These include humpback whale (*Megaptera novaeangliae*), gray whale (*Eschrichtius robustus*), the Southern Resident killer whale (*Orcinus orca*) subpopulation, sea otter (*Enhydra lutris*), and various pinniped species with haulouts in the study area. The humpback whale and Southern Resident killer whale are identified as culturally important species for the Coast Salish people (Gaydos et al. 2015).

Table 7-12: Special Status Marine Mammals

Species	Federal		State		Occurrence in Study Area
	ESA	Critical Habitat	Species of Concern	EFH in Study Area	
Humpback whale *Megaptera novaeangliae*	Endangered	No	Endangered	NA	The species may occur in the Strait of Juan de Fuca; however it is unlikely to occur in the eastern portion of the study area.
Gray Whale *Eschrichtius robustus*	NL	NA	Sensitive	NA	The species may occur in the Strait of Juan de Fuca; however, it is unlikely to occur in the eastern portion of the study area.
Southern Resident killer whale subpopulation *Orcinus orca*	Endangered	Yes	Endangered	NA	Pods of the subpopulation may occur throughout the study area in late spring, summer, and fall.
Sea otter *Enhydra lutris*	Of Concern	NA	Endangered	NA	Sea otters may occur in the western portion of the study area, but would be uncommon.

NA = Not applicable, because species is not eligible for listing; NL = Not listed

Humpback Whales

In Washington, humpback whales are most common from July through September. The whales then spend their winters breeding and calving off Hawaii, Mexico, and Japan (Calambokidis et al. 1997, 1999). Humpback whales are found in coastal and oceanic waters, and they prefer to feed on the shelf break or continental slope. They also follow migration routes in deep water along coasts or submarine mountains (NOAA 2013). Individuals do visit inner coastal waters. For example, one whale was observed in Hood Canal south of the study area from late January through February in 2012.

It is possible that humpbacks may visit the proposed project area vicinity, but their presence would be unusual and brief. The presence of humpback whales would be more common in the deeper waters with schooling fish in the Strait of Juan de Fuca and the western edge of the study area where it meets the open ocean.

Gray Whale

Gray whales occur in the North Pacific. North American whales migrate south to Mexico each fall and winter in Mexico. The whales migrate north between March and June. Most spend the summer feeding in the northern Bering and Chukchi seas, although some are observed in summer feeding in waters of Southeast Alaska, British Columbia, Washington, Oregon, and California (NOAA 2017). Gray whales have been recorded in the Strait of Juan de Fuca (NOAA 1998, 2006a; Gosho 2003). Individual gray whales may use habitat in the Strait of Juan de Fuca, although are unlikely to occur in the study area’s eastern portion.

Southern Resident Killer Whales

The known range for the Southern Resident killer whales extends from central California to the Queen Charlotte Islands off northern British Columbia (NMFS 2008). Three pods, identified as

J, K, and L, are regularly present in the Salish Sea during the late spring, summer, and fall (NMFS 2008). During this time, killer whale activity is concentrated from the south side of San Juan Island through Haro Strait to North and South Pender islands and Boundary Passage. Less time is generally spent by killer whales elsewhere, including other sections of the Georgia Strait, Strait of Juan de Fuca, and San Juan Islands and the Southern Gulf Islands, Rosario Strait, Admiralty Inlet west of Whidbey Island, and Puget Sound (NMFS 2008). Winter and early spring movements for this population are generally unknown; however, killer whales are not normally observed in the Salish Sea, and therefore are not likely to occur in the study area during this time (NMFS 2008).

Critical habitat for the species is present in the study area, and is shown on Figure 7-4.

Sea Otters

Otters currently occupy rocky habitats along the outer coast of the Olympic Peninsula from Destruction Island north to Tatoosh Island, at the mouth of the Strait of Juan de Fuca. Groups of otters have been observed using areas in the western side of the Strait of Juan de Fuca during fall and winter months; however, few sea otters were observed east of Cape Flattery (on the western edge of the Strait of Juan de Fuca) since 2000 (Laidre et al. 2009). It is therefore expected that sea otters would be uncommon in the study area.

Pinniped Haulout Sites

Critical area regulations in the state of Washington and the GMA designate important marine mammal haulout sites as priority habitat (see Section 7.1). A description of the marine mammal species that use haulout sites in the study area is provided in Table 7-13. The nearest haulout site is located approximately 2,000 feet from the wharf and 1,100 feet from the causeway. Haulout sites near the proposed project area are shown on Figure 7-7.

Table 7-13: Pinniped Haulout Site Description

Species	Species Description	Haulout Site Description
Harbor seal *Phoca vitulina richardsi*	Harbor seals have the widest distribution of any pinniped and are found throughout the northern hemisphere in temperate and arctic environments.	Harbor seals use hundreds of sites in coastal and nearshore habitats to rest or haulout, including intertidal sand bars, estuarine mudflats, intertidal rocks and reefs, sandy, cobble, and rocky beaches, islands, logbooms, docks, and floats throughout the study area (WDFW 2000).
Steller sea lion *Eumetopias jubatus*	Steller sea lions are divided into two DPS: the eastern DPS (which occurs within the study area) and the western DPS (which occurs west of Alaska).	Steller sea lion haulout sites can be found primarily along the coast from the mouth of the Strait of Juan de Fuca south to the Columbia River, as well as on the Vancouver Island side of the Strait of Juan de Fuca (WDFW 2000). Sea lions often use jetties, offshore rocks, and coastal islands for haulout sites.
California sea lions *Zalophus californianus*	California sea lions are the most commonly spotted eared seal in waters of the state of Washington. Male sea lions migrate to northwest waters while females remain in waters near breeding rookeries off the coast of Mexico and California (WDFW 2000).	Haulout sites for this species occur throughout the study area, including the Strait of Juan de Fuca and Puget Sound. In general, haulout sites are located on jetties, offshore rocks, islands, logbooms, marina docks, and navigation buoys.

Species	Species Description	Haulout Site Description
Northern elephant seals *Mirounga angustirostris*	Elephant seals are the largest pinniped found in state of Washington waters. Individual elephant seals can occasionally be found in Washington inland waters following the winter breeding season in Mexico and California.	Potential haulout locations in the study area include Smith/Minor islands (southwest of the proposed project area) and the Dungeness Spit in the Strait of Juan de Fuca (WDFW 2000).

Notes:
Pinniped data provided by Washington Department of Fish and Wildlife (2015).
Source:
ESRI Topographic Web Mapping Service
NAD 1983 UTM Zone 10N

Figure 7-7
Sea Lion Haulout Sites Adjacent to the Proposed Project Area
Tesoro Anacortes Refinery
Clean Products Upgrade Project
Draft Environmental Impact Statement
Anacortes, Washington

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7.4. POTENTIAL IMPACTS ON MARINE AND NEARSHORE RESOURCES

This section evaluates the potential direct and indirect impacts on marine and nearshore resources as a result of construction and operation of the proposed project and of the no action alternative. This section also includes an evaluation of unplanned events, such as spills. The impacts analysis is presented below and is summarized in Section 7.4.3.3.

7.4.1. Impacts on Marine and Nearshore Resources from Construction

Activities associated with construction of the proposed project that could impact marine and nearshore resources would primarily occur in the vicinity of the refinery wharf but could also occur from construction activities within the upland portions of the refinery. Impacts on marine and nearshore resources from construction could occur from operation of the spud barge, marine vessel strikes, and wakes from the spud barge or safety boat, effluent from the WWTP, and increased noise from construction activities at the wharf and within the refinery.

Installation of the proposed DSU and 3-inch natural gas line on the wharf would require operation of an ATB (comprising a tugboat and spud barge) and one small safety motor boat. The spud barge and an associated crane would be operated adjacent to the wharf primarily to install the two new skid-mounted units for the DSU. The tugboat would be used for initial spud barge placement and removal. After the initial placement and before operation of the mounted crane, individual spuds (vertical steel shafts or pipes connected to the bottom of the barge that can be hydraulically extended and driven into the seabed to provide stability) would be deployed to secure the barge to the seabed. The spuds would be hydraulically extended into the seafloor adjacent to the wharf and the barge would remain moored to the wharf for up to two weeks during DSU installation.

The safety boat would be operated at a low speed along the causeway during construction. If mooring was required, it would be tied to the pilings on the wharf/causeway and not anchored in areas with marine vegetation. Construction activities for the proposed three-inch natural gas line would occur on the existing wharf and causeway over the water. The natural gas line would be installed as an extension from the existing line at the refinery along the full length of the wharf system. Scaffolding would be installed temporarily on the wharf to support construction activities.

These activities would occur within and over navigable waters of the U.S. This would trigger a requirement for a permit under Section 10 of the RHA. Tesoro would obtain the relevant permit prior to commencing construction, and would be required to comply with the conditions of the permit.

7.4.1.1. Operation of the Spud Barge

Deployment of the spuds (vertical shafts) from the spud barge into the seafloor would directly disturb the benthic habitat in the area of the spuds adjacent to the wharf system. In addition, extension and retraction of individual spuds would potentially temporarily increase turbidity from suspended sediment in marine waters adjacent to the wharf system. Both of these activities could result in temporary habitat degradation and injury or mortality of marine species from direct seafloor disturbance and indirectly by increasing turbidity in the vicinity of the disturbance.

Direct impacts on the seafloor would be localized within the footprint of the spuds as they are extended into the seafloor. The limited extent would minimize disruption to the benthic habitats present in the area. Once the spuds are extracted, microorganism communities adjacent to the disturbance would provide a productive source of recolonizing organisms for the areas of disturbance where the spuds were removed. Productivity would be expected to return to pre-spud conditions within days or weeks after the individual spuds are retracted.

The potential increase in turbidity from suspended sediment generated during extension and retraction of individual spuds would occur in a limited area around each spud and would be expected to last for no more than a 24-hour period during the spud extension and again during the retraction. Increased turbidity could cause injury or mortality of juvenile fishes that occupy the marine and nearshore habitat in the spud vicinity; however, these fishes may also disperse from the area and thus avoid mortality. Increased turbidity can impact the gill function of fish, particularly juvenile fish, degrade spawning beds and suitable habitat, and reduce food supplies available to fish. Mobile species of fishes would likely avoid the areas with increased levels of turbidity, thereby avoiding direct impacts from increased turbidity. Increased turbidity can also reduce light penetration to the seafloor and shade habitat, if present.

Operation of the spud barge and spud placements would occur adjacent to the wharf in water deeper than 50 feet MLLW. Eelgrass and other species of macroalgae are not present in water this deep (see Section 7.3.3.1). Therefore, direct disturbance from spud extension into the seafloor would not impact marine vegetation. Similarly, indirect impacts from increased turbidity such as sedimentation or reduced light penetration in the water column would occur primarily in the spud barge vicinity, at 50 feet of depth and over 500 feet northwest from documented eelgrass and macroalgae habitat. Increased turbidity would be localized and would not be expected to result in significant impacts on marine vegetation. According to the Washington State Surface Water Quality Criteria for extraordinary quality (Table 7-2), the one-day maximum turbidity allowed as a result of human actions would be: 5 nephelometric turbidity units over background when the background is 50 nephelometric turbidity units or less; or a 10 percent increase in turbidity when the background turbidity is more than 50 nephelometric turbidity units. The use of the spud barge is not expected to exceed these limits, due to the limited extent of suspended sediment and the limited duration of the disturbance.

In-water work would be conducted within regulated in-water work windows to protect juvenile salmon, bull trout, rockfish, lingcod and forage fishes potentially spawning in the habitats adjacent to the wharf system. These windows are based on juvenile salmonid out-migrations into the estuary and spawning times for important forage fish species. Work would be conducted within this window such that temporary increases in turbidity associated with proposed project construction would not occur during a time when these species would be in the area. In addition, as required by WDFW, a survey for the presence of surf smelt eggs adjacent to the wharf system would be completed prior to beginning construction of the proposed project. If incubating surf smelt eggs are found, then no work would be conducted during the two weeks following the survey to allow a two-week incubation period for hatching of the smelt. After two weeks, the area of in-water work would need to be surveyed again and construction of the proposed project would begin, or be delayed, depending on the results. These surveys would continue every two weeks until no surf smelt eggs are found.

The proposed location and short duration (two weeks) of construction activities would minimize the disruption to the benthic habitats and potential direct and indirect impacts on marine species and associated habitat in the vicinity of the wharf system. Habitat degradation would be minimal due to the distance of marine vegetation from construction activities and temporary nature of the activities. Operation of the spud barge in compliance with marine aquatic life water quality criteria and only during the approved in-water work window would reduce potential impacts on juvenile and adult fishes by avoiding in-water work during out-migrations and spawning times. Therefore, potential direct and indirect impacts on marine and nearshore resources due to construction of the proposed project would be ***less than significant***.

7.4.1.2. Marine Vessel Strikes

In addition to the operation of the spud barge, additional in-water activity would include the operation of a tugboat and a small safety motor boat. The tugboat would be used for initial placement and removal of the spud barge. The safety boat would be deployed along the causeway and operated at a low speed along the causeway during construction. If mooring was required, the vessels would be tied to the pilings on the wharf structure. The vessels would operate in areas of deep water (50 feet or deeper) adjacent to the wharf, where communities of kelp and eelgrass are not present. Floating clumps of dislodged vegetation that has migrated to deep water could be damaged by direct contact with a propeller. Dislodged kelp or eelgrass would no longer be considered alive; however, it could still provide habitat for microorganisms, juvenile fishes, and other marine species.

Additionally, marine mammals could come into contact with the propellers from the marine vessels used during construction, resulting in injury or mortality from the vessels strikes. It would be possible but not expected to have species of whale near the refinery wharf and causeway. Pinniped haulout sites have also been identified in the vicinity of the wharf system; however, the operation of a spud barge and construction vessels would result in a negligible increase in marine vessel traffic in the study area. In addition, the vessels would be operated at low speeds and would be stationary for periods of time during construction of the proposed project. In-water work (i.e., deployment and retraction of spuds) would be performed during an approved in-water work window. Potential impacts would be temporary, lasting less than t weeks for the operation of the spud barge and tugboat, and up to 6 months for construction of the DSU and natural gas line that would require use of the safety boat.

Therefore, direct and indirect impacts from marine vessel strikes on marine species and associated habitat in the area adjacent to the wharf and causeway would be ***less than significant***.

7.4.1.3. Marine Vessel Wakes

Operation of the ATB and safety vessel during construction of the proposed project would create wakes that would subsequently lose their energy in nearby intertidal and estuary habitats, including the eelgrass bed immediately adjacent to the causeway Potential direct impacts would include stranding of marine vegetation or organisms above the OHWM, which would result in injury or mortality. Indirect impacts would include damage to substrate and vegetation that would be used as spawning habitat for marine species, such as forage fish.

In-water work for construction of the proposed project (i.e., deployment and retraction of spuds) would occur during an approved in-water work window when juvenile salmon, bull trout, and forage fishes are not likely to be spawning in the habitats adjacent to the wharf system. Surveys would be completed for the presence of forage fish spawning in the adjacent intertidal areas and, if present, in-water work would be stopped accordingly. In addition, the vessels would be stationary for long periods of time, and when needed, they would be operated at low speeds to reduce potential impacts from wakes.

Wakes generated from the operation of marine vessels during construction of the proposed project would be minimal and would result in a negligible increase in wakes near the wharf and causeway compared to existing conditions. In addition, potential impacts from wakes during construction would be temporary, persisting only periodically until construction of the proposed project is complete. Therefore, the impact of wakes generated during construction of the proposed project on marine and nearshore resources in the area adjacent to the wharf system would be ***less than significant***.

7.4.1.4. Release of Sediment to Coastal Waters

In the absence of any controls, construction activities at the proposed project area could lead to a release of sediment-laden stormwater to coastal waters. Increased turbidity from sediment-laden runoff could degrade nearshore habitat, and cause direct injury or mortality to marine invertebrates, juvenile fishes, and marine vegetation.

As described in Chapter 5, Freshwater Resources, stormwater within the developed portions of the refinery drains to the stormwater sewer (SWS) and oily water sewer (OWS) systems, which route stormwater to the WWTP for treatment (see Appendix 2-B, NPDES Permit, Section 1.9). The treated water is then discharged to Fidalgo Bay via Outfall 001 at the end of the wharf, as prescribed in the refinery's NPDES Industrial Wastewater Discharge Permit (see Figure 1 in Appendix 2-A, Existing Programs and Operations, and Permit WA0000761 in Appendix 2-B). A separate emergency outfall (Outfall 002) is also regulated under the permit. Any sediment-laden runoff released from proposed project components located within the developed portions of the refinery (VCU, NHT, Isom Unit, and ARU) would be captured by this existing system. The WWTP has sufficient capacity to manage any increased sediment load during construction, and discharges would be monitored to verify water is sufficiently treated prior to discharge (see Section 7.4.2.4).

For proposed project components located outside the developed portions of the refinery (the New Tanks Area, potential temporary laydown area, and North Texas Road Refinements), erosion and sediment control measures would be implemented to avoid the release of sediment-laden runoff to coastal waters. These include: installation and maintenance of temporary silt barriers such as reinforced silt fences and check dams; erosion prevention measures, such as covering soil stockpiles and dust suppression; and dewatering controls. Measures would be documented in a project-specific construction Stormwater Pollution Prevention Plan (SWPPP) and a temporary erosion and sediment control (TESC) Plan. Further information is provided in Chapter 5, Section 5.3.2, Potential Impacts on Surface Water; Chapter 2, Proposed Action and Alternatives; and Appendix 2-B. The proposed project components located outside developed portions of the refinery are approximately 0.25 mile from the shoreline. In the unlikely event that erosion and sediment control devices failed at these areas, sediment would be expected to be deposited in grassed areas prior to reaching marine waters.

Based on use of the existing SWS and OWS systems, the implementation of erosion and sediment control measures, and the distance of proposed project components from the coastline, it is considered unlikely that sediment-laden stormwater would enter coastal waters or the estuarine wetlands of Padilla and Fidalgo bays, either via sheet flow or through Outfall 001. Therefore, direct and indirect impacts on marine and nearshore resources due to sediment laden runoff from construction of the proposed project would be ***less than significant***.

7.4.1.5. Noise

Noise can directly and indirectly impact marine wildlife through the following mechanisms:

- Airborne noise can disturb pinnipeds at haulout sites, and in severe cases can cause stampedes which lead to injury or mortality of some individuals.
- High intensity, short-duration noises, such as noise from pile driving, seismic surveys, and military sonar activities, can lead to hearing loss or other injury in marine wildlife.
- Underwater noise sources can indirectly impact the health and behavior of marine wildlife by:
  - Causing elevated stress levels
  - Masking communication, such as mating calls and echolocation used for navigation and hunting
  - Masking sounds made by prey or predators, which can impact hunting success and potentially cause stress to prey due to perception of increased risk of predation
  - Causing animals to avoid the noisy area, resulting in indirect habitat loss
  - Startling wildlife

During construction, noise would be generated at the wharf by construction activities on the wharf, operation of marine vessels, and use of the spud barge (see Table 7-14). These noise sources would occur in addition to regular noise from wharf from existing operations.

Table 7-14: Sources of Noise during Construction

Activity Category	Activity	Duration
Terrestrial work	Operation of the barge-mounted crane to unload equipment, materials, and supplies	2 weeks
	Operation of additional machinery for installation of the DSU and natural gas line on the wharf and causeway.	Approximately 6 months
	Construction activities associated with the terrestrial components of the proposed project	Approximately 19 months
In-water activities	Operation of an ATB and safety vessel	Approximately 6 months
	Extension and retraction of spuds into the seabed to secure the barge, if extra stability is required	Less than 1 day, on two occasions

Airborne noise from terrestrial-based construction work is not expected to impact marine wildlife underwater. Airborne noise could be detected by pinnipeds above water at nearby haulout. Three haulout locations have been documented adjacent to the wharf system, with the nearest located approximately 2,000 feet from the wharf and 1,100 feet from the causeway. The proposed construction activities are considered unlikely to substantially disturb pinnipeds at these haulout locations, as pinnipeds at these locations would be accustomed to existing noise disturbance at the refinery.

Underwater noise from operation of the ATB and safety vessel as well as spud deployment could be heard by marine wildlife underwater. A key concern from underwater noise is the risk of impacts on the hearing ability of marine wildlife. Impacts on hearing typically occur as a result of high-intensity, short duration noises such as pile driving, seismic surveys, and military sonar activities (Merchant et al. 2012). Operation of the ATB and safety vessel, and deployment of spuds, would not produce high-intensity, short duration noises. Instead, noise from these activities would be similar to existing noise from marine vessels docking at the wharf. Therefore, noise from construction of the proposed project would not cause temporary or permanent changes in the hearing ability of marine wildlife.

Measuring Noise

Underwater sound amplitude is measured in decibels (dB) relative to a fixed reference pressure. For this discussion, noise is relative to a pressure of 1 μPa.

The unit μPa refers to micropascal, a measure of pressure

The unit 'dBrms' refers to the average sound pressure level over the duration of a noise event.

The unit 'dB_{peak}' refers to the maximum instantaneous sound pressure level of a noise event.

Modeling indicates underwater noise would attenuate to background levels within approximately 0.08 mile for fish, 0.26 mile for pinnipeds, and up to 0.35 mile for cetaceans (see Appendix 2-A). Outside of these ranges, noise from construction would not impact marine wildlife. Within these ranges, noise emitted from construction activities could exceed behavioral thresholds defined for fish, cetaceans, and pinnipeds (see Table 7-15). Exceedance of these thresholds could cause marine wildlife to avoid the area, effectively temporarily reducing the area of available habitat for the species, inhibit communication between individuals and cause stress during the construction period.

Table 7-15: Underwater Noise Thresholds for Marine Mammals and Fish

Functional Hearing Group	Underwater Noise Behavioral Thresholds [a] (dBrms)	Underwater Noise Thresholds for Permanent Changes in Hearing (dB_{peak})[b]
Low-frequency cetaceans	120	230
Mid-frequency cetaceans	120	230
High-frequency cetaceans	120	202
Phocid pinnipeds	120	230
Otariid pinnipeds	120	230
Fish[c]	150	No data

[a] NOAA Undated. The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level.
[b] NOAA 2015
[c] WSDOT 2016

Table 7-16: Approximate Noise of Current and Proposed Activities at the Wharf

Activity Type	Activity	Approximate Sound Generated (dBrms re: 1µPa at 1 m)
Current Activity	Large commercial vessel operation	181.0
Proposed Activities	Tugboat operation	163.8
	Safety vessel operation	162.0
	Deploying Spuds into the seabed	164.3

Note: See Appendix 7-A, Noise Attenuation Modeling Results, for a description of the metrics presented here.

Underwater noise associated with construction would be slightly lower in intensity compared to the noise sources from current operations/sources (Table 7-16). Because marine wildlife around the wharf are already exposed to similar noise intensities as those that would be generated during construction, wildlife sensitive to this disturbance would likely already avoid the area. Therefore, indirect habitat loss as a result of avoidance would not be expected to occur as a result of the proposed project during construction. The marine wildlife continuing to use the area are likely accustomed to this level of noise intensity, so this wildlife would not likely be further disturbed by additional noise sources of the same intensity. Further, disturbance from construction noise would be temporary: the tugboat and safety vessel would only operate as needed during construction, and the spuds would be deployed only on one occasion.

Based on the similar intensity of construction noise to existing noise sources at the wharf, the temporary nature of noise disturbance (intermittent over a 6-month period), and the relatively small geographic extent of noise disturbance (noise would attenuate to background levels within 0.35 mile of the source), the impacts of construction of the proposed project on marine wildlife would be ***less than significant***.

7.4.2. Impacts on Marine and Nearshore Resources from Marine Vessels and Operation

Activities associated with operation and maintenance of the proposed project that could impact marine habitat would occur throughout the study area, including within the refinery boundary and along the marine vessel transportation route. Activities within the refinery boundary (specifically, the wharf) would include the loading/unloading of reformate feedstock and xylene products, and the operation of new units and equipment associated with the proposed project. Along the marine vessel transportation route, impacts could result from an additional five marine vessels traveling to and from the refinery wharf per month (60 vessels per year). Based on historic marine vessel traffic data for specific waterways in the study area, the proposed project would increase large vessel activity in the study area by:

- 1.3 percent in the Strait of Juan de Fuca compared over current levels
- 2.2 percent at the southern end of Rosario Strait over current levels
- Less than 0.1 percent at Guemes Channel over current levels

See Chapter 13, Marine Transportation, for further detail.

7.4.2.1. Damage to Marine Vegetation due to Marine Vessel Operation

Potential impacts on vegetation from marine vessel traffic include destruction of floating marine vegetation due to propeller strike and destruction of non-floating vegetation due to operation of vessels in shallow water or anchoring.

Vessels associated with the proposed project would not operate in shallow areas that support kelp or eelgrass communities, and marine vessels would not be anchored in areas with sensitive habitat or species such as eelgrass beds or kelp beds.

The proposed project may result in damage to floating vegetation due to propeller strike. This could include kelp or eelgrass that has been dislodged and, while no longer alive, would continue to provide habitat values, as well as naturally floating vegetation, such as floating kelp or macroalgae. Damage to floating vegetation would be limited to vegetation present within the direct path of vessel traffic. Therefore, the impact of the proposed project on marine vegetation due to marine vessel operation would be ***less than significant***.

7.4.2.2. Marine Vessel Strikes

Gray whales, fin whales, humpback whales, and minke whales occur in the Strait of Juan de Fuca and the Salish Sea and may be vulnerable to marine vessel strikes (NOAA 2017). Vessel strikes have been shown to disproportionately impact fin whales, with less evidence of vessel strike for gray and humpback whales despite higher numbers of these species in waters off the state of Washington (Douglas et al. 2007). In addition, leatherback sea turtles may occur in the western portion of the study area. Fishes considered in this assessment are agile and are considered unlikely to be at risk of marine vessel strike.

An increase in the number of vessels transiting the study area would increase the potential for vessel strikes on marine mammals, although the proposed project is not expected to represent a significant increase in risk based on an increase of 2.2 percent or less that the proposed project would increase large marine vessel traffic in the study area compared to current levels.

NOAA recommends measures for operators or large vessels to avoid marine mammal strike, such as listening to advisory notices and reducing speeds while in advisory zones or areas of high whale abundance (NOAA undated). The risk of injury or mortality of marine wildlife due to vessel strike cannot be completely eliminated. However, based on the number of additional vessels operating as a result of the proposed project (five vessels per month), it is considered unlikely that the proposed project would result in injury or mortality of a marine mammal. Therefore, the impact of the proposed project on marine and nearshore resources due to vessel strikes throughout the study area would be ***less than significant***.

7.4.2.3. Marine Vessel Wakes

Vessels currently transiting the study area would create wakes that result in waves dissipating energy in the intertidal and estuary habitats. Estuarine and marine wetlands with diverse and sensitive habitats are present along shorelines throughout the study area. Potential direct impacts include stranding of marine vegetation or organisms above the high water mark, which would result in injury or mortality. Indirect impacts would include damage to substrate and vegetation that would be used as spawning habitat for marine species, such as forage fish.

Marine vessels would travel within established vessel traffic lanes described in further detail in Chapter 2, Proposed Action and Alternatives, and Chapter 13, Marine Transportation. For safety, marine vessels are typically operated at low speeds in sheltered areas, and this would help to reduce the intensity of wakes in these areas. The addition of five marine vessels traveling to and from the refinery wharf per month is unlikely to result in perceivable change from the baseline wake conditions due to the current level of shipping activity and natural waves that occur in the study area. Therefore, the impacts of operation and maintenance of the proposed project on habitat in the marine environment and throughout the study area would be ***less than significant***.

7.4.2.4. Increased Effluent Discharge

The refinery operates an existing WWTP that currently removes contaminants from wastewater streams and stormwater prior to being discharged to Fidalgo Bay via Outfall 001 at the end of the wharf as prescribed in the refinery's NPDES Industrial Wastewater Discharge Permit (see Permit WA0000761 in Appendix 2-B). The proposed project would increase the volume of wastewater processed through the WWTP by introducing ballast water from approximately five additional marine vessels per month, and increasing the area of impervious surface within the refinery. Impervious surfaces do not allow stormwater to infiltrate to groundwater, and therefore the stormwater would be routed through the WWTP. The proposed project would increase impervious surfaces by 15.18 acres, equivalent to a 1.5 percent increase within the Tesoro Anacortes Refinery facility.

An increase in effluent discharge could potentially impact marine and nearshore resources by changing water quality around the outfall. In a worst-case scenario, direct impacts from a change in water quality could include injury or mortality of microorganisms, invertebrates, and marine vegetation in the vicinity of the outfalls, resulting in indirect impacts on marine species that depend on these resources for food, shelter, or prey. However, the WWTP has sufficient capacity to process the additional volume of wastewater generated by the proposed project and measures are in place to enable and verify compliance with the refinery's NPDES permit. Compliance with the NPDES permit would avoid degrading water quality from existing baseline conditions at the outfall.

Wastewater and stormwater from the proposed project would be treated at the WWTP to remove potential contaminants and would be discharged via the same outfall as prescribed in the refinery's NPDES permit. The NPDES permit identifies two mixing zones, acute and, chronic in the marine waters adjacent to the refinery's outfalls:

- The acute mixing zone encompasses an area from the seabed to the water surface in a circle extending from the point of discharge out to a radius of 23 feet.
- The chronic mixing zone encompasses an area from the seabed to the water surface in a circle extending from the point of discharge out to a radius of 225 feet.

The effluent discharged to Fidalgo Bay would adhere to the chronic and acute aquatic life criteria from Ecology discussed in Section 7.1.1, as required by the NPDES. Routine monitoring of wastewater discharge quality and periodic monitoring for specific toxic or polluting chemicals are currently and would continue to be undertaken. Through routine visual observations and analytical testing, the operator of the WWTP is able to detect contamination that may be indicative of a plant upset or spill. As a minimum, effluent discharged to Fidalgo Bay would be monitored for the following parameters under the refinery's NPDES permit to confirm that effluent meets discharge quality requirements:

- Biochemical oxygen demand (5-day)
- Chemical oxygen demand
- Total suspended solids
- Oil and grease
- Phenolic compounds (stormwater only)

Based on effective treatment and monitoring of effluent, and the expected increase in effluent from the project in comparison to existing effluent discharge, the impact on marine and nearshore resources from increased effluent from the proposed project would be ***less than significant***.

7.4.2.5. Introduction of Invasive Species

The release of ballast water into the marine environment has the potential to introduce non-native marine or estuarine species. However, ballast water would be directed to the WWTP, which would remove non-native marine or estuarine species, prior to discharge. The volume of ballast water received by the refinery would not be limited by the terms of the refinery's NPDES permit. Procedures are in place to route ballast water from marine vessels to the WWTP, without release to water. Reception facilities for ballast water and slop oil are located at the east side of the wharf. Marine vessels arriving with ballast water, tank washings, and discharge slop would use hoses to offload ballast water to the wharf. Ballast water would then be transferred through pipes to a 50,000 bbl storage tank within the refinery. From the storage tank, the ballast water would go to the on-site WWTP and would be treated prior to discharge.

Therefore, the proposed project is unlikely to release invasive species from ballast water into the marine environment, and impact from invasive species introduction would be ***less than significant***.

7.4.2.6. Noise

Noise can directly and indirectly impact marine wildlife through a number of mechanisms, as described in Section 7.1.1.1. Operation of the proposed project would generate airborne noise from operation of the proposed facilities at the refinery wharf and causeway and underwater noise from operation of an additional five marine vessels per month within the marine vessel transportation route.

Ambient (airborne) noise levels adjacent to the wharf system are currently elevated compared to natural ambient noise levels due to the existing operation of the adjacent industrial facility. The new 3-inch natural gas line and DSU are the closest portions of the proposed project to the marine environment, and Tesoro has sited other components of the proposed project more than 200 feet upland of the marine and nearshore environment. Airborne noise contributions from these sources would be negligible, particularly in consideration of the existing ambient noise at the refinery.

A key concern from underwater noise sources is the risk of impacts on the hearing ability of marine wildlife. Merchant et al. (2012), note that "high-intensity, short-term events such as seismic surveys, pile-driving operations and military sonar activities have been the focus of considerable attention due to their potential to cause physical injury and temporary or permanent loss of hearing sensitivity in marine mammals." The proposed project would not involve high-intensity, short-term events, and underwater noise sources would be limited to operation of marine vessels. The peak sound pressure level from operation of a large loaded marine vessel is 190 dB re 1 micropascal (μPa) at 1m from the source (Wyatt 2008). This is below the thresholds defined for onset of permanent changes in hearing of marine mammals (NOAA 2015) (see Table 7-15. The sound pressure level would be lower at greater distances from the vessel (i.e. the sound would be loudest close to the noise source, but would be quieter when listening from further away).

Less intense noise sources, such as marine vessel operation, can elicit behavioral responses. Underwater noise from marine vessel operation associated with the proposed project could exceed behavioral thresholds defined by NOAA (see Table 7-15) within approximately 1 mile of marine vessels for fish, approximately 3.5 miles for pinnipeds, and up to approximately 5 miles for cetaceans (see Appendix 7-A, Noise Attenuation Modeling Results). Within these ranges, the intensity of underwater noise generated from marine vessels associated with the proposed project would be consistent with noise currently generated from shipping activities in the Salish Sea. Beyond these ranges, noise would attenuate to background levels, and noise associated with the proposed project would have negligible impact on marine wildlife. Annual marine vessel call data for the entire Salish Sea provided in Chapter 13, Marine Transportation, identifies an annual average of 2,915 large commercial vessels and 597 tank ships. In addition, the USCG tracks approximately 170,000 ferry transits of the Salish Sea annually, which represents 74 percent of all transits.

Because marine wildlife in the marine vessel transportation route are already exposed to noise from large vessels within the same intensity ranges, wildlife sensitive to this disturbance would likely already avoid the area. Therefore, operation of marine vessels associated with the proposed project would not result in indirect habitat loss as a result of avoidance. Some wildlife continuing to use the area may be accustomed to this type of disturbance and therefore would be expected to be resilient to additional noise from marine vessels. However, other wildlife species are currently impacted by noise from the existing high levels of shipping traffic in the Salish Sea.

Noise generated from marine vessels associated with the proposed project would be intermittent, with only temporary exposure at any given location along the marine vessel transportation route. For example, if the five additional marine vessels per month each spend 10 hours travelling to and from the wharf, marine vessels would be generating noise in the study area for 50 hours per month. This is less than 0.1 percent of the hours in a month, and, based on the large size of the marine vessel transportation route, noise generated at any given location along the marine vessel transportation route would occur for even less than 0.1 percent of the month. In addition, the increase of five marine vessels per month is equivalent to a 0.1 to 2.2 percent increase in marine vessel traffic along these transportation routes – which would not be considered a significant increase in marine vessel traffic over current levels.

In summary, noise from operation of marine vessels associated with the proposed project has potential to disturb behavior of fish, pinnipeds and cetaceans within 5 miles of the marine vessels. However, due to the short duration of disturbance, marine vessel operation is unlikely to impact behavior of marine wildlife to an extent that would reduce the viability of a population of a marine wildlife species. Therefore, impacts on marine wildlife from noise during operation of the proposed project would be ***less than significant***.

7.4.3. Impacts on Marine and Nearshore Resources from Marine Spills

7.4.3.1. Marine Spills during Construction

Spills during construction could occur due to release of fuels, chemicals, or debris from operation of equipment on the wharf/causeway. Debris could originate from welding, sand blasting, and other activities required for construction of the new natural gas line and DSU. Even in the absence of controls, these leaks would be of a small scale and localized, but would have potential to impact water quality surrounding the wharf. Potential impacts of a spill during construction include damage to marine vegetation, health impacts on wildlife due to dermal contact or ingestion of chemicals, and habitat degradation.

Measures would be in place to reduce the likelihood of spills during construction. For example, vehicles and equipment would be inspected and maintained regularly. During work in and over the water, secondary containment structures, screens and temporary scaffolding would be in place to prevent release of contaminants or debris to water. Welding and coating activities would be performed onshore or on the causeway road and later lifted into position, to minimize activities performed over the water.

Considering implementation of these measures, any spills that might occur would be expected to be small volume, and restricted to the immediate vicinity of the wharf. Impacts would be temporary, as the spill would either be cleaned up, or chemicals would dissipate naturally. Therefore, impacts on marine resources from spills during construction of the proposed project would be ***less than significant***.

7.4.3.2. Marine Spills during Operations

Exposure Pathways

Impacts on marine and nearshore resources from a marine spill during operation are dependent on the exposure pathways of the spill materials to the resources. An exposure pathway describes the way that organisms come into contact with a chemical. At the point of exposure, a chemical can enter the body by inhalation, ingestion, or direct contact or it can be inhaled if an organism takes a breath and the chemical is present in the air. A chemical can be ingested by incidentally swallowing the chemical while the organism is eating its prey or grooming itself, and can also be ingested if it has bioaccumulated in the tissues (i.e., the chemical has concentrated in the tissues) of the organisms' food and the organism eats this contaminated food. A chemical can also come into contact with the exterior of the organism which results in direct contact exposure, also known as dermal exposure.

Adverse impacts can only occur if an exposure pathway is considered complete (i.e., the chemical can reach the potentially impacted population) and the concentration is sufficient at the point of exposure to result in an adverse impact. The exposure pathways by which xylenes or reformate spills could reach ecological populations in the event of a marine spill during construction are shown on Figure 7-8.

Several pathways were determined to be incomplete due to the chemical nature of xylene and reformate. Exposure via the food chain is an incomplete pathway because bioaccumulation of these compounds in tissues of marine organisms is generally not considered a concern. The physical/chemical properties indicate that xylene and reformate compounds have a moderate affinity for moving into tissue lipids of aquatic organisms, but bioaccumulation is not significant because they are rapidly metabolized and excreted from tissues, precluding uptake in marine organisms (ATSDR 2007, Neff 2002). For example, the microalgae, *Selenastrum capricornutum,* and the manila clam, *Tapes semidecussata,* rapidly accumulated compounds found in xylene and reformate in exposure studies, but both species excreted all accumulated concentrations within 30 minutes of being placed in clean seawater (Herman et al. 1991, Nunes and Benville 1979).

Exposure to deep water benthic populations is also an incomplete pathway because the maximum depth at which xylenes or reformate would dissolve into the water column was estimated to be 3 meters (9.8 feet) or less under the water surface (see Chapter 13, Marine Transportation). The material would never dissolve deep enough into the water to reach benthic communities; therefore, this exposure pathway is not shown on Figure 7-8.

The remaining populations shown on Figure 7-8 have complete pathways; these populations could be exposed to the spilled materials either through direct contact, incidental ingestion, or inhalation. In many cases, the concentrations at the point of exposure would be too low to result in an adverse impact. A discussion of exposure impacts on marine birds is included in Chapter 6, Terrestrial Vegetation and Wildlife. Potential human exposures are discussed in Chapter 9, Environmental Health.

Characteristics of a Xylene or Reformate Spill

Chapter 13, Marine Transportation, describes the properties of xylene and reformate, and presents modeling of various spill scenarios. The outcomes of xylene and reformate spill modeling have the following key characteristics:

- Xylene and reformate are insoluble and less dense than water. Therefore, a spill of xylene or reformate would typically occur as a thin slick on the water surface rather than being dispersed throughout the water column. If churned into the water by wind and wave action, the products would occur as tiny undissolved droplets. Under extreme mixing conditions, the product (xylene or reformate) could be dispersed up to 6 meters (19.7 feet) below the water surface, but typically would form a thin slick directly on the water surface.
- Xylene and reformate slicks are not viscous, and therefore have a limited ability to coat a bird's feathers.
- Xylene and reformate rapidly volatilize. In computer modeling of a worst-case spill scenario, the thickness of the floating spilled material was estimated to be 10 µm or greater immediately after the modeled release. This thickness would reduce to less than 0.1 µm within two days as the material is dispersed and evaporates. After three days, 99.5 percent of spilled material had evaporated or dissipated.
- The spatial extent of a spill varies depending on seasonal and tidal conditions. In the modeled worst-case scenario, the area covered by spilled material was estimated at up to 23.5 square miles of surface water, and up to 11.5 miles of shoreline.

For a full description of the physical properties of xylene and reformate see Chapter 13, Marine Transportation.

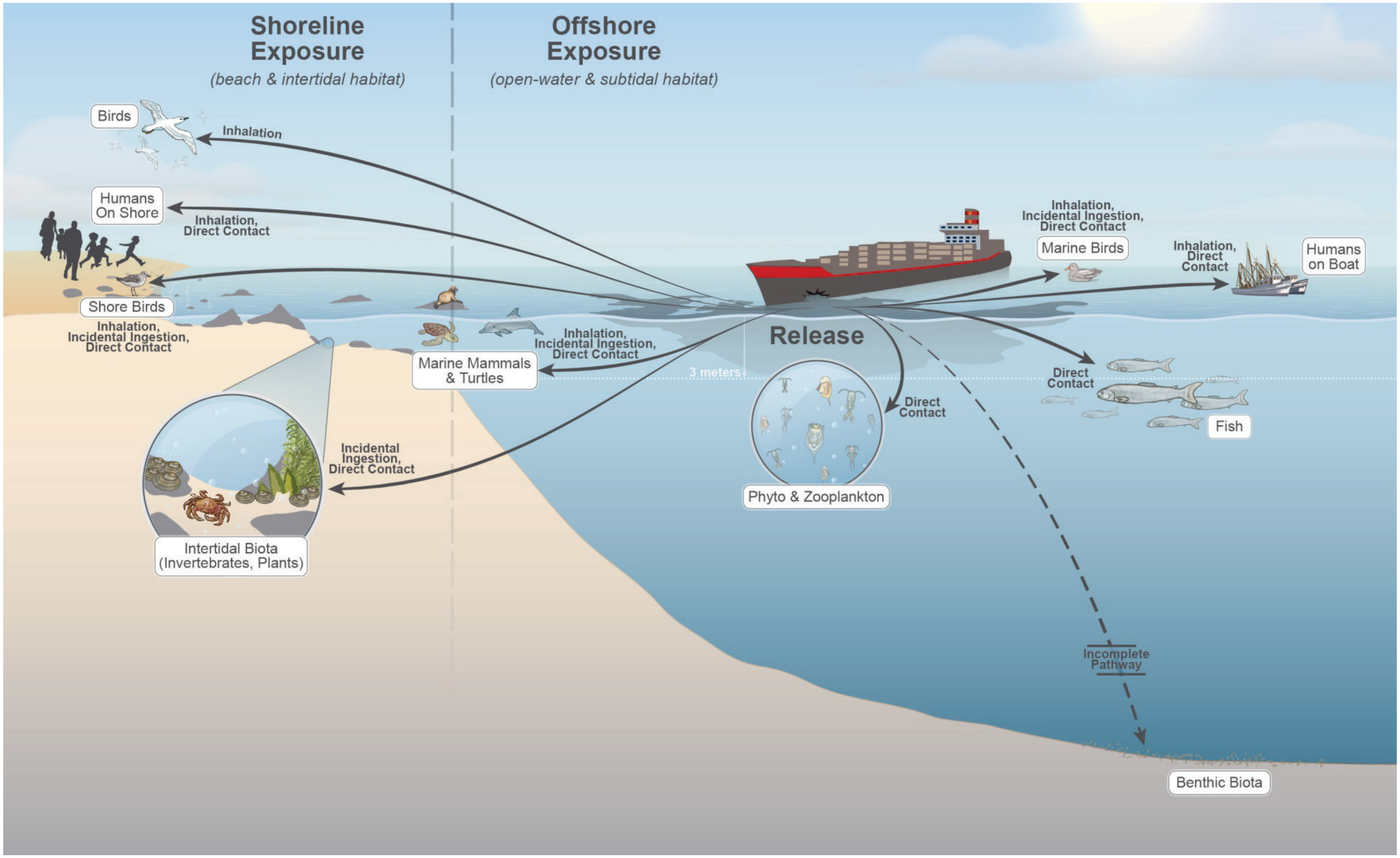

Figure 7-8: Exposure Pathways for a Marine Spill

Toxicity of Xylene and Reformate to Marine Life

The primary chemicals of concern in xylene and reformate are the monocyclic aromatic hydrocarbon compounds, which includes xylene isomers and ethylbenzene. Monocyclic aromatic hydrocarbons have similar chemical characteristics, and therefore, have similar ways of inducing toxicity in a marine organism. This class of compounds induce a toxic response known as nonspecific narcosis in an organism when they reach a critical concentration in tissue (Neff 2002). If sufficient concentrations are present, an organism exposed to the narcotic chemicals can experience a system-wide depression of biological activity that can lead to death. If the exposure is small enough, or of short enough duration, the impacts are reversible.

The concentrations of xylene and reformate that cause narcosis vary among individual compounds and different organisms. In other words, some species are more sensitive to the monocyclic aromatic compounds than others. The potential for toxic impacts on marine life is not only dependent on the concentration of the compounds in the water, but also on the length of time the organisms are exposed to those concentrations (i.e., the exposure duration). Therefore, understanding the likelihood that a critical concentration would be reached in the water column and the likelihood that the critical concentration would remain constant for a specific time period is important in predicting the potential for impacts on marine life.

For the worst-case spill scenarios considered in Tesoro’s studies, the dissolved concentrations beneath the slicks would likely reach the saturation concentration (i.e., the highest concentration that can be dissolved), which means the following monocyclic aromatic hydrocarbon compounds could occur at the following concentrations at 20°C:

- Xylene at 199 mg/L
- Ethylbenzene at 160.4 mg/L

These concentrations are a conservative estimate since the water temperature is typically around 9°C, which would result in slightly lower solubility for these compounds. Actual saturation concentrations would also depend on the conditions at the time of a spill (wind speeds, water temperature, and air temperature).

Water quality guidelines and toxicity test results for specific species are presented below. These guidelines and test results were used to assess whether the estimated short-duration hydrocarbon concentrations could potentially adversely impact marine life. Since modeling indicates that the compounds in xylene and reformate would not persist in the water column after a maximum of three days during a worst-case spill scenario, chronic exposure of species in the marine environment is not expected. Thus, only toxicity guidelines and test results from acute exposures are the focus of the following subsections.

Water Quality Guidelines

Water quality guidelines developed by the USEPA, known as the Ambient Water Quality Criteria for Aquatic Life, have been developed for a number of chemicals of concern. These guideline concentrations are intended to represent concentrations that would protect aquatic organisms from harm due to chemical exposure. Unfortunately, there are no USEPA Ambient

Water Quality Criteria for the monocyclic aromatic hydrocarbons due to insufficient toxicity test data to develop the criteria. While there are no USEPA recommended values for these chemicals, other informal guideline values are used in the U.S. that provide information on the concentrations that are potentially toxic to marine organisms. For instance, protective concentrations presented in the NOAA Screening Quick Reference Tables (SQuiRTs) for acute exposures to marine organisms are 0.23 mg/L for xylene (freshwater value) and 0.43 mg/L for ethylbenzene (Buchman 2008).

Toxicity Tests

The water quality guidelines listed above are lower concentrations than the saturation concentrations estimated to occur under worst-case spill scenarios. This suggests a potential for acute toxicity when xylene and reformate concentrations are present at their saturation concentrations. However, the potential for acute toxicity is likely overestimated since many of the acute toxicity test results used to derive the water quality guidelines are based on a 96-hour (i.e., four-day) exposure time frame and the xylene and reformate compounds would not remain at saturation concentrations for that period of time after a spill. As noted above, concentrations of xylene and reformate are expected to persist in the water column for a maximum of three days under the worst-case spill scenario. Thus, a shorter exposure to saturation concentrations, such as one to three days, would likely result in less or no toxicity to marine organisms.

Data on the toxicity of xylene and reformate compounds to marine mammals and sea turtles is limited. Thus, exposure to these animals was evaluated by focusing on contact with an oil slick. Research estimating the exposure thresholds for marine mammals and sea turtles contacting an oil slick on the water's surface found that slicks less than 1 µm are not likely to be harmful (see French-McCay 2009). Additional studies found that marine mammals and sea turtles may be impacted from a spill of petroleum compounds that likely resulted in slick thicknesses in the range of 10 µm and 25 µm (Engelhardt 1983; Geraci and St. Aubin 1988; and Scholten et al. 1996). The thickness threshold value of 0.1 µm, one order of magnitude less than the literature threshold of 1 µm, was selected as the value when some minor adverse impacts due to exposure could occur. The majority of the studies reviewed did not report adverse impacts on aquatic life until thickness levels were greater than 10 µm.

Impacts on Marine and Nearshore Resources from Spills

Potential impacts on marine resources that occupy the surface of the marine water column were evaluated based on the assumption that xylene and the chemicals of concern in reformate (monocyclic aromatic hydrocarbons) would reach saturation concentrations within the water column for areas covered by a sheen with a thickness of 0.1 µm during a spill. Modeling indicates that xylene and reformate would volatilize to concentrations below those associated with aquatic species toxicity after a maximum of three days during a worst-case spill scenario and would not persist in the water column. Therefore, chronic exposure of species in the marine environment is not expected. The following subsections describe the potential acute impacts on specific species groups.

Marine Habitat

Potential impacts on marine habitat from a worst-case spill scenario of xylene or reformate could occur in intertidal areas and the surface layer of the water column. Impacts could potentially include direct mortality and damage to marine vegetation from acute exposure to xylene or the monocyclic aromatic hydrocarbons in reformate. Information about xylene and reformate toxicity to marine vegetation is limited, but direct mortality and damage could occur as evidenced by the toxicity test results on the green algae species mentioned above. Potential impacts on marine vegetation are likely to be temporary and would depend on the spill's location and scale. Chronic exposure of marine vegetation is not expected due to the physical properties of xylene and reformate compounds (specifically, the rapid volatilization characteristics). While direct mortality and damage to species of marine vegetation could occur due to acute toxicity, widespread loss of vegetation is not expected to occur, even under a worst-case spill scenario.

The significance of potential impacts on estuaries and bays from a worst-case spill scenario of xylene or reformate would be dependent on the location, season, and scale of the spill. Bays and estuaries with diverse and sensitive habitat and communities of species are present along shorelines throughout the study area. Large-scale sensitive habitats, including coastal kelp beds and eelgrass meadows in Fidalgo and Padilla bays in particular, would remain largely intact following a spill event. These habitats are important for microorganisms and early life stages of marine species (eggs, larvae, and juveniles). Xylene and reformate would not be persistent in aquatic sediments and concentrations would be expected to dissipate and evaporate entirely within a few days (USACE 2012).

Invertebrates

Less mobile species of invertebrates and early life stages (including eggs and larvae that occupy the surface layer) would be expected to be the most impacted group of marine life in the event of a spill. Potential adverse impacts on invertebrates and early life stages from a worst-case spill scenario of xylene or reformate would be concentrated in the surface layer and in areas with marine vegetation (i.e., eelgrass meadows and kelp beds). Direct impacts including injury or mortality of species such as Dungeness crabs and bay shrimp could potentially occur since xylene LC_{50s} for these species have been reported at 6 mg/L and 1.3 mg/L, respectively, and xylene concentrations in a worst-case spill scenario could reach 199 mg/L. However, as noted above, the monocyclic aromatic hydrocarbons are only expected to reach saturation concentrations for a short time frame (up to three days). If a spill were to occur and impact organisms in the surface layer of the water column, communities in the adjacent areas would be expected to provide a productive source of recolonizing the area of disturbance. Further, widespread damage to marine vegetation, which provides habitat for early life stages, is not expected to occur.

Direct injury or mortality could extend into the subsurface layer; however, the level of acute toxicity is expected to decrease quickly at greater depths due to the physical properties of xylene and reformate.

Fish

Some fish species have been shown to avoid crude oil (Rice 1973) and hydrocarbons such as xylene (Maynard and Weber 2011). This avoidance response could enable fish to partially avoid direct mortality and injury by moving out of the area impacted by a spill. However, fish that do not avoid the spill area could experience acute toxicity of xylene. Direct impacts on fishes could include mortality or injury from the acute toxicity of xylene and other monocyclic aromatic hydrocarbons. Data for the acute toxicity of these compounds on marine fishes was limited, but an LC_{50} of 2.6 mg/L over 96 hours was demonstrated for freshwater rainbow trout (*Salmo gairdneri*) and LC_{50} of 2.0 mg/L over 24 hours was demonstrated for estuarine/marine striped bass (*Morone saxatilis*). The assumed saturation of the water column with mixed xylene (199 mg/L) to 20 feet could result in injury or mortality of adult and juvenile fishes in the area of a spill. Chronic exposure to fishes would not be expected due to the rapid volatilization of xylene and reformate.

Impacts associated with behavior changes as a result of a spill or impacts on prey species would depend on the location and season of a spill. However, any impacts are expected to be temporary, as xylene and the compounds in reformate rapidly volatilize and do not bioaccumulate.

Marine Mammals and Leatherback Sea Turtles

No information is available for the acute toxicity of xylene or reformate compounds on marine mammals or leatherback sea turtles; however, direct mortality of an individual or population would not be expected. Individuals of these species would only come into contact with the spilled material when coming to the surface to breathe. Many of these species have broad home ranges and travel large distances each day. Therefore, any exposure to spilled material would be temporary and short-term. Due to the rapid volatilization of xylene and the compounds in reformate, and the fact that these compounds do not bioaccumulate, injury from ingesting prey contaminated by a spill is considered very unlikely. Further, due to the short timeframe of xylene or reformate exposure, any behavior changes from marine mammals or leatherback sea turtles are expected to be short-term.

The number of individuals impacted and the significance of the potential impacts would depend on the location and season of a spill. More whale species are likely to be present in the western portion of the study area than the eastern portion of the study area, and leatherback sea turtles are not considered likely to occur in the eastern portion of the study area. Therefore, a spill occurring in the west may contact a greater number of marine mammals compared to a spill located at or near the wharf and refinery.

Summary of Potential Impacts on Marine and Nearshore Resources from Spills

Impacts on marine and nearshore resources due to a marine spill could include mortality of individual microorganisms, invertebrates and fish; disruption to behavior of marine mammals; and temporary damage to marine habitat. Impacts from a spill would be short term, as xylene and reformate rapidly volatilize, and even in a worst-case spill scenario these chemicals were modeled to volatilize to levels less than 0.1 μm within two days. Therefore, a spill would not be expected to permanently degrade habitat or impact the long-term viability of a population of a species. Based on the definitions provided in Section 7.2.2.2, a spill would have a ***less than significant impact*** on species that are not identified as special status species.

The definitions provided in Section 7.2.2.2 indicate that injury or mortality of an individual marine mammal or an individual of a threatened or endangered species would constitute a significant impact. Concentrations of xylene at the immediate location of the spill could be acutely toxic to fish, and special status fish are known to occur in the study area. Therefore, a marine spill could have a ***potentially significant impact*** on special status fish, depending on the location and season of the spill.

Because a spill is an unplanned event, the significance of a spill is examined within the context of the likelihood of a spill occurring and the potential for the proposed project's vessel traffic to change the current spill risk (see Chapter 13, Section 13.5.6, Spill Likelihood, and Section 13.3, Vessel Traffic, respectively). Based on both the historical record and a spill risk analysis study by the Ecology, there is a negligible to low likelihood of a spill occurring, depending on the specific location in the study area. In addition, the risk of a spill occurring at the refinery wharf or along the marine vessel transportation route would not significantly change from existing conditions as a result of the proposed project.

The potential impacts and significance of a spill described above were derived from an uncontrolled spill scenario (i.e., no spill response) of mixed xylenes or reformate into the marine environment. The estimated potential impacts presented in this section are therefore conservatively high. If an actual spill were to occur, response measures governed by regulatory agencies and provided by the refinery and local and regional response organizations would be implemented to avoid or minimize the potential impacts from a spill.

Safety measures are in place to prevent spills from marine vessels transiting the marine vessel transportation route and for loading/unloading petroleum products safely at the wharf (see Chapter 13, Section 13.4, Vessel Safety, and Appendix 2-A. In addition, spill response resources (both equipment and personnel) are available to respond immediately in the event of a spill throughout the study area as described in Chapter 13, Section 13.5, Marine Spills and Spill Response.

7.4.4. Summary of Impacts on Marine and Nearshore Resources

In summary, all potential impacts on marine and nearshore resources from construction and operation were evaluated as ***less than significant***. Unplanned events were evaluated to have a ***potentially significant impact*** on marine and nearshore resources. Table 7-17 summarizes the evaluation of potential impacts on marine and nearshore resources.

Table 7-17: Summary of Potential Impacts on Marine and Nearshore Resources

Impact Topic	Impact Summary	Potential Impact Significance	
		Less than Significant	*Potentially Significant*
Construction			
Operation of a Spud Barge	Operation of the spud barge would temporarily disturb benthic habitat in the direct footprint of the spuds, and could cause a temporary increase in turbidity in the immediate vicinity of the spuds. The disturbance would not occur within an area mapped as containing eelgrass or kelp.	✓	
Marine Vessel Strikes	Operation of the tugboat and safety boat during construction presents a risk of damage to vegetation, or injury or mortality of marine mammals. However, these impacts are considered unlikely, as the safety boat and ATB would operate in deep water without marine vegetation, and would travel at slow speeds during construction.	✓	
Marine Vessel Wakes	There is potential for wakes caused by marine vessels to disturb habitat, or strand marine vegetation or organisms, leading to injury or mortality. However, the ATB and safety boat would be operated at low speeds, and wakes generated would be minimal. Therefore it is unlikely that organisms would become stranded or habitat disturbed.	✓	
Release of Sediment to Coastal Waters	In the absence of any controls, construction activities at the proposed project area could lead to a release of sediment-laden stormwater to coastal waters. However, based on use of the existing SWS and OWS systems, the implementation of erosion and sediment control measures, and the distance of proposed project components from the coastline, it is considered unlikely that sediment-laden stormwater would enter coastal waters or the estuarine wetlands of Padilla and Fidalgo bays, either via sheet flow or through Outfall 01.	✓	
Noise	Operation of the ATB and safety boat, and deployment of spuds, would generate underwater noise intermittently over a six month period. These noise sources are slightly lower in intensity compared to the noise sources from current operations/sources. Therefore, it is expected that marine wildlife sensitive to these noise sources would likely already avoid the area, and the remaining marine wildlife are likely accustomed to this level of noise intensity.	✓	
Operations			
Damage to Vegetation due to Marine Vessel Operations	Marine vessel operation could damage floating vegetation within the direct path of vessel traffic. Vessels associated with the proposed project would not operate in shallow areas that support kelp or eelgrass communities, and marine vessels would not be anchored in areas with sensitive habitat or species such as eelgrass beds or kelp beds.	✓	

Impact Topic	Impact Summary	Potential Impact Significance	
		Less than Significant	***Potentially Significant***
Marine Vessel Strikes	Injury or mortality of marine mammals or sea turtles could occur; however, the number of vessel movements produced by the proposed project is an increase of 2.2 percent or less compared to current large marine vessel traffic movements in the study area.	✓	
Marine Vessel Wakes	The operation of an additional five marine vessels per month is unlikely to result in perceivable change from baseline wake conditions due to the current level of shipping activity and natural waves that occur in the study area.	✓	
Increased Effluent Discharge	The proposed project would increase the volume of stormwater from the refinery due to an additional 15.18 acres of impermeable surfaces at the refinery, and effluent from ballast water from an additional five marine vessels per month, which can be accommodated by the existing WWTP facility. Stormwater and effluent would be treated and monitored to confirm compliance with the NDPES permit effluent limits prior to discharge.	✓	
Introduction of Invasive Species	Due to treatment of all ballast water at the WWTP, it is unlikely the proposed project would introduce a non-native marine or estuarine species.	✓	
Noise	Operation of the proposed project would result in an additional five marine vessels travelling to and from the refinery wharf each month. The intensity of noise generated from marine vessels associated with the proposed project is similar to noise generated from large vessels currently transiting the Salish Sea. Noise from operation of marine vessels associated with the proposed project would occur intermittently (approximately 0.1% of each month), throughout operation of the proposed project.	✓	
Unplanned Events			
Marine Spills During Construction	Any spills that might occur during construction would be expected to be small volumes, would be restricted to the immediate vicinity of the wharf, and would be rapidly controlled.	✓	
Marine Spills During Operations	Marine spills during operation could result in mortality of microorganisms present within the upper marine water column, invertebrates, fish and marine vegetation in the surface and sub-surface layers. Marine spills could also cause potential health impacts on fish, marine mammals and marine turtles. In all modeled scenarios, the slick thickness reduced to a level reported to not typically be harmful to marine wildlife within the first three days. Any impacts are expected to be temporary, as xylene and the compounds in reformate rapidly volatilize and do not bioaccumulate. Significant resources would be available for spill response, for example for every spill event, booms would be rapidly deployed to protect sensitive areas.	✓ non-special status species	✓ threatened and endangered fish

7.5. Potential Impacts of the No Action Alternative

Under the no action alternative, Tesoro would not proceed with the proposed project. Because no construction or operations would take place under the no action alternative, there would be no new impacts on marine and nearshore resources.

7.6. Additional Mitigation Measures

No additional mitigation measures are recommended beyond the embedded controls that are already incorporated into the proposed project design.

7.7. Cumulative Impacts

As described above, construction and operation of the proposed project could result in less than significant to significant impacts on the marine and nearshore environment. Future marine vessel traffic in the Salish Sea is expected to increase (see discussion in Chapter 13, Section 13.6, Cumulative Impacts on and from Marine Transportation). Marine vessels associated with the BP refinery on Cherry Point would primarily transit Rosario Strait. Marine vessels associated with the proposed project would transit Guemes Channel and the southern portion of Rosario Strait. Marine vessels associated with the Trans Mountain project would primarily transit Haro Strait. The future increase in marine vessel traffic from all sources would increase the level of disturbances, including:

- Potential for damage to marine vegetation from marine vessel operation
- Potential for injury or mortality of marine wildlife due to marine vessel strike
- Potential for wakes caused by marine vessels to disturb habitat, or strand marine vegetation or organisms, leading to injury or mortality
- Potential for injury or mortality of wildlife, disruption to behavior, or increased stress due to noise generated from marine vessels

Although it would only represent an increase of 2.2 percent or less over current levels of large marine vessel traffic, the proposed project, when considered with past, present, and reasonably foreseeable future actions, would contribute to cumulative impacts on the marine and nearshore environment.

When the Canadian National Energy Board (NEB) approved the Trans Mountain pipeline expansion in 2016, it noted the risk that increased marine vessel traffic in the Salish Sea could impact the Southern Resident killer whale population. The NEB concluded that although the Trans Mountain Project's vessels (348 vessels per year, 34 vessels per month) "will be a small fraction of the total cumulative impacts, the Board acknowledges that this increase in marine vessels associated with the proposed project would further contribute to cumulative impacts that are already jeopardizing the recovery of the Southern Resident killer whale." The NEB based this finding on its belief that the Southern Resident killer whale population had "crossed a threshold where any additional adverse environmental impacts would be considered significant." The NEB also noted that "it [was] mindful that the [overall] recovery of the Southern Resident killer whale would require complex, multi-party initiatives," and that it expected Trans Mountain to participate in and support some of those initiatives (NEB 2016).

In light of the NEB conclusion that any additional adverse environmental impacts would be considered significant, the cumulative impacts of marine vessel traffic in the Salish Sea, including the proposed project as well as existing and future marine vessel traffic from all sources, could impact the Southern Resident killer whale population. Although it would only represent a small portion of projected marine vessel traffic and the increase would occur in the Rosario Strait, where the Southern Resident killer whale , spend less time compared to surrounding areas (NMFS 2008) the proposed project would contribute to potential cumulative impacts on the Southern Resident killer whale population.

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