TESORO

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March 16, 2016

Skagit County Planning & Development Services
1800 Continental Place
Mount Vernon, WA 98273

Attn: John Cooper

Subject: File # PL15-0302; Tesoro Anacortes Refinery Clean Products Upgrade Project (CPUP)
Vessel Traffic Assessment Technical Report

Per your request, please find enclosed the Tesoro Anacortes Refinery Clean Products Upgrade Project (CPUP) *Vessel Traffic Assessment Technical Report.*

Please contact me at (360) 293-1664 if you have any questions or concerns.

Respectfully,

Rebecca Spurling
Lead Environmental Engineer

Enclosure

TECHNICAL REPORT

Tesoro Anacortes Refinery Clean Products Upgrade Project Vessel Traffic Assessment

Prepared for

Tesoro Refining & Marketing Company LLC

March 2016

CH2M, Rodino, Inc. and Peterson Resources

Contents

Section Page

Executive Summary

Tesoro Refining & Marketing Company LLC's (Tesoro's) Anacortes Refinery (Refinery) is located in Fidalgo Bay in Skagit County, Washington state, about 70 miles north of Seattle. The Refinery receives crude oil and other materials for refining via pipeline, rail and marine vessel. It produces a range of products, including gasoline, jet fuel, diesel fuel, propane, and industrial fuel oil. The Refinery also ships refined products via marine vessels (ships and barges), pipeline, railcar, and tanker trucks.

Salish Sea Waterways are Safe and Suitable for the CPUP Project

This assessment documents that the waterways leading to the Tesoro Anacortes Refinery are safe and suitable for the proposed new marine vessel operations.

The proposed Clean Products Upgrade Project (CPUP) would include construction of an Aromatics Recovery Unit (ARU) capable of extracting about 15,000 barrels per day of mixed xylenes from reformate that is already produced in the refining process. Xylenes are a gasoline blendstock and a common petrochemical feedstock used to make a wide variety of products including clothing, film for medical x-rays, plastics, cleaners, and many other products.

The CPUP would also include installation of a new Marine Vapor Emission Control (MVEC) System to control hydrocarbon emissions from marine vessels during loading operations. Additional on-shore facility upgrades and expansions unrelated to marine operations are also included in the proposal. The CPUP is planned to begin operations in 2018.

Mixed xylenes will be extracted from the Refinery's existing high-octane gasoline blendstock called *reformate.* Reformate is produced at the Refinery's existing Catalytic Reformer (CR) unit and is normally used as a primary blendstock in gasoline. Additional reformate will be received at the terminal by marine vessel from other refineries. Reformate delivery is planned to require about 40 vessel arrivals annually.

These vessels are expected to be similar in size to vessels that currently call at the Refinery – with a capacity of about 180,000 barrels (bbl). Mixed xylenes are planned to be shipped from the terminal by ships similar in size to product tankers that currently call at the Refinery – with a capacity of about 330,000 bbl. On average, about 20 shipments of mixed xylenes are expected on an annual-basis.

Tesoro has retained CH2M HILL Engineers, Inc., Rodino, Inc., and Peterson Resources to conduct this change analysis for the marine terminal to assess vessel traffic associated with the CPUP. This report also includes measures to avoid, minimize, and mitigate potential vessel traffic risks.

In preparing this Vessel Traffic Assessment (VTA), the Puget Sound Pilots and the U.S. Coast Guard Captain of the Port, Sector Puget Sound, have been consulted.

Specifically this assessment demonstrates the following:

a. Vessel traffic levels in the study area overall and at the Refinery are below the historical levels.

b. Reformate and gasoline are regularly delivered to and shipped from the Refinery without incidents.

c. Reformate is similar to gasoline and is currently used to produce a variety of gasoline blends for the marketplace. Mixed xylenes are being extracted from reformate for higher valued global markets.

d. The current CPUP shipping plan will increase vessel traffic levels 2 percent above the current vessel traffic recorded by the VEAT Marine Traffic Data system in the Salish Sea. This is less than the average annual fluctuation in the Washington Ecology Vessel Entries and Transit System (VEAT) traffic data of more than 4% (plus or minus) per year.

e. CPUP will increase annual vessel traffic days in the Salish Sea study area by 0.5% compared to current vessel traffic days.[1]

f. Tankers and barges calling at Tesoro for the CPUP do not introduce any substantial new risk elements to the study area.

g. The comprehensive vessel traffic management systems in place for the study area, which include the joint United States Coast Guard (USCG) and Canadian Coast Guard (CCG) Cooperative Vessel Traffic Service (CVTS) and a Traffic Separation Scheme (TSS), have proven to be effective in preventing accidents and have the capacity to accommodate the CPUP traffic.

h. Existing passive and active mitigation measures are adequate for the anticipated volume of vessel traffic associated with the CPUP and for other anticipated development in the study area. The most significant of those measures are the TSS and the CVTS, which result in most large vessels moving in one-way traffic lanes with active traffic management and mandatory position reporting by vessel crews.

i. No conditions or concerns were identified that would preclude the safe implementation of the proposed CPUP vessel operations. This assessment documents that the waterways leading to the Refinery are suitable for the proposed marine vessel operations.

[1] Current vessel traffic days are based on data prepared for the Washington State Department of Ecology. (Glosten, 2014)

Acronyms and Abbreviations

AIS	Automatic Identification System
ARU	Aromatics Recovery Unit
ATB	articulated tug-barge-unit
bbl	barrel (1 barrel is 42 US gallons)
BC	British Columbia
bpd	barrel per day
CCG	Canadian Coast Guard
CFR	Code of Federal Regulations
CN	Canada
COTP	Captain of the Port
CPUP	Clean Products Upgrade Project
CRS	Congressional Research Service
CVTS	Cooperative Vessel Traffic Service
DHS	Department of Homeland Security
DOT	Department of Transportation
dwt	deadweight tonnage
ERTV	emergency response towing vessel
Ecology	Washington State Department of Ecology
ft	feet
GAO	Government Accountability Office
HHW	Higher High Water
HSP	Harbor Safety Plan
IMO	International Maritime Organization
km	kilometer
kt	knot
LLW	Lower Low Water
LOA	length overall
LPG	liquefied petroleum gases
MVEC	Marine Vapor Emission Control
N/A	not applicable
NH_3	ammonia
nm	nautical mile (1.15 miles or 6,676 feet)
NOAA	National Oceanic and Atmospheric Administration

PA	Precautionary Area
PORTS	NOAA's Physical Oceanographic Real-Time System
PSP	Puget Sound Pilots
PWSA	Ports and Waterways Safety Act
RCW	Revised Code of Washington
Refinery	Tesoro Anacortes Refinery
RNA	Regulated Navigation Area
SOA	Special Operating Area
Tesoro	Tesoro Refining & Marketing Company LLC
TSS	Traffic Separation Scheme
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
VEAT	Washington Ecology Vessel Entries and Transits System
VTA	Vessel Traffic Assessment
VTC	Vessel Traffic Center
VTS	Vessel Traffic Service
VTRAS	Vessel Traffic and Risk Assessment Study
VTSPS	Vessel Traffic Service Puget Sound
WA	State of Washington
WAC	Washington Administrative Code
WSA	Waterway Suitability Assessment
yd	yard

SECTION 1

Project Description and Background Information

Tesoro Refining & Marketing Company LLC (Tesoro) proposes to upgrade its Anacortes Refinery (Refinery) to purify and export existing mixed xylenes that are presently contained in gasoline. The Refinery is located in Fidalgo Bay, about 70 miles north of Seattle. The Refinery, as with all refineries in western Washington, receives crude feedstock via pipeline, by rail, and by tanker. It produces a range of products that includes gasoline, jet fuel, diesel fuel, propane, and industrial fuel oil. The Refinery has a capacity of processing about 120,000 barrels per day (bpd) of crude oil which will not change as a result of this project.

The proposed Clean Products Upgrade Project (CPUP) would include construction of an Aromatics Recovery Unit (ARU) capable of extracting about 15,000 bpd of mixed xylenes from existing gasoline blendstocks. Xylenes are a gasoline blendstock and a common petrochemical feedstock used to make a wide variety of products including clothing, film for medical x-rays, plastics, cleaners and many other products. There are three forms of xylenes: meta-xylene, ortho-xylene, and para-xylene (m-, o-, and p-xylene). These different forms are referred to as isomers. Mixed xylenes are a mixture of the three isomers and contains approximately 18 percent ethylbenzene. All of these molecules are in gasoline sold by the various petroleum refineries across the nation.

The CPUP would also include installation of a new Marine Vapor Emission Control (MVEC) system to control hydrocarbon emissions from marine vessels during loading operations. Additional facility upgrades and expansions unrelated to marine operations are also included in the proposal. The CPUP is planned to begin operations in 2018.

The CPUP will require incoming marine traffic and will also generate outbound vessel traffic. Reformate has been received by marine vessel at the Refinery in the past. Reformate will be delivered by ships, barges, or articulated-tug-barge-units (ATBs) with about 40 vessel arrivals annually. Vessels delivering reformate are expected to be similar in size to vessels currently calling at the Refinery – with a capacity of about 180,000 barrels (bbl).

Mixed xylenes are planned to be shipped from the terminal by tanker similar in size to vessels that currently call at the Refinery (with a capacity of about 330,000 bbl) with an estimated 20 shipments annually. The combined estimated vessel traffic volume, about 60 vessel calls annually, will fluctuate with xylene production and vessel size. The offsite reformate feed, in addition to contributing to the mixed xylenes production, will also yield gasoline blendstocks. Various products being shipped from Anacortes, including but not limited to the gasoline blendstocks, will be optimized by utilizing backhaul opportunities provided by the marine vessels delivering the reformate feed.

The subsequent sections of this Vessel Traffic Assessment report provide the following:

- An overview of the CPUP's physical and regulatory setting
- Description of the sophisticated Vessel Traffic Management System for the Salish Sea and petroleum related vessels
- Documentation of the data and information sources utilized in the preparation of this report
- Descriptions and illustrations of the vessel traffic routes in the Salish Sea and for the CPUP
- Vessel traffic data from multiple sources including Tesoro, the VEAT and Marine Exchange

- A change analysis for the Refinery as a consequence of the CPUP
- Identification of existing and proposed mitigation measures that avoid, minimize, or mitigate potential vessel traffic related impacts

SECTION 2

Geographic Study Area

The general vicinity where the Refinery is located is also known as the Salish Sea. The Salish Sea is a network of waterways between British Columbia (BC) and Washington state (WA), extending from the western end of the Strait of Juan de Fuca to the southern end of Puget Sound and the northern end of the Strait of Georgia and all of the connecting waters including Haro Strait, Rosario Strait, Bellingham Bay, Hood Canal, and the waters around and between the San Juan Islands in WA and the Gulf Islands in BC.

The project geographic study area encompasses portions of the Salish Sea starting at the Pacific Ocean seaward of the entrance to the Strait of Juan de Fuca and ending at Fidalgo Bay and Padilla Bay. It includes the Strait of Juan de Fuca and its approaches, Rosario Strait, the Guemes Channel, and Fidalgo and Padilla Bays. Those waters lie mostly in the United States (U.S.) and partially in Canada. However, with respect to commercial vessel operations, the issues being assessed are identical for both countries for the entire route.

Figure 2-1. Geographic Study Area

2.1 Strait of Juan de Fuca

The Strait of Juan de Fuca is an international waterway that separates the U.S. and Canada. The international boundary lies along the centerline of this Strait. Its width ranges from 12 to 16 nautical miles (nm), with deep water and few shoreline risks along most of its length.

The Strait of Juan de Fuca extends east from the Pacific Ocean between Vancouver Island, BC, and the Olympic Peninsula, WA, to Haro Strait, San Juan Channel, Rosario Strait, and Puget Sound. The entrance to the Strait of Juan de Fuca at the Pacific Ocean boundary is formed by a line between Cape Flattery and Tatoosh Island, WA, and Carmanah Point, Vancouver Island, BC.

The Strait of Juan de Fuca provides access to major U.S. ports, including Seattle and Tacoma, WA, and Canadian ports including Vancouver, BC, as well as access to other BC ports and southeastern Alaska via the Inside Passage at Vancouver Island.

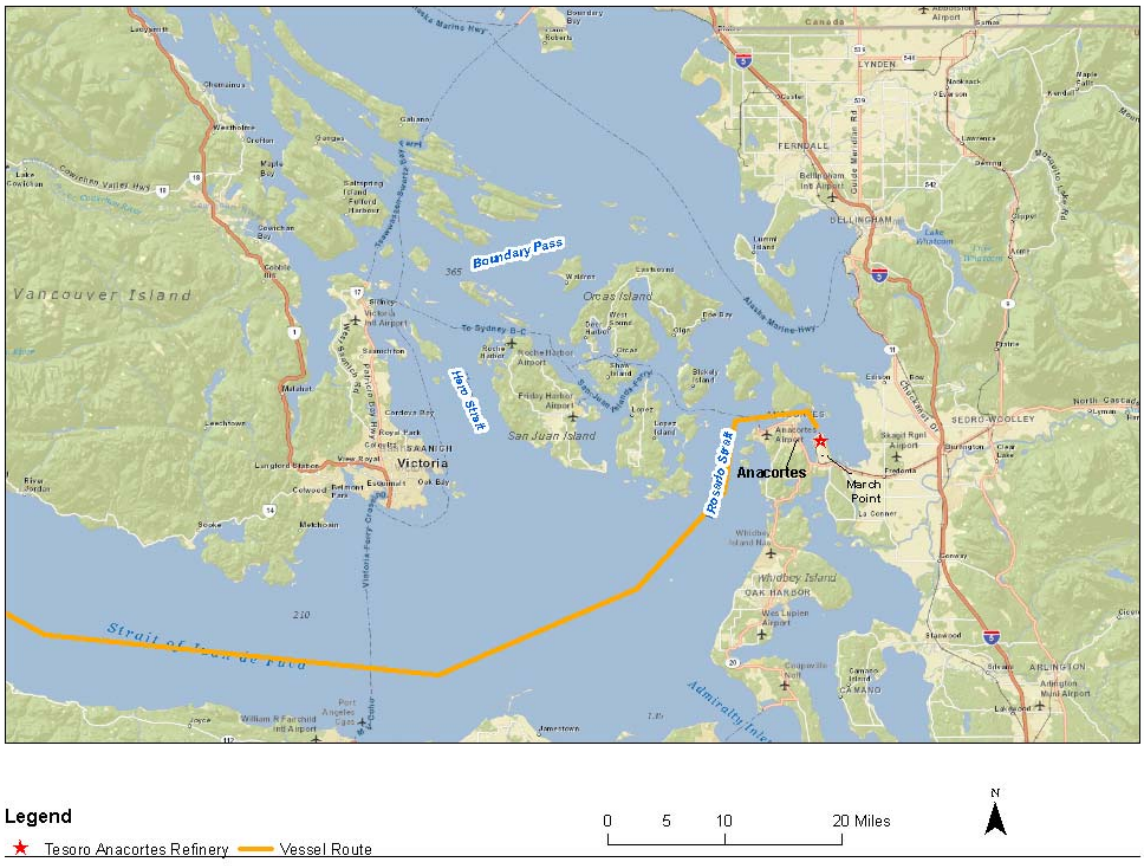


Figure 2-2. Haro Strait, Boundary Pass, and Rosario Strait

2.2 Haro Strait and Boundary Pass

Haro Strait connects the Strait of Juan de Fuca to Boundary Pass and the Strait of Georgia. It is the main route to Vancouver, BC, and to Alaska via the Inside Passage. It is not expected that vessels calling at Tesoro Anacortes would use that waterway, although it would be an alternative route to the terminal (See Figure 2-2). Haro Strait and Boundary Pass have a total length of about 30 nm and very deep water.

2.3 Rosario Strait

Rosario Strait is the easternmost channel between the Strait of Juan de Fuca and the Strait of Georgia and is used primarily by vessels bound for Cherry Point, Anacortes, and Bellingham. It ranges from 1.5 to 5 nm in width and has water depths of 78 feet or more. Vessels calling at Tesoro Anacortes will pass through the southern entrance to Rosario Strait (See Figure 2-2).

2.4 Guemes Channel

The Guemes Channel stretches from Rosario Strait in the west to Padilla Bay in the east. The channel is 3 nm long and 0.5 mile wide at its narrowest point, with depths from 48 to 108 feet (See Figure 2-3).

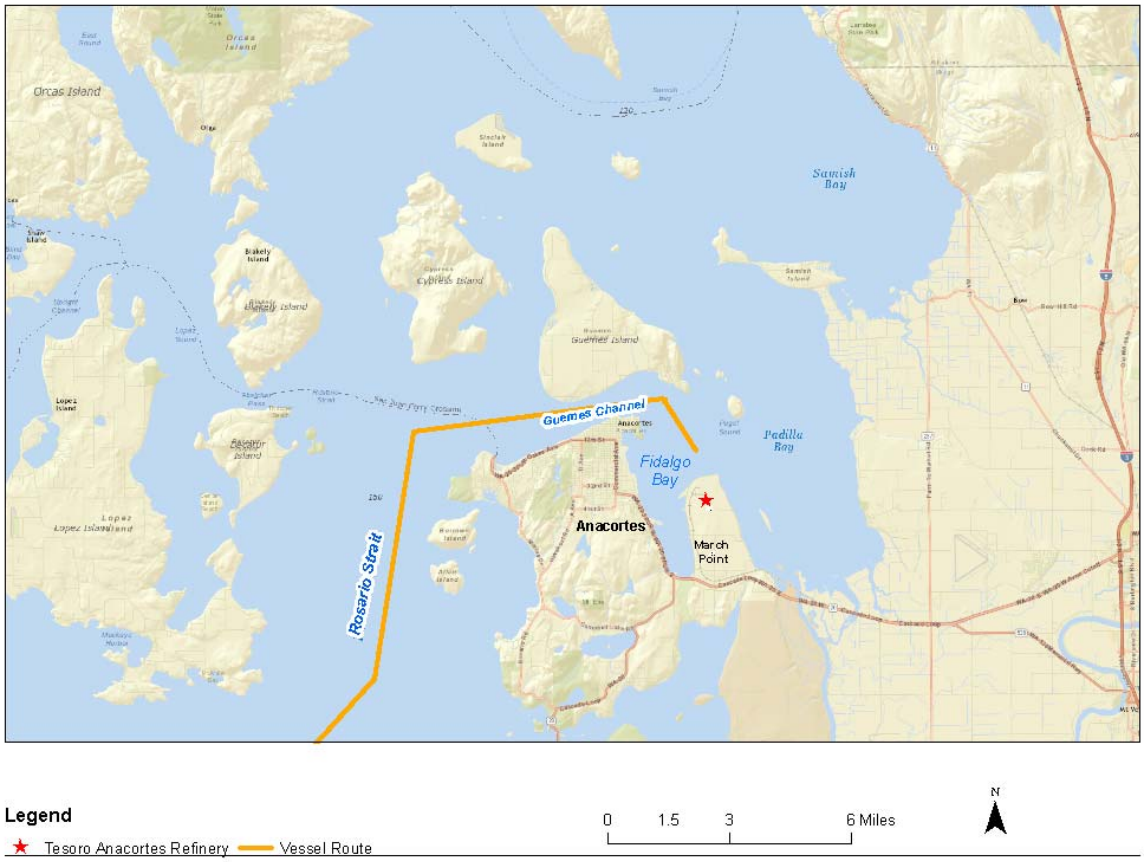


Figure 2-3. Guemes Channel

2.5 Fidalgo Bay and Padilla Bay

Fidalgo Bay is a small deep water area between Anacortes and the mainland. It has three designated anchorages. Deep water docks are available at the Port of Anacortes and at the Tesoro and Shell terminals on March Point at the south side of the bay.

Padilla Bay lies on the east side of March Point. Vessels calling at Tesoro Anacortes do not pass through Padilla Bay.

SECTION 3

Marine Environment

3.1 Coastal Weather

The weather in offshore approaches to the Strait of Juan de Fuca is mild, windy, and rainy in winter; cool and pleasant in summer; and with periods of fog. Wind and fog conditions in and along this Strait often differ from conditions offshore. Radiation fog is common and can occur any time when nights are clear and calm. Winter storms produce rain on 15 to 25 days each month and significant snow on occasion.

Northwest winds prevail in summer, increasing in evening hours. Southeast winds in winter blow out of the Strait of Juan de Fuca, causing confused cross-sea conditions off the entrance when wind-generated swells meet the typically heavy prevailing seas from the southwest. As a result, sea conditions outside the entrance can be severe.

Summer is the heaviest fog season, with visibility of less than 0.5 mile (0.9 kilometer [km]) occurring on 3 to 10 days per month. In general, the worst conditions are experienced near the entrance to the Strait of Juan de Fuca.

Predominantly east to southeast winds occur from October through March. Storms are common but reach gale force only 3 to 6 percent of the time. Visibility of less than 0.5 mile (0.9 km) occurs on 3 to 4 days each month from October to February.

Conditions improve in spring. Storms are less frequent; winds are light and blow from the west; visibility usually is good; and rain occurs on just 8 to 15 days each month.

Numerous sources of information on real-time and forecast conditions are available to mariners. Those are addressed later in this report.

3.2 Salish Sea Weather

The climate in the Salish Sea is generally described as oceanic. Annual rainfall ranges from over 100 inches in the coastal areas at the western end to as little as 16 inches in the inland eastern region. Rainfall in the entrance area is considerable, even in the summer, with the heaviest rains occurring from December through March.

The Strait of Juan de Fuca is exposed to the generally westerly winds and waves of the Pacific. As a result, weather and sea conditions generally are rougher than in the more protected inland areas.

The waters of the Strait of Juan de Fuca generally are described in publications (such as the *Coast Pilot*) as being more fog-prone than the waters further inland. While those conditions might occasionally preclude some vessel activities, there is nothing to indicate that they routinely hamper large vessel transits. Fog is generally heavier near the entrance and can extend well into this Strait, but wind patterns usually hold it to one bank or the other.

3.3 Tides

There are two high tides and two low tides in the project area each day: Higher High Water (HHW), Lower Low Water (LLW), Lower High Water, and Higher Low Water. The difference between HHW and LLW averages about 0.3 foot (0.09 meter) at Port Townsend on Admiralty Inlet, increases to about 14.4 feet (ft) (4.4 meters) at Olympia at the southern end of Puget Sound, and varies at other locations. The range at Anacortes is about 11 ft.

Tidal currents can be 2 to 4 knots (kt) at the entrance to the Strait of Juan de Fuca and are generally lower (that is, from 1.5 kt to 2.6 kt) at the eastern end of the Strait. Maximum flood velocity could reach 3.8 kt, and maximum ebb could be as much as 5.0 kt during severe weather, but those conditions are not typical.

SECTION 4

Regulatory Setting

The inbound vessel route follows the Strait of Juan de Fuca through Puget Sound to the Haro Strait/Rosario Strait/Boundary Pass region. The U.S.-Canada international border runs generally along the centerlines of the Strait of Juan de Fuca, Haro Strait, and Boundary Pass. Rosario Strait, to the east of Haro Strait, lies wholly in U.S. waters. Eastbound vessels follow a traffic lane in U.S. waters, and westbound vessels follow a traffic lane in Canadian waters. The traffic lanes are described in detail later in this report.

The overall regulatory roles of the two nations are generally consistent, in that both are signatory to the majority of the international conventions applicable to large commercial vessels in international trade that are addressed in this report. In some cases, the U.S. has adopted standards or implemented regulations that are more stringent than those in force in the international arena overall, or that are interim measures to be applied to U.S.-flagged vessels and to foreign-flagged vessels calling at U.S. ports. For the most part, the U.S. and Canadian standards and requirements applicable to large commercial vessels address design, construction, outfit, and operational requirements. They are essentially the same for all large vessels.

4.1 U.S. Federal

The following are the principal statutes and regulations that are applicable to commercial vessels. Numerous other statutes apply to vessel traffic and the waterways in the study area; however, those generally are the same for all large commercial vessels in all U.S. navigable waters:

- Ports and Waterways Safety Act (PWSA) of 1972 (33 United States Code [USC] 1221 et seq.).
- Port and Tanker Safety Act of 1978, amending the PWSA.
- Maritime Transportation Security Act of 2002 (46 USC 701) and implementing rules in the Code of Federal Regulations (CFR) Title 33, Parts 101 and 105, and 1555 and Title 40 Part 300.

Specific requirements apply to marine vessels operating in the project study area. Those include a security zone rule for tankers published at 33 CFR 165.1313 and a traffic separation rule published at 33 Part 167 that applies to both tankers and barges.

4.2 Canada

There are no special requirements for marine vessels operating in Canadian waters. The requirements are essentially the same as for vessels on the U.S. side of the border.

4.3 Washington State

The State of Washington also exercises jurisdiction over certain aspects of vessel operations, including oil spill prevention, for vessels operating in state waters.

The state agency with responsibility for waterway issues and environmental compliance is the Washington State Department of Ecology (Ecology). The statutory requirements for marine terminals and commercial vessels are contained in various sections of the Washington Administration Code (WAC).

Ecology also collects and analyzes vessel traffic data for ships calling at ports within the state through its Vessel Entries and Transits (VEAT) system, which is addressed in more detail later in this report.

SECTION 5

Ports

5.1 Ports in the Study Area

The study area contains numerous large and small ports in the U.S. and Canada.

Vessels arriving from sea or from BC often stop at more than one port, either on inbound or outbound legs of voyages, and could also spend time at anchor in one or more locations. Common to all ports is transit through the Strait of Juan de Fuca, and the overall traffic volume for all vessels that pass through this Strait is considered in this assessment.

The traffic management system for the study area, which is described in detail later in this report, minimizes the potential for vessel interactions. For the CPUP traffic, those interaction areas generally are limited to Rosario Strait and the Guemes Channel.

5.2 Ports in the Strait of Juan de Fuca

Ports along the Strait of Juan de Fuca are Esquimalt Harbor, to the northwest of Victoria, and the Port of Victoria in BC. Ports in WA are Port Angeles, Neah Bay, Friday Harbor (on San Juan Island), Anacortes, and Bellingham. (www.worldportsource.com/waterways/Strait_of_Juan_de_Fuca_315.php).

5.3 Ports in the Strait of Georgia

The Strait of Georgia has 27 ports and harbors. In Canada, they are Chemainus, Blubber Bay, Comox, Cortes Bay, Cowichan Bay, Crofton, Delta (Westshore Terminals), Fraser River, Fulford Harbour, Ganges, Harmac, Kuper Island (Telegraph Harbour), Ladysmith, Lund, Lyall Harbour, Mayne, Nanaimo, Port Mellon, Powell River, Richmond (Port North Fraser), Sturdies Bay, Vancouver (Port Metro Vancouver), and Whiterock Passage (Burdwood Bay). In the U.S., they are Blaine, Ferndale, and Semiahmoo, WA. (http://www.worldportsource.com/waterways/Strait_of_Georgia_317.php).

5.4 Ports in Puget Sound

Puget Sound has 14 ports and harbors, all in the U.S., at Allyn, Bremerton, Brownsville, Edmonds, Everett, Keyport, Kingston, La Conner (Port of Skagit), Olympia, Port Gamble, Port Townsend, Seattle, Shelton, and Tacoma, WA. (http://www.worldportsource.com/waterways/Puget_Sound_199.php).

5.5 Anchorages

Numerous anchorages have been established throughout the project area by the USCG and are administered by the COTP for the Puget Sound Zone. The regulations establishing the anchorages are in 33 CFR 110.230. Anchorages typically are used by vessels waiting availability of a berth or awaiting sailing orders. Three anchorages are located in the waters off Anacortes:

- *Anacortes East (ANE) Anchorage.* The waters within a circular area with a radius of 600 yards, having its center at 48°31’27” N., 122°33’45” W.
- *Anacortes Center (ANC) Anchorage.* The waters within a circular area with a radius of 600 yards, having its center at 48°30’54” N, 122°34’06” W.
- *Anacortes West (ANW) Anchorage.* The waters within a circular area with a radius of 600 yards, having its center at 48°31’09” N, 122°34’55” W.

5.6 Ferries

Numerous ferry routes cross the waterways. A commercial vehicle ferry crosses the Strait of Juan de Fuca from Port Angeles, WA, to Victoria, BC, several times each day, as do passenger ferries of the Washington State Department of Transportation (DOT) Ferry system. A commercial high-speed ferry also operates between Victoria and Seattle.

Skagit County also operates a small ferry from Anacortes to Guemes Island daily.

The Washington State DOT and Skagit County ferries cross waterways that CPUP vessel routes would follow.

As described in Section 6.4.1, special operational rules apply to ferries to allow them to operate safely near large vessels and to maintain their schedules.

SECTION 6

Vessel Traffic Management

A comprehensive vessel traffic management system is already in place for the entirety of the geographic study area. Vessel traffic is governed and controlled by both regulatory actions and active vessel traffic management by both U.S. and Canadian authorities.

6.1 Traffic Separation Scheme

A key regulatory element of the traffic management system is the Traffic Separation Scheme (TSS) that encompasses all of the waters of the study area from the Pacific Ocean to Rosario Strait. The TSS, jointly managed by the USCG and the Canadian Coast Guard, provides unique protection to the Salish Sea by separating inbound and outbound vessel traffic.

In the Strait of Juan de Fuca the eastbound traffic separation lane lies to the south of the international border in U.S. waters, and the westbound lane lies to the north of the border in Canadian waters.

The TSS allows for a much higher level of vessel traffic control than exists in most major U.S. port areas and minimizes the potential for traffic interactions that could result in collisions. The TSS separates vessel traffic into one-way lanes with wide separation zones between them. It also identifies Precautionary Areas (PAs) where lanes converge or when traffic volumes trigger special operating criteria. Once a TSS has been established, the waters within the TSS coverage area become a Regulated Navigation Area under the jurisdiction of federal regulations in 33 CFR 165. In those waters, the right of navigation by commercial vessels takes precedence over all other waterway uses (such as commercial fishing and recreational activities).

Traffic Separation Scheme (TSS) Provides Unique Protection to Salish Sea

The TSS, jointly managed by the USCG and the Canadian Coast Guard, provides unique protection to the Salish Sea by separating inbound and outbound vessel traffic.

6.2 Regulatory Description

Jointly proposed by the U.S. and Canada, the TSS for the Salish Sea was adopted by the International Maritime Organization (IMO), which serves as a clearing agent to ensure that vessel traffic measures are made available to the global maritime community through a single source. The IMO adopted the TSS in December 1992, and implemented the TSS on June 10, 1993. The USCG published implementing regulations for the TSS on November 19, 2010, and those regulations became effective on January 18, 2011 (USCG, 2011).

All seagoing vessels operating in waters subject to a TSS, regardless of which country's jurisdiction applies, are required to follow the operating rules established for the TSS. The rules are detailed in 33 CFR 167, Offshore Traffic Separation Schemes, Subpart B—Description of Traffic Separation Schemes and Precautionary Areas, Section 167.1300. In addition to being shown on National Oceanic and Atmospheric Administration (NOAA) charts, the TSS is listed in the IMO publication Ships' Routing, which is publicly available via the Internet at http://www.imo.org (IMO, 2008). It also is discussed in U.S. Coast Pilot Volume 7, Pacific Coast: California, Oregon, Washington, Hawaii and Pacific Islands which all large commercial vessels calling at U.S. ports are required by federal regulations to carry.

The TSS lanes are shown on NOAA Charts 18460 and 18465 (see Appendix). In the Strait of Juan de Fuca, the inbound (that is, eastbound) traffic lane is on the southern side of the Strait and is wholly within U.S.

waters, while the outbound (that is, westbound) traffic lane is on the northern side of the Strait and is wholly within Canadian waters. The U.S.-Canada border lies in the Separation Zone between the lanes.

At the eastern end of the Strait of Juan de Fuca, the TSS consists of multiple traffic management areas. In that region, the TSS lines do not follow the U.S.-Canada border. NOAA Chart 18421 shows the islands and adjacent waterways. The U.S.-Canada border runs north through Haro Strait and then northeast through Boundary Pass.

Most of the traffic lanes are at least 1,000 yards (914 meters) wide. In the Rosario Strait, the minimum lane width is about 950 yards (yd) (900 meters) wide. The separation zones at least 500 yd (457 meters) wide.

6.3 Cooperative Vessel Traffic Service

Vessel traffic in the TSS is jointly managed by the USCG and the Canadian Coast Guard (CCG) through a Cooperative Vessel Traffic Service (CTVS) that was established in 1979. The areas of coverage for the CVTCs are shown on Figure 6-1, which also shows the TSS lanes for the study area that are described in detail in subsequent paragraphs.

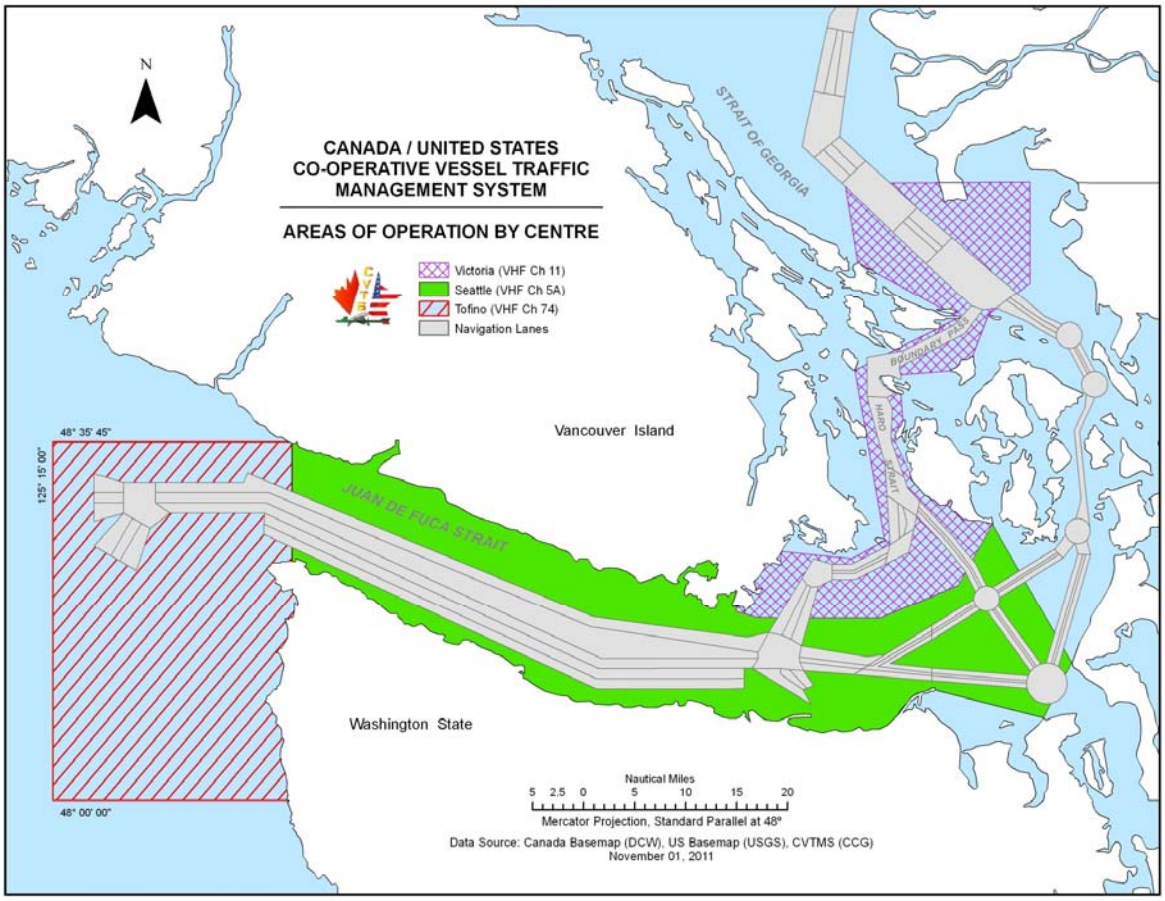


Figure 6-1. CVTS Coverage Areas

The USCG operates the Vessel Traffic Service Puget Sound (VTSPS) from a Vessel Traffic Center (VTC) in Seattle known as "Seattle Traffic." The VTSPS area includes Puget Sound, Hood Canal, Possession Sound, the San Juan Island Archipelago, Rosario Strait, Guemes Channel, Bellingham Bay, the U.S. waters of the Strait of Juan de Fuca and the Strait of Georgia, and all adjacent waters. The USCG VTC manages all

eastbound vessel traffic and vessels entering U.S. ports. The USCG VTC manages all vessels calling at the Refinery.

The CCG operates VTCs located at Tofino and Victoria. "Tofino Traffic" manages the approaches to the Strait of Juan de Fuca and "Victoria Traffic" manages traffic in the eastern portion of the Cooperative Vessel Traffic Service (CVTS) area. Detailed information is publicly available on the CVTS website at http://www.uscg.mil/d13/cvts .

6.3.1 VTC Automatic Identification System

The VTCs receive a wide range of information on commercial vessels from the Automatic Identification System (AIS) transponders; large vessels, including those calling at the Refinery, and tugs are required to have such transponders. The transmitted data includes the vessels' names, destinations, last ports, cargoes, and locations, as well as other vessel particulars. The AIS data can also be received by any similarly equipped vessel and by any other person who has an interest via publicly-accessible web sites and commercial data services.

Rosario Strait and Guemes Channel vessel traffic is continuously monitored

The Rosario Strait and Guemes Channel Special Operating Area is continuously monitored by the Seattle Traffic VTC, and the rules are enforced under the authority of the U.S. Coast Guard Captain of the Port.

The CVTS operations include a Vessel Movement Reporting System that aids in tracking vessels. Vessels required to participate in the Vessel Traffic Service (VTS) system, which includes all vessels that call at the Refinery, also are required to report their sailing plans upon getting underway and also to report arrival at certain predesignated locations. All new vessel traffic that would be generated by the CPUP would be required to participate in the VTS for the entire route to and from the Tesoro wharf. Data from the AIS is compiled by the Marine Exchange. Such data from the Marine Exchange was compiled for this report and discussed in Section 10.

6.3.2 VTC Radar and Closed Circuit TV

The VTCs also receive radar signals from 12 sites covering Puget Sound, the Strait of Juan de Fuca, Rosario Strait, and surrounding waters. A closed circuit television system provides coverage of critical waterway subareas. The VTCs also have voice communications capabilities and are linked by computer and telephone.

Active participation in the CVTS system, including communications with the VTCs and reporting of movements, is mandatory for powered vessels 131 ft (40 meters) or more in length, commercial towing vessels 26 ft (8 meters) or more in length, and vessels certificated to carry 50 or more passengers for hire, which includes all vessels that call at the Tesoro Refinery.

Passive participation—which entails continuous monitoring of prescribed radio channels and responding to calls from the VTS—is mandatory for powered vessels 66 ft (20 meters) or more in length, vessels of 100 gross tons or more carrying passengers for hire, and floating plants (such as dredges) engaged in operations likely to restrict or affect navigation of other vessels.

The rules governing vessel operations in the CVTS are in 33 CFR 161.1 through 161.23, and 161.55. Those rules apply to all vessels in all of the waters, both U.S. and Canadian, within the CVTS coverage area.

A CVTS User's Manual is available from the Commander, USCG Sector Puget Sound, 1519 Alaskan Way South, Seattle, WA 98134-1192 and on-line at http://www.uscg.mil/d13/psvts/docs/userman032503.pdf

6.4 Special Operating Areas and Precautionary Areas

Certain areas outside the TSS traffic lanes that may experience heavy vessel traffic and congestion warrant careful oversight of commercial vessel operations. Rosario Strait and Guemes Channel fall into those categories of Special Operating Areas (SOAs) and Precautionary Areas (PAs).

6.4.1 Special Operating Area

Waters designated as SOAs — although they are not part of a TSS — are subject to specific rules for certain categories of commercial vessels. The Rosario Strait and Guemes Channel SOA is continuously monitored by the Seattle Traffic VTC, and the rules are enforced under the authority of the USCG COTP. The following applies to this SOA:

- Vessels of 40,000 deadweight tonnage (dwt) or greater must receive specific authorization from the CVTS before getting underway in those channels. Vessels 109 yards (100 meters) long or longer are required to stay 2,000 yards (1,828 meters) away from the large vessels and also are required to avoid meeting, overtaking, or crossing situations except when crossing astern. A general exception is granted for the Washington State Ferries to allow them to cross astern of large vessels at distances less than 2,000 yards.
- Vessels 109 yards (100 meters) or longer may not enter a SOA when another vessel of that size is already in the SOA.
- Vessels in line must maintain a minimum 1,000-yard (914-meter) separation. Overtaking (that is, approaching a vessel from behind with the intent of passing it) is allowed only with CVTS concurrence.
- Towing vessels are required to stay clear and not to impede the passage of a large vessel.

6.4.2 Precautionary Area

A PA is one where vessels must navigate with particular caution due to traffic congestion or other concerns and where the direction of traffic movements may be made by the VTC. In addition to the SOA designation, the northern end of Rosario Strait is also designated as a PA. The PA boundaries are shown on the navigation charts and are listed in the nautical information publications that all large commercial vessels are required to have on board. Beyond the Rosario Strait PA, Separation Zones are re-established into the Strait of Georgia.

6.5 Regulated Navigation Area

The USCG has designated waters in the project study area as a Regulated Navigation Area (RNA) with permanent operating parameters and restrictions. The RNA encompasses the same area covered by the CVTS (that is, the entire CPUP route).

The implementing regulations are published in 33 CFR Part 165—Regulated Navigation Areas and Limited Access Areas / Subpart F—Specific Regulated Navigation Areas and Limited Access Areas, Thirteenth Coast Guard District / § 165.1301 Puget Sound and Adjacent Waters in Northwestern Washington—Regulated Navigation Area.

The RNA rules establish operating requirements for fishing vessels and other small vessels that are operating in the vicinity of the TSS, so that they do not impede TSS traffic. The RNA rules bar fishing vessels from areas where they might impede TSS traffic but do allow for seasonal commercial fishery activity in most areas. The rules also focus on enhancing vessel traffic safety when heavy traffic levels, hazardous conditions, or vessel traffic congestion situations (such as regattas or recreational fishing

derbies) take place. The rules also limit large vessels operating in the TSS to maximum speeds of 11 kt when transiting areas where those events or permitted fishing activities are underway.

6.6 Safety and Security Zones

6.6.1 General

The Federal regulations that address Safety Zones and Security Zones also are contained in 33 CFR Part 165. They may be established in waters of the U.S. to the 12-nm limit of the territorial sea, when the USCG COTP determines that the need exists.

6.6.2 Safety Zone

As defined in 33 CFR 165.20, "A Safety Zone is a water area, shore area, or water and shore area to which, for safety or environmental purposes, access is limited to authorized persons, vehicles, or vessels. It may be stationary and described by fixed limits, or it may be described as a zone around a vessel in motion."

6.6.3 Security Zone

As defined in 33 CFR 165.30, "A Security Zone is an area of land, water, or land and water which is so designated by the Captain of the Port or District Commander for such time as is necessary to prevent damage or injury to any vessel or waterfront facility, to safeguard ports, harbors, territories, or waters of the United States or to secure the observance of the rights and obligations of the United States."

6.6.4 Access Restrictions

Safety and security zones are not absolute exclusion zones wherein other vessel traffic is completely prohibited. They are areas around vessels and/or terminals or in waterways where the USCG has determined that specific traffic and access restrictions and controls are warranted in the interests of maritime safety and security. No person may enter a safety or security zone or bring or cause to be brought into such zone any vehicle, vessel, or object unless authorized by the USCG COTP. Other criteria also apply and may vary depending on circumstances.

6.6.5 Extent of the Zone

The USCG does not specify a standard size or minimum or maximum extents for safety zones or security zones. Determining the appropriate clearance distances for safety or security zones is the responsibility of the USCG COTP and may vary with the nature of the operating area, the specific operation, the vessels and cargoes involved, other marine activity, facility or terminal issues, and shoreline development. A moving zone may be established around a vessel underway.

6.6.6 Tanker Security Zone

In the project area, the USCG COTP has established a permanent security zone relative to tanker operations. Through regulations published at 33 CFR 165.1313, a 500-yd (457-meter) moving security zone is established around each tanker in transit. No vessel or person may enter the security zone without the permission of the USCG COTP. Vessels allowed within the security zone are required to operate at the minimum speed necessary to maintain a safe course, they must proceed as directed by the master of the tanker or the person in charge of a tanker escort vessel, and they may not approach within 100 yd (109 meters) of a tanker without permission of the master or person in charge of the escort vessel.

6.7 Marine Industry Awareness

Although the TSSs were not listed in the CFR until 2010, they have been shown on NOAA charts since 2006 and have been listed in the IMO publications since 2008. A general discussion of the operational requirements in the TSS is published in the *United States Coast Pilot, Volume 7, Pacific Coast: California, Oregon, Washington, Hawaii and Pacific Coast*, which Federal regulations require to be carried on all large commercial vessels operating in U.S. waters covered by Volume 7.

The marine industry—vessel owners and operators, terminal operators, port authorities, marine service providers, and pilots—are thoroughly familiar with the TSS for the study area and the CVTS operating requirements. Discussions with USCG representatives indicate that incidents of noncompliance are rare.

6.8 Pilotage

Both the U.S. and Canada require that most large vessels must be under the control of a licensed marine pilot while underway in inland waters. Washington also has established pilotage rules for vessels operating in waters within the state. For the project area, ships and ATBs calling at ports in the US are handled by Washington or U.S. licensed pilots and ships calling at ports in Canada are handled by Canadian-licensed pilots.

Licensed Pilots Required on CPUP Tankers, ATBs and seagoing barges

All tankers calling at the Tesoro Refinery will be under the direction and control of a state-licensed pilot and all ATBs and other seagoing barges will be under the direction and control of a federally-licensed pilot.

6.8.1 Licensed Pilots Required

For Washington waters, foreign vessels and U.S. vessels engaged in foreign trade must be under the direction and control of a state-licensed pilot. U.S. vessels engaged in coastwise trade and seagoing tank barges, including ATBs, must be under the direction and control of a federally-licensed pilot who may be a member of the vessel's crew. Coastwise trade refers to trade from one US port to another, including Alaska, with no stops outside of the US. Vessels involved in such coastwise trade are required under the Jones Act to be on U.S. flagged vessels. Foreign flagged vessels are prohibited for intra-U.S. port trade. This means that vessels delivering reformate to the Refinery would be under the direction and control of a federally licensed pilot.

6.8.2 Puget Sound Pilots

The Puget Sound Pilots (PSP), who typically hold both state and federal licenses, handle all vessels bound to or from the U.S. ports regardless of which nation's waters the vessel might pass through during that voyage. The Pilot Station is at Ediz Hook at Port Angeles. The coverage area extends eastward to the U.S.-Canada border in the Strait of Georgia. There is no pilotage requirement west of Port Angeles. The PSP's General Guidelines for Vessels Transiting Restricted Waterways or Ports, Puget Sound are publicly available on the PSP website at http://pspilots.org/wp-content/uploads/2013/01/Guidelines-Jan-27-2015.pdf.

6.8.3 RCW 88.16

Pilotage requirements for vessels operating in Washington state waters are also published in the Revised Code of Washington (RCW) Chapter 88.16 with specific requirements for oil tankers at RCW 88.16.180. This section specifies "any registered oil tanker of five thousand gross tons or greater, shall be required…to take a Washington state licensed pilot while navigating Puget Sound and adjacent waters".

RCW 88.16.180 does not include a specific definition for oil tankers. However, RCW 88.16.250 which applies similar requirements to the waters of Grays Harbor does provide definitions that clearly would apply in other waters as well. This section states “Oil tanker’ means a self-propelled deep draft tank vessel designed to transport oil in bulk. ‘Oil tanker’ does not include an “articulated tug barge tank vessel”.

6.8.4 Summary

Seagoing ATB’s, which account for most of the ATB traffic in the study area, as well as other seagoing barges carrying oil whether being towed or pushed, require federal pilots which can be a Puget Sound Pilot or a member of the ATB crew.

In summary, all tankers calling at the Tesoro Refinery will be under the direction and control of a state-licensed pilot and all ATBs and other seagoing barges will be under the direction and control of a federally-licensed pilot.

SECTION 7

Waterway and Navigation Information Sources

7.1 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) Seattle District provides a wide range of data through links on its website and by dissemination of channel survey data and other waterway and navigation-related information on its website at http://www.nws.usace.army.mil/ .

7.2 U.S. Coast Guard

The USCG Sector Puget Sound website at http://www.uscg.mil/d13/sectpugetsound/default.asp includes general information on USCG programs in the region.

The USCG also operates a VTS for the region with a wide range of information on its website at http://www.uscg.mil/d13/cvts . The VTS program is addressed in detail in the following web-based sources:

- https://www.uscg.mil/directives/ci/16000-16999/CI_16001_1.pdf
- http://www.uscg.mil/d13/dpw/

7.3 Physical Oceanographic Real-time System

NOAA's Physical Oceanographic Real-Time System (PORTS®) provides real-time and forecast data on water levels, currents, and meteorological conditions from sensors located at the BP refinery dock at Cherry Point and at the Port of Tacoma. These PORTS stations provide real-time oceanographic data and other navigation products to promote safe and efficient navigation in the study area.

The PORTS data is available by telephone and over the Internet at http://tidesandcurrents.noaa.gov/ports/index.shtml?port=cp.

7.4 Puget Sound Harbor Safety Plan

The Harbor Safety Plan (HSP), developed by the Puget Sound Harbor Safety Committee and updated in 2014, provides comprehensive guidance for all marine operators and stakeholders on a wide range of operational, safety, and response issues. The HSP, which is publicly available over the Internet at http://www.pshsc.org/about/harbor_safety_plan, is discussed in more detail later in this report (Puget Sound, 2016).

The HSP includes Standards of Care developed by the regional Harbor Safety Committee for the following:

- Anchoring
- Bridge team management
- Bunkering operations
- Dead Ship Tow Plans
- Equipment failures
- Heavy weather
- Hot work

- Lightering
- Line-handling
- Propulsion loss prevention
- Restricted visibility
- Rosario Strait towing operations
- Spokane Street Bridge openings notification
- Tanker escorts
- Terminal gantry crane safety
- Towing vessel operations
- Under-keel clearance

As with other elements of vessel traffic management in the study area, the HSP is continuously revised and updated to reflect changing conditions (Puget Sound, 2016).

7.5 Coast Pilot 7

Very detailed information on the waterways and on the navigation and operational procedures for vessels is contained in the publication *Coast Pilot 7*, which is required by Federal regulations to be carried on board every seagoing vessel. This publication is available in print form and over the Internet at http://www.nauticalcharts.noaa.gov/nsd/coastpilot_w.php?book=7.

SECTION 8

Vessel Route

8.1 General

Vessels calling at the Refinery follow a route from sea to Anacortes up to the Guemes Channel, the same route followed by large tankers and other large vessels bound for the refineries at Cherry Point, WA, and other terminals in the Strait of Georgia (See Figure 8-1).

Figure 8-1. Vessel Route

The waterways are shown in more detail on these NOAA Charts:

- 18400 Strait of Georgia and Strait of Juan de Fuca (See Appendix A)
- 18460 Strait of Juan De Fuca
- 18465 Strait of Juan De Fuca, Eastern part
- 18429 Rosario Strait, Southern Part
- 18427 Anacortes to Skagit Bay (see Appendix A)

The charts can be viewed using the Office of Coast Survey Nautical Chart On-Line Viewer—Pacific Coast available at http://www.nauticalcharts.noaa.gov/mcd/OnLineViewer.html.

8.2 Anacortes Port Area

The Port of Anacortes is a small vessel port with limited deep water dock capacity. It hosts a large marina and limited commercial shipping operations.

8.3 Tesoro Marine Terminal

The Refinery is on March Point, east of the city of Anacortes. It is bounded on the west by Fidalgo Bay and on the east by Padilla Bay, both of which are connected to Rosario Strait by the Guemes Channel. At Latitude: 48°30’34” N, Longitude: 122°34’35”W, it is 1 mile east of the City of Anacortes, Skagit County, WA. The plant has been in operation since 1955 and includes the Refinery, marine transportation facilities, and onshore storage and processing facilities. The marine transportation-related facility includes a single wharf with barge and tanker berths. An aerial view of the Refinery and the marine terminal/wharf is shown on Figure 8-2.

The Tesoro Marine Terminal is used to transfer a variety for petroleum-based feedstocks, intermediates and finished products, including but not limited to crude oil, gasoline, diesel fuel, industrial fuel oil, jet fuel, and gasoline blendstocks (for example, naphtha, alkylate and reformate).

Figure 8-2. Tesoro Marine Terminal

8.3.1 Marine Transportation Facilities

The marine terminal has a single wharf with two berths. A causeway consisting of a timber structure with concrete piles and dolphins extends about 3,100 ft from the shoreline to a 650-ft wharf and a 193.5-ft finger pier.

The outside berth can accommodate tankers up to 125,000 dwt with dimensions of 952 ft length overall (LOA), 166 ft Beam, and 45 ft Draft. The inside berth can accommodate product tankers up to 51,000 dwt and dimensions of 680 ft LOA, 106 ft Beam, and 37 ft Draft. Two vessels can be loaded or unloaded simultaneously.

The wharf is equipped with a number of safety and environmental protection features, including navigation lights, leak detection and containment systems, and spill response equipment. No major modifications to the dock will be necessary for the CPUP, although a new MVEC System will be installed to control hydrocarbon emissions from marine vessels during loading operations.

8.3.2 Marine Operations

Crude is typically transferred via tankers in the 75,000 to 125,000 dwt class while product tankers typically range from 34,000 to 62,000 dwt. Additionally tank barges transfer products to and from the Refinery.

8.4 Shell Oil Marine Terminal

In addition to the Tesoro Marine Terminal, Shell Oil Co. operates a marine terminal at March Point, which serves Shell's Puget Sound Refinery, located immediately south of the Tesoro Refinery. The Shell marine terminal has been in operation since 1958, built as a single dock and located west of the Tesoro dock. It receives crude oil via vessel and exports refined products.

The Refinery processes about 150,000 bbl of crude oil per day[2]. From this crude oil, the Refinery produces gasoline, jet fuel, diesel fuel, industrial fuel oil, propane, butane, petroleum coke, sulfur, and a petrochemical called nonene.

[2] Northwest Clean Air Agency. Statement of Basis for the Air Operating Permit - FINAL - Shell Puget Sound Refinery Anacortes, Washington (May 2015)

SECTION 9

Historical and Planned Vessel Traffic at the Refinery

9.1 Historical Refinery Vessel Traffic

Current vessel traffic levels at the Refinery are about 60 percent of historical traffic volumes of ten years ago. Table 9-1 presents a summary of all vessel calls at the Refinery for 2002 through 2015 broken down between ships and barges.

Table 9-1. Vessel Calls (ships and barges) at the Refinery 2002 - 2015

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Ships	103	124	123	110	102	94	72	58	42	81	88	60	75	60
Barges	381	362	281	291	301	292	221	126	91	169	162	155	161	161
Total	**484**	**486**	**404**	**401**	**403**	**386**	**293**	**184**	**133**	**250**	**250**	**215**	**236**	**221**

Barge totals include barges and ATBs

The vessel traffic data shown in this section was obtained from Tesoro's operating records for the refinery dock. These data represent a physical count of the vessels (including all tankers and tank barges) that actually called at the refinery dock. These numbers are used to compare past and current vessel traffic levels at the Refinery to the levels expected when the CPUP project is placed in service.

Tesoro's traffic data for the dock supplements and adds additional detail to the vessel traffic numbers obtained from the Marine Exchange of Puget Sound (MX) presented in Section 10.3. Data from the MX is derived from the AIS transmissions made by large commercial vessels. The AIS data, including its collection methods, are discussed in more detail in Section 10.3.

The number of tankers calling at the Refinery has declined from over 100 per year in the early 2000s to a range of about 60 to 80 annually in recent years. The number of barges has declined from peak of about 380 to about 160 each year. The maximum number of calls recorded by Tesoro occurred in 2003, when 486 vessels called at the Refinery. From 2011 to 2015, the number of vessel calls ranged from about 215 to 250, as shown in Table 9-1.

9.2 Historical Gasoline and Reformate Shipments

Reformate and gasoline have been transported by vessel in the past to and from the Refinery. For the 10 year period of 2005 through 2014 an average of 60 ships and barges called each year at the Refinery to either deliver or ship out gasoline or reformate. Table 9-2 summarizes the call frequency by year for vessels that delivered or shipped these products for the years 2005 through 2014.

Table 9-2. Gasoline and Reformate Shipments to and from the Refinery by Vessel Type 2005 - 2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average
Ships	22	20	24	20	19	17	23	29	23	26	22
Barges	58	54	62	61	25	14	20	20	28	37	38
Total	80	74	86	81	44	31	43	49	51	63	60

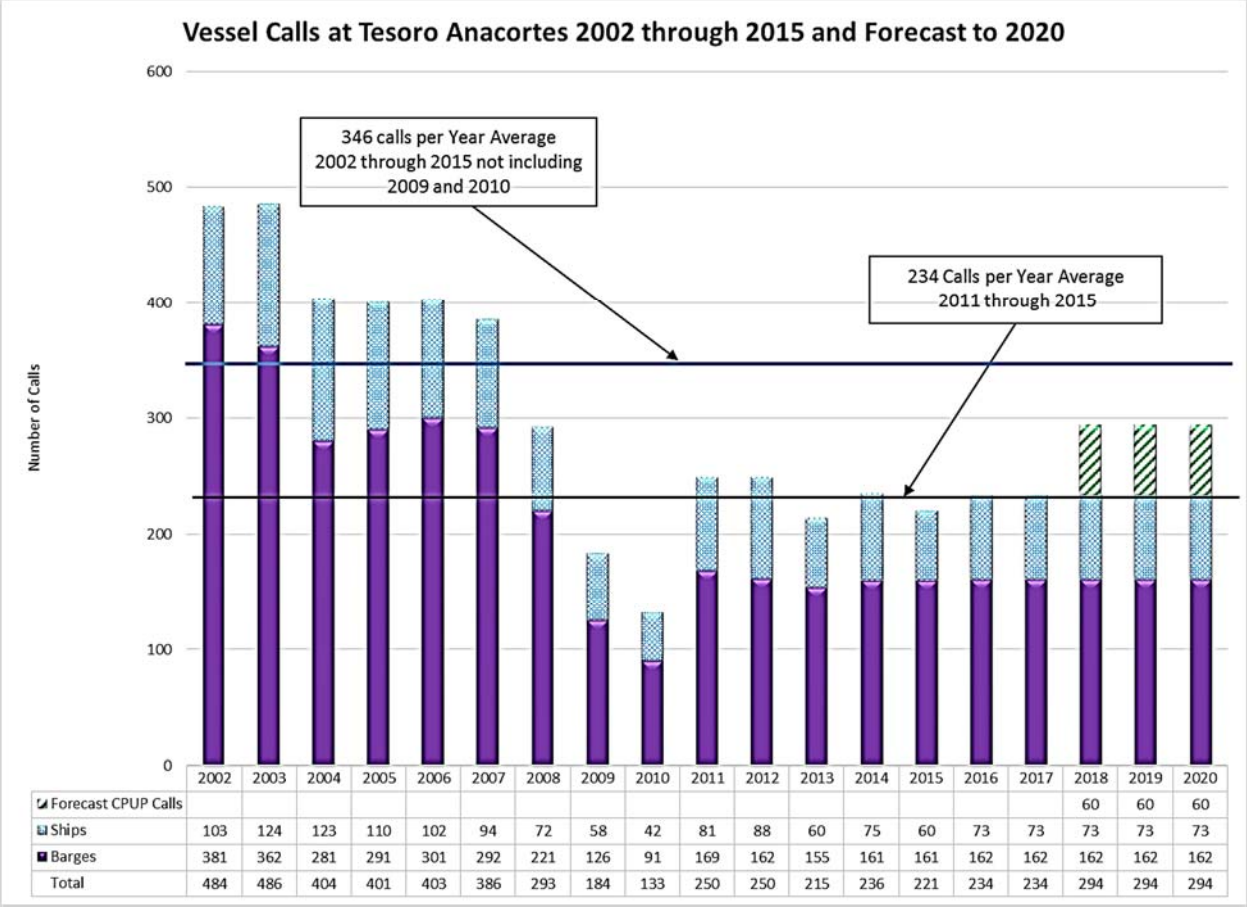
Note: Some ships carried both gasoline and reformate. In that case the ship was counted once.

During this period an average of 5.3 million bbl of gasoline was shipped or delivered each year to the Refinery. Reformate shipments have not been as regular as gasoline shipments. No reformate was delivered or shipped out in the years 2007, 2008 and 2011. For the remaining years in the dataset when reformate was shipped from or delivered to the Refinery, an average of about 106,000 bbl of reformate was shipped.

9.3 Historical and Planned CPUP Vessel Traffic Levels

Current vessel traffic level at the Refinery is about 60 percent of historical traffic volumes of ten or more years ago.

Figure 9-1 depicts a number of refinery vessel traffic dynamics. First, it shows both variability and general decline in vessel traffic at the Refinery. Second, it shows that expected vessel traffic including the CPUP would be less than the average vessel traffic for the last 13 years (not including 2009 and 2010). Third, it provides a visual reference comparison of the planned vessel traffic for the years 2018 through 2020 from current refinery traffic levels.



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Forecast CPUP Calls																	60	60	60
Ships	103	124	123	110	102	94	72	58	42	81	88	60	75	60	73	73	73	73	73
Barges	381	362	281	291	301	292	221	126	91	169	162	155	161	161	162	162	162	162	162
Total	484	486	404	401	403	386	293	184	133	250	250	215	236	221	234	234	294	294	294

Figure 9-1. Vessel Calls at Tesoro Anacortes Refinery 2002 - 2020

The Refinery averaged 408 tanker and barge calls per year for the period from 2002 through 2008. Vessel calls in both 2009 and 2010 declined precipitously due to a combination of economic conditions and refinery shutdowns. These two anomaly years were not included in the average annual calls shown in Figure 9-1. The average for the years 2011 through 2015 was 234 calls per year.

Adding 60 reformate and xylene calls per year for the CPUP represents an increase of about twenty-six percent over the recent (2011 – 2015) average. However, the overall traffic volume will be less than in past years such as 2002 through 2007.

SECTION 10

Existing Vessel Traffic in the Study area

Existing vessel traffic in the study area includes large oil tankers and liquefied hazardous gas carriers; large passenger, container, and general cargo vessels; and a multitude of smaller vessels. Extensive commercial fishing, towing vessel, and excursion vessel operations take place throughout the study area.

10.1 Ferries

Numerous ferry routes cross the waterways. A commercial vehicle ferry crosses the Strait from Port Angeles, WA, to Victoria, BC, several times each day. A commercial high-speed ferry also operates between Victoria and Seattle. Other commercial ferries operate seasonally.

The Washington State DOT Ferry system serves the San Juan Islands and Vancouver Island from a terminal at Anacortes. The state's operating schedule shows 18 crossings daily.

Skagit County also operates a small ferry from Anacortes to Guemes Island daily.

Both the Washington State DOT and Skagit County ferries cross waterways that CPUP vessel routes would follow.

As described in Section 6.4.1, special operational rules apply to ferries to allow them to operate safely near large vessels and to maintain their schedules.

10.2 VEAT Marine Traffic Data

Data for annual vessel calls was obtained from Ecology VEAT for Washington Waters database in order to ascertain trends in vessel traffic volumes over the past 15 years.

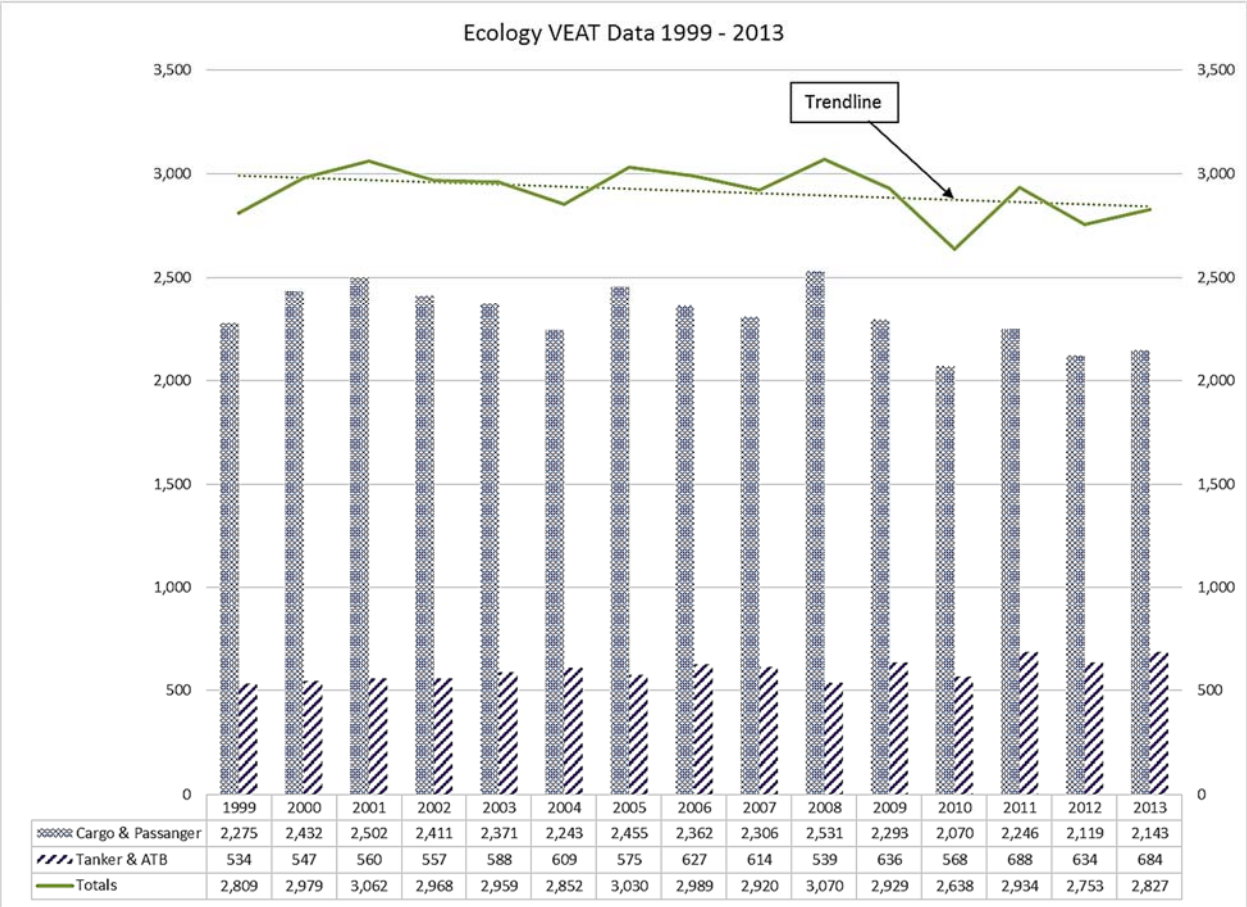
At the time of this report, the latest data available was for 2013. In the VEAT data, a vessel call represents one vessel visit to a port in the Salish Sea.

The annual number of total vessel calls from 1999 to 2013 is 2,915 with a downward trend over time (see Figure 10-1)

- 1999 to 2005 annual average = 2,951
- 2006 to 2010 annual average = 2,909 (decline of 42 vessels per year)
- 2011 to 2013 annual average = 2,838 (decline of 71 vessels per year)

In addition to the downward trend, the average for each group of years is lower than the historical peak traffic years for the study area. This indicates that the waterway is currently operating at a traffic level lower than that for which it has been proven adequate over time. Even with the addition of the CPUP vessels, the traffic volume will be lower than the recent average levels.

Figure 10-1 also illustrates the variability from year to year of total vessel traffic. For the period 1999 through 2013 vessel traffic varied from a maximum decline of 9.94% (2009 – 2010) to a maximum increase of 11.22% (2010-2011). The average annual variability for this period was 4.68% (plus or minus) per year.



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Cargo & Passanger	2,275	2,432	2,502	2,411	2,371	2,243	2,455	2,362	2,306	2,531	2,293	2,070	2,246	2,119	2,143
Tanker & ATB	534	547	560	557	588	609	575	627	614	539	636	568	688	634	684
Totals	2,809	2,979	3,062	2,968	2,959	2,852	3,030	2,989	2,920	3,070	2,929	2,638	2,934	2,753	2,827

Figure 10-1. VEAT Annual Vessel Calls 1999 to 2013

10.3 Marine Exchange of Puget Sound Vessel Arrival Data

Vessel traffic data for the CPUP study area was obtained from the Marine Exchange of Puget Sound (MX) for the years from January 2010 through November 2015, a total of 71 months for marine traffic to the port areas at or beyond the refinery locale. Data was obtained for all of the U.S. terminal locations and anchorages in U.S. waters between the eastern end of the Strait of Juan de Fuca and Ferndale and Cherry Point. The port areas covered are Anacortes, March Point, Bellingham, Ferndale, and Cherry Point. The data reflects vessels entering the Strait of Juan de Fuca from sea or from ports in Canada.

The Marine Exchange provided AIS data for marine traffic to the port areas at or beyond the refinery locale. The port areas covered are Anacortes, March Point, Bellingham, Ferndale, and Cherry Point; the data reflect vessels entering the Strait of Juan de Fuca from sea or from ports in Canada. AIS equipment is required on all large vessels, including the following:

- tankers,
- chemical tankers,
- dry bulk carriers,
- tugs over 26 feet long,
- ATBs, and
- passenger vessels (including ferries) carrying more than 150 passengers.

The AIS data are the best available for vessel traffic studies performed for the study area. However, the AIS data do not necessarily provide all the count details of the different types of vessels calling at individual terminals. For example, barges are not counted; only the tugs moving them have AIS. Thus, a

tug-barge movement is counted as one vessel, regardless of how many barges are in the tow. This and other factors account for the difference from the detailed Tesoro vessel traffic counts in Section 9 and those reflected in this section.

10.3.1 Marine Exchange Data Collection Systems

The data captured by the Marine Exchange are whatever is transmitted by the individual vessel. There is no way for the Marine Exchange to verify or cross check the data. Some elements of the data, including destination call and cargo information, are coded and entered into the AIS transmission by the vessel's crew, with the very real potential for erroneous or incomplete entries. For example, entries for "Anacortes" were found with 17 different formats and spellings. Also, the Refinery is located at March Point, which also is the name of the nearby anchorage area. This fact could result in errors in counts at the individual locations.

The AIS traffic counts are widely accepted by waterway stakeholders and regulators as providing the most accurate picture of vessel traffic available for the study area. These data are especially useful for reviewing general traffic patterns and trends in vessel traffic volumes.

The data represents the large deep-draft commercial vessels that the Marine Exchange tracks which are pertinent to this assessment (specifically tankers, chemical tankers, dry bulk carriers, and tugs—the latter primarily ATBs). All of those vessels are equipped with AIS and thus can be tracked by the Marine Exchange and other parties. Certain other vessels also are required to have AIS and are tracked, but most of those (such as passenger vessels, ferries, and towing vessels) are not pertinent to the comparisons for tanker traffic levels.

10.3.2 Marine Exchange Data Overview

The arrival data showed a total of 7,009 movements within the coverage area for the period January 2010 and concluding in November 2015 when the data was compiled. That data counts all vessel arrivals at terminals or anchorages. It includes all vessels entering the coverage area from sea or from Canadian waters. It also includes shifts within the area, such as a vessel that initially goes to an anchorage to await a berth and later shifts to a terminal; in that case, the vessel would be counted as making two movements—arrival at the anchorage and then arrival at the terminal—even though only one port call is involved.

Table 10-1. Vessel Calls in the Study area
(Marine Exchange Data)

Year	Calls
2010	1,026
2011	1,112
2012	1,138
2013	1,323
2014	1,272
2015	1138* (1,241)**
Total	7009 * (7112)**

* Totals through November 2015

** Totals through December 2015, projecting 103 calls in the month of December

In order to readily allow for annual comparisons where appropriate, a total number of movements through the end of 2015 was projected by adding 103 vessels, about 9 percent, to the January to November figure, for a projected total of 1,241 calls in 2015. Adding 103 vessel movements to the Marine Exchange figure of 7,009 yields a new overall total of 7,112 movements calls for the study area.

The Marine Exchange data lists both "tankers" and "chemical tankers." With a very few exceptions, the term "tanker" is associated with a vessel carrying cargo listed as "crude" for delivery to one or more refineries. The few deviations clearly were matters of miscoding of the data entry, as the rest of the data indicated that the vessel arrived without cargo and departed loaded with petroleum products. Also with very few exceptions, the term "chemical tanker" is associated with product tankers, which are shown as

arriving without cargo and departing loaded with petroleum products. A few of the chemical tankers are listed as loading cargoes of nonene and alkylate, but most loaded jet fuel and similar products. Since the deviations are so few and do not affect the comparison of tanker traffic, the original raw data are used in this assessment.

The data for tugs represents ATBs as distinguished from typical towing vessels pushing or pulling barges.

The two areas with large volumes of vessel traffic are

1. Ferndale / Cherry Point with the ALCOA INTALCO smelter, the Phillips 66 Ferndale Refinery, and the BP Cherry Point Refinery; and
2. March Point with the Tesoro Anacortes Refinery and the Shell Puget Sound Refinery.

The data for those facilities, shown in Table 10-2, indicate that all of the vessels calling are crude oil tankers, product carriers, and tugs (some of which would have been moving barges).

Table 10-2. Vessel Calls by Area – Marine Exchange Data

Year	March Point	Anacortes	Bellingham	Ferndale	Cherry Point
2010	395	47	9	131	329
2011	481	39	20	123	297
2012	490	32	16	128	299
2013	491	40	16	153	378
2014	508	26	16	160	316
2015*	458*	26*	13*	129*	262*
Total	2,823	210	90	824	1,881

* 2015 figures through November 2015

During the 71-month assessment period, a total of 824 vessels called at the facilities in Ferndale, including 470 tankers calling at Phillips 66. That total also includes the vessels calling at the INTALCO terminal: 111 dry bulk vessels delivering alumina to the plant for smelting, and 39 liquefied petroleum gas carriers shipping propane and butane by way of a portable loading arm and a fixed piping system on the INTALCO dock.

During that period, a total of 1,882 vessels called at BP Cherry Point, including 1,338 tankers. The balance of the traffic involved ATBs. Some of that traffic would have transited through Rosario Strait and may have used the anchorages at March Point, as a total of 1,048 vessels did during the period.

Bellingham received the least vessel traffic, with a total of just 90 vessels in the 6-year period, only 7 of which were tankers and all of which went to the anchorage.

The Port of Anacortes receives a small volume of commercial traffic, consisting of general cargo vessels, bulk carriers moving petroleum coke and sulphur, and ATBs. The Marine Exchange data shows just 210 calls at the Port of Anacortes during the 6-year period.

Table 10-3. Vessel Calls at Tesoro and Shell Refineries 2010 – 2015
Marine Exchange Data

Vessel Type	Tesoro	Shell
Crude Tankers	243	641
Product Tankers	160	151
ATBs	117	463
Total*	520	1,255

* Totals through November 2015

The March Point area is the most heavily trafficked of the areas reviewed, due to the presence of three designated Anacortes anchorages—ANE, ANC, ANW— which are among the most heavily used in the study area due to their somewhat central location (See Section 5.5).

According to MX data, of the total of 2,823 vessels calling at March Point, 1,048 went to anchor, 1,255 went to Shell, and 520 went to Tesoro. The breakdowns for the two refineries are shown in Table 10-3.

The vessel movements derived from Marine Exchange Data, including shifts from anchorages, for tankers at the refineries are shown in Table 10-4. As discussed previously, the Tesoro dock records used in Figure 9-1 supplement and provide additional detail.

Table 10-4. Vessel Movements to and from Tesoro and Shell Refineries 2010 – 2015
Marine Exchange Data

	Tesoro Anacortes Refinery			**Shell Puget Sound Refinery**		
Year	***Crude Tankers***	***Product Tankers***	***ATBs***	***Crude Tankers***	***Product Tankers***	***ATBs***
2010	28	12	79	92	22	9
2011	59	24	75	119	32	9
2012	58	30	82	137	12	2
2013	33	28	81	108	29	30
2014	42	37	69	91	30	40
2015	23	29	77	94	26	27
Total*	243	160	117	641	151	463
All Vessel Movements		520			1,255	

* Totals through November 2015

10.3.3 Passageline Data

Traffic data also were obtained for key points along the route from sea to the Refinery. The Marine Exchange has divided the waterways into a number of segments to facilitate vessel tracking and data capture. The boundaries between those segments are designated as passagelines. Traffic counts are made at those points. Vessels calling at the Tesoro terminals cross passagelines designated as Strait of Juan de Fuca, Rosario Strait South End, Rosario Strait North End, and West End of Guemes Channel. These data document how many vessel transits are made along the route that the CPUP tankers will follow. Note that every crossing of the passageline is documented, rather than indicating unique voyages. At the time of preparing this report, data was available only through 2014.

Figure 10-2 illustrates Marine Exchange passageline designations.

The passageline data include counts of all vessels equipped with AIS that crossed each of the lines, including traffic calling at terminals in Canada or transiting further up the Strait of Georgia. It includes cargo vessels, tankers, and passenger vessels (including the many ferries that operate in the study area), as well as towing vessels and tugs, all of which are reflected in these totals.

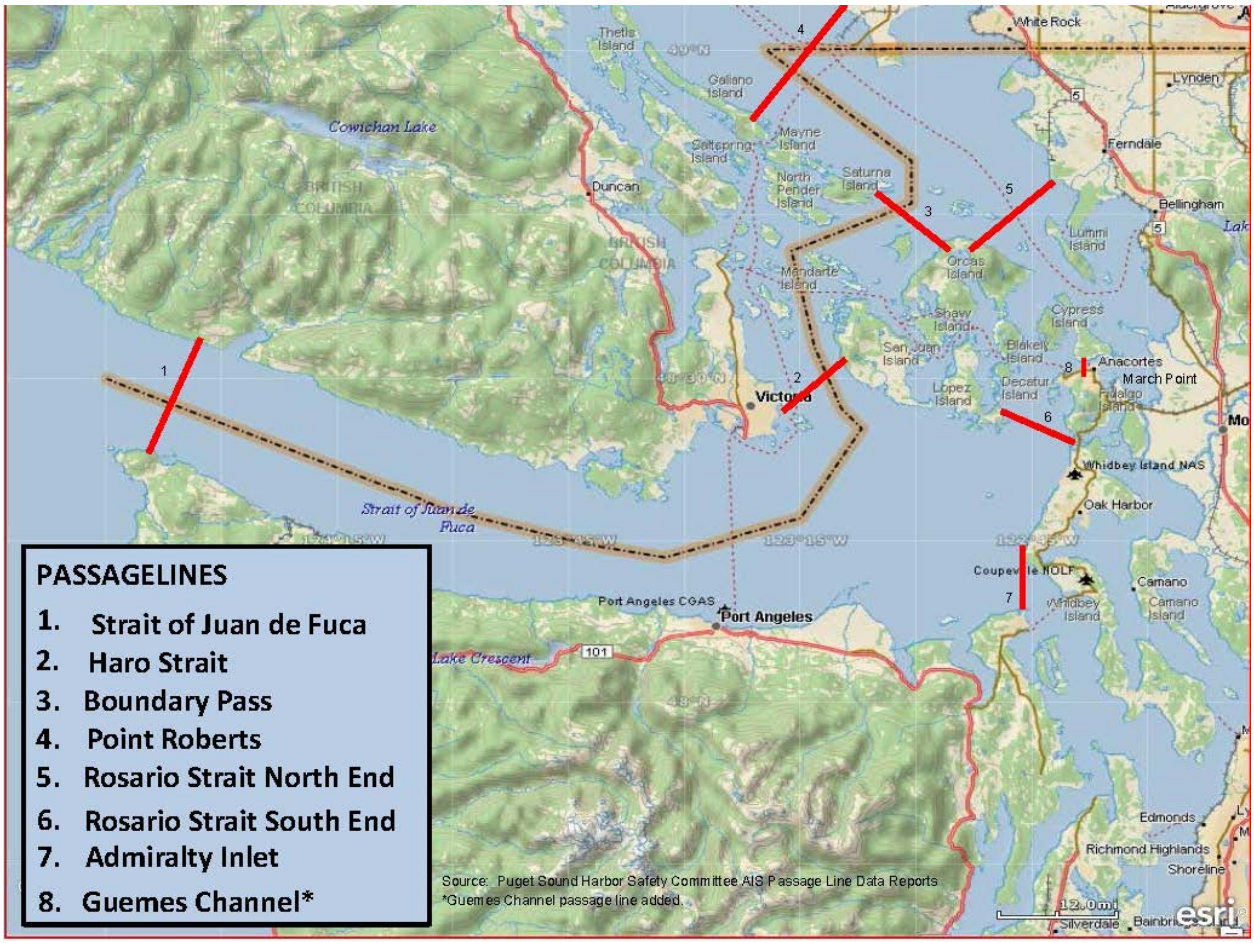


Figure 10-2. Marine Exchange Passagelines

Vessels operating on short routes, especially ferries, may cross the line numerous times in a single day, and all crossings are counted, thereby contributing to the large traffic volumes, as shown in Table 10-5 for Guemes Channel that includes state and county ferry traffic.

Table 10-5. Total Traffic at Passagelines

	Strait of Juan de Fuca	Rosario Strait South End	Rosario Strait North End	Guemes Channel
2010	8,589	4,509	2,237	13,921
2011	9,219	5,504	2,843	16,130
2012	9,494	5,292	2,947	15,765
2013	9,310	5,523	2,989	15,821
2014	10,594	6,162	3,550	17,654

These figures are for total traffic in both directions: that is, eastward and westward in the Strait of Juan de Fuca, Rosario North, and Guemes Channel; and northward and southward in Rosario South. These figures show a general trend of increasing traffic levels, with a substantial increase in 2014, which the Marine Exchange attributes to a change in service on the route for ferry service to and from BC.

Review of the Marine Exchange data shows that the majority of the traffic in the Strait of Juan de Fuca consists of cargo vessels. A large majority of the traffic in the Rosario Strait (on the order of 80 percent)

consists of towing vessels and tugs. An even larger percentage of the traffic in the Guemes Channel consists of passenger vessels, primarily ferries. The data capture information on towing vessels and tugs, but the data do not distinguish ATBs from other types of tugs and towing vessels and do not provide a mechanism to determine how many ATBs were in the traffic mix.

This data is useful for reviewing trends and general traffic levels, but they may not give a completely accurate view of actual vessel operations. The data are obtained from AIS transmissions from individual vessels, which are recorded and aggregated by the Marine Exchange. Some elements of the data are coded by the crew of the vessel, such as the vessel's destination, which can introduce uncertainties.

For example, entries for "Anacortes" were found with 17 different formats and spellings. Differences in the east-west and north-south traffic volumes are not readily explained, other than to consider that many vessels do not transit directly to a terminal but rather go to anchorages that might be somewhat remote from the final destination. However, these are the most complete data available for the study area, and these data are the basis for all of the major vessel traffic studies that have been performed for the region, including the Vessel Traffic Risk Assessment Study (VTRAS) prepared for WA State Department of Ecology.

The totals indicate that cargo and tank vessel traffic in the study area overall have increased in the past several years: substantially so in the Strait of Juan de Fuca and to a lesser degree in Rosario Strait. At the same time, cargo and tanker traffic levels in the Guemes Channel have dropped by nearly 70 percent from 2010 to 2014. Figure 10-3 illustrates the relatively stable traffic volumes for Rosario Strait compared to the dramatic decline in cargo and tanker vessel traffic in the Guemes Channel.

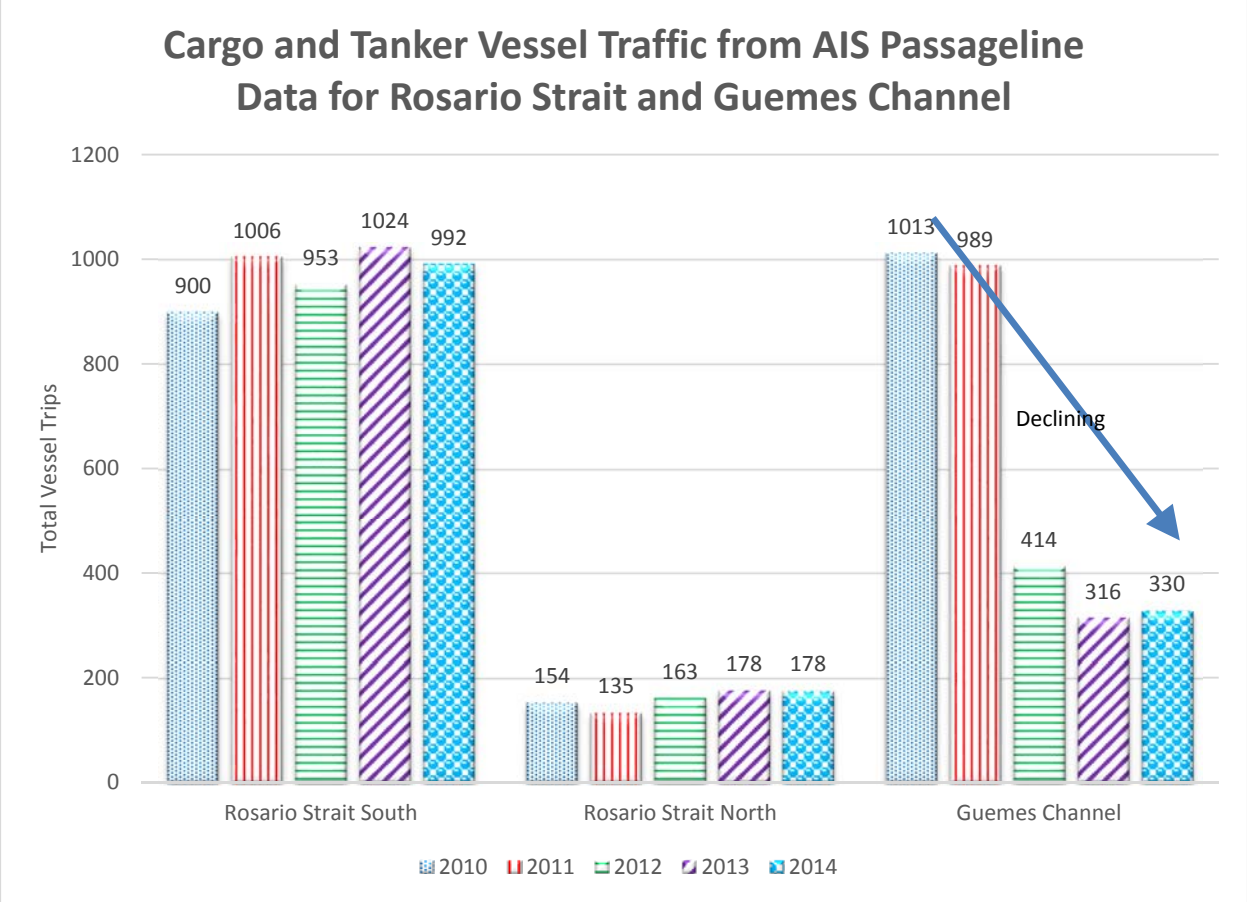


Figure 10-3. AIS Vessel Traffic in Rosario Strait and Guemes Channel 2010 to 2014

The main growth area was cargo vessel traffic in the Strait of Juan de Fuca, which includes increases in container shipping and general cargo to Puget Sound ports, while dropping significantly in the Guemes Channel from 2010 and 2011 to 2012 and later. Tanker traffic has grown overall, with some fluctuations, for the study area; however, tanker traffic to Anacortes has been decreasing for several years, and that traffic is a very small percentage of the overall traffic in the study area.

Other changes also have taken place that will or could result in further small changes in vessel traffic. For example, ALCOA has announced that it will close the INTALCO smelter, which could eliminate alumina delivery traffic. At the same time, Petrogas has acquired the Chevron Ferndale liquefied petroleum gases (LPG) Terminal (which uses the INTALCO dock for import and export of propane, butane, and iso-butane) and announced its intention to increase exports of butane. Both of these actions represent very small traffic volumes, and the net change will not have any substantial impact on the study area.

Guemes Channel Traffic has declined nearly 70 percent

Cargo and tanker vessel traffic levels in the Guemes Channel have dropped by nearly 70 percent from 2010 to 2014.

SECTION 11

CPUP Change Analysis

11.1 Existing Condition

The initial step in change analysis is to define the existing condition. In general, the following applies:

a. Vessels similar in size to those that will call at the Refinery for the CPUP already are calling at the Refinery.

b. Vessels larger than those for the CPUP already are operating throughout the study area.

c. Historical peak traffic for the study area overall has been as high as 3,219 vessel calls.

d. Traffic levels in recent years have been on the order of 2,900 vessel calls annually and trending downward.

e. Changes tied to changing economic conditions in recent years have resulted in decreases in vessel traffic at many existing facilities.

11.2 Changes Analysis for the CPUP

The CPUP will result in about 60 tank vessel calls—tankers, ATBs, and barges—at the Refinery annually. That represents an increase of about twenty-six percent for the Refinery compared to recent years and 2 percent compared to total VEAT traffic for the study area currently (see Section 10.2). This is less than the average annual fluctuation in VEAT traffic data of more than 4% (plus or minus) per year. Even with the additional CPUP vessel traffic, vessel traffic volumes would still be lower than traffic volumes of 2002 through 2007 (see Figure 9-1).

A change analysis identified the differences that the project will introduce as compared to the existing condition. For marine traffic, the analysis considers the following:

a. Changes in the operating environment

b. Vessel types

c. Vessel sizes

d. Numbers of vessels

e. Cargoes

f. New Vessel Transport Risk Factors

f. Impacts on other waterway users

11.2.1 Operating Environment

The operating environment through the Strait of Juan de Fuca to Anacortes has not changed appreciably since the TSS and the CVTS were established. The nature of the waterways is generally constant; naturally deep, wide traffic lanes that do not require maintenance dredging. No changes are anticipated as a result of the CPUP.

11.2.2 Vessel Types and Sizes

Planned marine traffic in support of CPUP will consist of tankers, ATBS and barges with capacities of about 180,000[3] bbl arriving and departing from sea laden with reformate. Additionally tankers around 330,000 bbl[4] laden with xylene will also depart Tesoro. Marine vessels in those classes already transit through Rosario Strait to Anacortes—including to and from the Tesoro Refinery—and to Cherry Point and beyond in both ballasted and laden conditions, and therefore do not result in a change (see Section 9).

11.2.3 Numbers of Vessels

According to Ecology VEAT data, vessel traffic levels are trending down in the study area (see Figure 10-1). MX data document a nearly 70 percent decline in cargo and tanker traffic in the Guemes Channel (see Figure 10-3). Vessel traffic in the Guemes Channel is dominated by passenger (ferry) and fishing vessels compared to tankers (5:1) and tank barges (11:1). (Glosten, 2014)

Total vessel calls per year at the Refinery from 2011 to 2015 averaged 234 calls per year. More vessels called at the Refinery in previous years, with an average of 408 calls per year from 2002 to 2008. The historical high level occurred in 2003, when 486 vessels called at the Refinery.

Sixty (60) calls per year would increase vessel calls at the Refinery by about twenty-six percent compared to recent years. However, the new total would be about 294 ships per year; below historical vessel traffic levels at the Refinery.

11.2.4 CPUP Vessel Traffic Volume Conversion

Planned CPUP vessel traffic was converted to vessel traffic days. Vessel traffic days are a unit of measurement developed by the Glosten team for the Department of Ecology. A vessel traffic day is twenty-four hours of time spent by a vessel in the study area. (Glosten, 2014).

CPUP would increase vessel traffic days by 0.5% in the study area.

The addition of from 104 to as many as 112.5 vessel traffic days annually is an increase of 0.5% compared to current vessel traffic days in the study area.

The distance from the J Buoy to the Port Angeles Pilot Station is 67.7 nm and from the Pilot Station to the Refinery via the Strait of Juan de Fuca, Rosario Strait, and Guemes Channel is 48.8 nm, resulting in a total transit distance of 116.5 nm. At the typical tanker speed of 14.5 kt, tankers bound for Tesoro will take about 8 hours to make that transit. Rendezvousing with a tug and docking at the Refinery adds about 0.8 hour, for a total transit time of 8.8 hours.

Inbound and outbound times are similar, resulting in 17.6 hours total for a round trip. It is expected that each ship will be at the terminal for 24 hours. Thus, the total time in the study area for each tanker will be about 41.6 hours. Applying that figure to the CPUP traffic level of 60 vessels annually results in a total of 2,496 hours in the study area annually; when divided into 24-hour days, this results in a total of 104 vessel traffic days in the study area.

[3] Forty (40) vessel calls per year for reformate was assumed using a loaded volume of about 180,000 bbl at a conservative delivery rate of 20,000 bpd, 365-days per year.

[4] Twenty (20) vessel calls per year for mixed xylenes was assumed using a conservative loaded volume of 278,000 bbls at 15,000 bpd, 365-days per year.

For ATBs, typical transit speed is 11.5 kt and total transit time is 10.5 hours on average, resulting in 21 hours per round trip, which is about 20 percent greater than for a typical tanker. Each vessel will be at the berth for 24 hours, for a total time in the study area of 45 hours.

If all 60 calls were to be made using ATBs, the annual total time in the study area would be 2,700 hours or 112.5 vessel traffic days. This is not a likely scenario, as project plans call for the export of xylenes to be made by tanker, but it does illustrate a conservative total for vessel time in the project study area. The total vessel traffic days for the study area for the period 1995 to 2010 was 322,805, amounting to more than 20,000 vessel traffic days per year. (Glosten, 2014)

The addition of from 104 to as many as 112.5 vessel traffic days annually is an increase of 0.5% compared to current average vessel traffic days.

11.2.5 New Cargoes

Reformate has been delivered to and shipped from the Refinery by ship and barge in recent years (see Section 9.2). Reformate will not be a new cargo.

Xylenes will be extracted from reformate and will be exported by ship. Xylenes will be a new cargo shipped from the Refinery.

11.2.6 New Vessel Transport Risk Factors

Risks of cargo release in an accident are reduced by the robust design of modern product carriers, with both double hulls and small cargo tanks. For the xylene tankers, individual cargo tank capacities are expected to be about 25,000 bbl (3,000 cubic meters) but sizes could vary depending on customer needs.

Transport of reformate will not create any new risk factors other than the increase in vessel call frequency. Reformate, which is a gasoline blendstock with comparable characteristics to gasoline, is already being handled at the Refinery and is already addressed in Tesoro’s existing spill and emergency response plans.

Upland and at the dock, risks and mitigation measures for cargo-related incidents are addressed in detail in the Refinery's Emergency Response Plan, Oil Spill Contingency Plan, and other documents required by Federal statutes and regulations.

11.2.7 Impacts on other Ports and Users

The increased vessel traffic is modest and within the historical variation of vessel traffic levels, and the new total volume of traffic is below past levels. No impact on other waterway users is anticipated.

SECTION 12

Risk Mitigation

Historic accident levels in the project area are very low. Modern ships and navigation systems, coupled with the comprehensive vessel traffic management system in the study area, greatly reduce the potential for an accident to occur. Nonetheless, increased vessel traffic represents more opportunities for accidents. The factors discussed here serve to minimize the likelihood of adverse impacts and to mitigate any potential impacts.

12.1 Vessel Traffic Management

Based on available data, the peak total vessel traffic year for the study area was 2008 with 3,070 vessel calls. That volume of traffic did not pose any management issues for the waterway and was easily managed by the CVTS.

The average vessel traffic level in recent years (that is, 2011 to 2013) was 2,838 vessel calls.

The CPUP traffic would result in a total of 60 additional port calls, amounting to an increase of about 2 percent annually from current vessel traffic recorded by VEAT. This is less than the average annual fluctuation in VEAT traffic data of more than 4% (plus or minus) per year. The 60 additional port calls result in a total of 120 transits, inbound and outbound combined. Annually, this is an addition of one transit every 4 to 5 days.

The very modest increases that would result from CPUP operations are well within the existing management system capabilities.

12.2 Modern Ships and Tugs

The improvements in vessel designs and equipment standards over time have included provisions that made them generally more maneuverable, less prone to damage, and more environmentally sound, through features such as redundant control systems and protectively located oil tanks. These advancements minimize the potential for an accident to occur and provide construction features intended to reduce the potential for an accident to result in major damage or an oil spill.

Many older vessels have been retired, including all single-hull oil tankers, and many others will be phased out by the time CPUP begins operations (as new standards such as ballast water management systems and air emission standards come into effect). Tug designs have evolved as well, with modern propulsion systems and hull designs that greatly increase power ratings, maneuverability, and ship control capabilities without increasing tug size.

12.3 Tug Assist

Two tugs for both docking and undocking assistance will be the norm for the CPUP tankers. Such assist significantly reduces in potential for incidents and spills. Guidance related to employing tug assists can be found here: http://pspilots.org/wp-content/uploads/2013/01/Guidelines-Jan-27-2015.pdf.

12.4 Modern Technical Tools

The many advantages of modern navigation equipment, tools, and vessel systems are major factors in safe navigation. AIS and Global Positioning Systems (GPS) make it possible to track vessel movements very closely. Laptop computers carried by pilots with remote data access to navigation and environmental information sources, and sophisticated voice and email communication capabilities, are

just some of the tools available to pilots and vessel crews. Pilots can observe and compare predicted conditions and real-time data at any point in the transit and, historically, those predicted and actual conditions match very closely.

12.5 Improved Maritime Standards

Professional qualification, training, watch-keeping, and performance standards (such as Bridge Team Management training for vessel crews and pilots) have evolved greatly in recent years. Current standards include provisions for enhanced training levels, comprehensive voyage planning, and minimizing crew fatigue.

12.6 Regional Standards of Care

The Puget Sound Harbor Safety Committee has developed the Puget Sound HSP that provides information, guidelines, and Standards of Care for marine operations in Puget Sound. The HSP is specifically directed to enhancing marine safety and environmental stewardship by using risk-based decision-making (Puget Sound, 2016).

12.7 Emergency Response Tug at Neah Bay

A marine industry-funded emergency response towing vessel (ERTV) is stationed at Neah Bay, near the entrance to the Strait of Juan de Fuca. The tug currently assigned is Foss Maritime's Jeffrey Foss, a 4,300-horsepower twin-screw ocean towing vessel with a 70-ton bollard pull rating. It is capable of stopping, holding, and towing a 180,000 dwt disabled vessel—a vessel much larger than any of those that currently call at the Refinery and much larger than the CPUP vessels—in severe weather conditions.

The tug was selected by a marine industry working group that included the Puget Sound Harbor Safety Committee and other maritime stakeholders. It is under charter to the Washington State Maritime Cooperative (WSMC) and is funded through the Marine Exchange of Puget Sound.

The tug is available 24 hours a day and can be underway within 20 minutes of a decision to deploy. The tug is available to assist vessels on request via the USCG VTC or the Marine Exchange of Puget Sound.

12.8 Moving Security Zone

Under current USCG practice, a 500-yard moving security safety zone is established around each tanker for the duration of its transit.

As defined in 33 CFR 165.30, information on the security safety zone is as follows:

a. *A security zone is an area of land, water, or land and water which is so designated by the Captain of the Port or District Commander for such time as is necessary to prevent damage or injury to any vessel or waterfront facility, to safeguard ports, harbors, territories, or waters of the United States or to secure the observance of the rights and obligations of the United States.*

b. *The purpose of a security zone is to safeguard from destruction, loss, or injury from sabotage or other subversive acts, accidents, or other causes of a similar nature:*
(1) Vessels, (2) Harbors, (3) Ports, and (4) Waterfront facilities:
in the United States and all territory and water, continental or insular, that is subject to the jurisdiction of the United States.

In the project area, the USCG COTP has established a permanent security zone relative to all tanker operations. The rule is published at 33 CFR 165.1313–Security zone regulations, tank ship protection, Puget Sound and adjacent waters, Washington. Under that rule, a 500-yd (457-meter) moving safety zone is established around each tank ship in transit. No vessel or person may enter the security zone

without the permission of the USCG COTP. Vessels allowed within the security zone are required to operate at the minimum speed necessary to maintain a safe course, must proceed as directed by the tank ship master or other on-scene person in charge, and may not approach within 100 meters (109 yards) of a tanker without permission of the tank ship master or other on-scene person in charge.

The regulations describe in detail how the security zone will be managed to minimize threats to and risks associated with tanker operations.

12.9 Spill Response Preparedness

Tesoro's *Anacortes Refinery Oil Spill Contingency Plan* addresses the company's spill response preparations in detail. That plan has been approved by the USCG, the U.S. Environmental Protection Agency (USEPA), and Ecology as meeting all applicable federal and state requirements for such plans and is updated on a regular basis.

The plan will be updated, as needed, to address the CPUP changes.

SECTION 13

Security Analysis

Security issues related to the Refinery and the marine vessels that call at it are considered low. Sophisticated, integrated and redundant systems to monitor and address security greatly reduce potential security related incidents. The analysis, assessment and mitigation measures discussed in this section summarize nature of security issues and the measures in place that mitigate potential issues.

13.1 Analysis Approach

This assessment focuses on identifying potential threats to tankers, ATBs and barges, recognizing that tankers, ATBs, and barges routinely haul bulk oil, chemical, refinery products and liquefied gas in the study area. The assessment considers research and background material cited in the recently-completed Waterway Suitability Assessments (WSAs).

These prior assessments developed an understanding of threats and incident histories involving tankers, barges, ATBs and other commercial vessels, including the following:

- History of threat, activity, or attacks
- Identifiable threat intelligence
- Potential adversarial or threat groups
- Motivation, intent, and capabilities of identified threats

The research focused on sources that are publicly available and also some with restricted content. Those sources included materials mainly from 2005 to 2008, which indicate that the potential for terrorist threats and hostile actions exists, but that the history of such attacks is extremely limited, with none domestically, and that no specific credible or imminent threats have been identified. The few more recent references available confirm this conclusion.

Among the sources reviewed for information on both overall domestic threats and maritime-specific threats are the following:

- Center for Risk and Economic Analysis of Terrorism Events, University of Southern California, Los Angeles, California
- Congressional Research Service (CRS)
- Department of Homeland Security (DHS), including Federal Emergency Management Agency and USCG, and the DHS Small Vessel Security Strategy (DHS, 2008)
- Government Accountability Office (GAO)
- Homeland Security Digital Library

None of those sources yields any indication of commercial vessels being at risk of attack in U.S. waters.

13.2 Results of Research

The amount and type of information that is publically available is limited; however, what was found indicates that there is no history of attacks on commercial vessels in the U.S. and that there is no reason to expect that this situation has changed for the present or foreseeable future. The maritime community communicates freely, and any attack or other hostile action would be published quickly.

The CRS *Report for Congress Marine Security of Hazardous Chemical Cargo:* August 26, 2005-Paul W. Parfomak and John Frittelli Resources, Science, and Industry Division includes these findings that address overall threat levels:

> "Although security experts widely acknowledge that marine shipments of hazardous chemicals may be attractive terrorist targets, no marine vessel carrying hazardous chemicals has been used by terrorists in an attack on civilians."
>
> "Major accidents involving the marine transportation of hazardous chemicals are uncommon."
>
> "Although terrorists have never used a marine cargo vessel to launch a chemical attack on the general public, both international combatants and domestic terrorists tried to use explosives to release chemicals from land based manufacturing and storage facilities during the 1990s. Most of these attempts were in foreign war zones such as Croatia."
>
> "Many types of marine vessels may transport hazardous cargo in bulk. These vessels have distinct construction and operating characteristics depending upon the quantities and physical properties of the cargoes they are designed to carry. Cargo vessel characteristics are an important security consideration. They determine, in part, the physical vulnerability of such vessels to accident or deliberate attack, as well as the potential consequences of an accident or attack."

The available information indicates that there is no identifiable history of malevolent acts directed against these types of vessels in U.S. ports or waterways. There have been no publicly reported or alleged incidents of domestic terrorism directed against vessels or marine terminals in the U.S. related to the carriage or handling of hazardous cargoes.

The search results reinforce this conclusion. For example, GAO's Report to Congressional Requesters (*Maritime Security: Federal Efforts Needed to Address Challenges in Preventing and Responding to Terrorist Attacks on Energy Commodity Tankers (GAO-08-141) December 2007)* includes in its "Results in Brief" section, the following statement:

> "To date, no such attacks have occurred on tankers in U.S. waters or on loading facilities in U.S. ports, and intelligence officials report there is currently no specific credible threat to tankers or terminals on the domestic front."

In the same vein, the DHS *Small Vessel Security Strategy* states the following:

> "Understanding the relationship of the threat, risk, vulnerability, and consequence of a small vessel terrorist attack on the United States will help to reduce the risk of such an attack" and structures the strategy accordingly. To date it has been successful.

In a more recent setting, Robert Gauvin, Technical Advisor, Office of Vessel Activities (CG-543(ta)), USCG Headquarters, in an interview related to the Institute for Defense and Government Advancement's (IDGA) 10th Annual Maritime Homeland *Security* Summit, April 30-May 2, 2012, made this statement, which is published at http://www.idga.org/naval-assets/articles/uscg-small-vessel-security-initiatives-revealed/:

> "By way of background, there is no specific imminent threat based on intelligence that drives the Small Vessel Security Strategy and the Small Vessel Security Implementation Plan. Rather, DHS developed them to prepare for the possible future use of small vessels by terrorists based on the fact that terrorists have in the recent past been inventive and deadly with the use of small vessels [in foreign ports]."

13.3 Security Assessment

Although no current credible threats have been identified, a general threat analysis was conducted to consider the possibility that a hostile act might be directed against a vessel in the project study area. The

assessment was based on the USCG's guidance in the *Navigation and Vessel Inspection Circular* 01-2011 for conducting WSAs. The guidance addresses a range of potential methods of attack including explosives, penetration weapons, and hijacking of the ship, as well as the potential for a release that stems from a grounding, collision, or allision resulting from an attack.

The assessment considered threat scenarios that could be initiated by individuals, such as disgruntled employees, as well as threats associated with terrorist organizations, then evaluates those scenarios for credibility. It considers the potential consequences of an attempt to cause a release and also assesses the adequacy of existing countermeasures and mitigation strategies.

The assessment found no specific threat conditions and no history of security threats to commercial vessels operating in U.S. waters.

13.4 Security Mitigation Measures

Security mitigation measures fall into two categories;

1. Overarching statutes that govern operations and protocol at the Refinery, and
2. Specific systems related to vessels that call at the Refinery.

The Refinery is regulated under the Marine Transportation Security Act (33 CFR 105). This regulation requires a site specific Security Vulnerability Assessment. This vulnerability assessment is part of a required site specific Facility Security Plan (FSP) that addresses the vulnerabilities and details mitigations to those vulnerabilities. The FSP is Security Sensitive Information (SSI) and protected from public disclosure. The FSP, including the SVA, must be periodically reviewed, updated and approved by the USCG.

As outlined in previous sections (Sections 6 and 12), a broad array of systems, programs, and equipment have been and are in place to address potential vessel security risks.

These mitigations measures include:

- VTC Automatic Identification System (Section 6.3)
- VTC Radar and Closed Circuit TV (Section 6.3)
- Special Operating and Precautionary Areas (Section 6.4)
- Regulated Navigation Areas (Section 6.5)
- Safety and Security Zones (Section 6.6)
- Moving Security Zones (Section 12.8)

Together with vigilance, these measures have effectively managed security in and around the Refinery.

SECTION 14

Conclusions

The following conclusions are supported by this Vessel Traffic Assessment:

a. The vessel traffic management system for the Salish Sea is robust and has proven effective in preventing vessel related incidents and spills and has the capacity to accommodate the CPUP traffic.

b. Existing passive and active mitigation measures are adequate for the anticipated volume of vessel traffic associated with the proposed action and other anticipated development in the study area. The most significant of those measures are the TSS and the CVTS, which result in most large vessels moving in one-way traffic lanes with active traffic management and mandatory position reporting by vessel crews.

Waterways leading to the Tesoro Anacortes Refinery are suitable

No conditions or concerns were identified that would preclude the safe implementation of the proposed CPUP vessel operations. This assessment documents that the waterways leading to the Tesoro Anacortes Refinery are suitable for the proposed new marine vessel operations

c. Vessel traffic levels in the study area overall and at the Refinery are below historical levels.

d. The CPUP will increase the vessel traffic level by about 60 vessels annually, representing an increase of 2% in overall traffic compared to current VEAT measured levels. This is less than the average annual fluctuation in VEAT traffic data of more than 4% (plus or minus) per year.

e. Vessels the size of the tankers and ATBs that will call at the Refinery already operate safely throughout the entire study area.

f. Tankers and barges calling at Tesoro for the CPUP do not introduce any substantial new risk elements from the existing levels to the study area.

Overall, no conditions or concerns were identified that would preclude the safe implementation of the proposed CPUP vessel operations. This assessment documents that the waterways leading to the Tesoro Anacortes Refinery are suitable for the proposed new marine vessel operations.

SECTION 15

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18400 Strait of Georgia and Strait of Juan de Fuca
18460 Strait of Juan De Fuca
18465 Strait of Juan De Fuca, Eastern part
18429 Rosario Strait, Southern part
18430 Rosario Strait, Northern part
18431 Rosario Strait to Cherry Point

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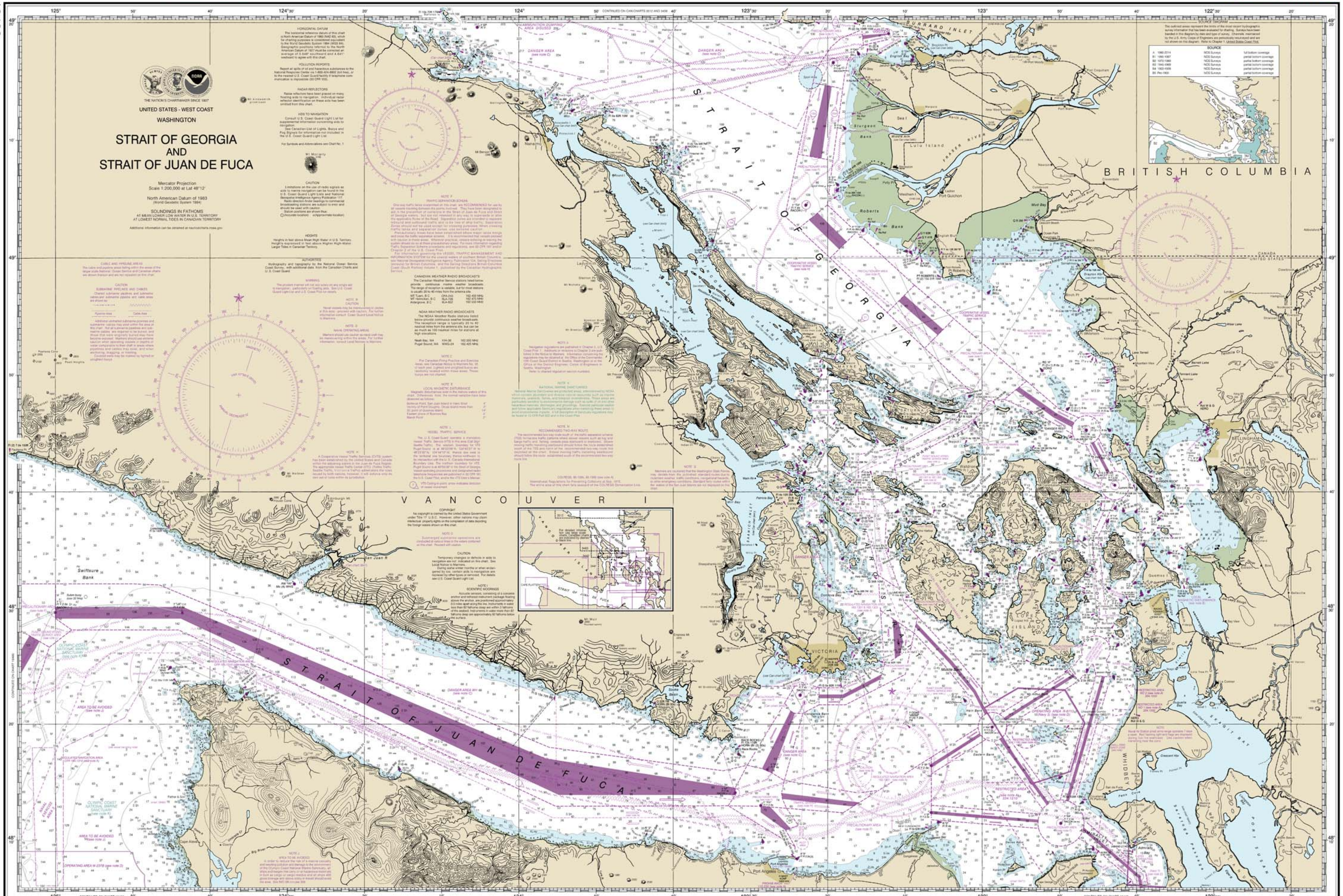
Appendix A
NOAA Charts 18400 and 18427



18400

49th Ed., Apr. 2012

18400

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U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
COAST SURVEY

Strait of Georgia and Strait of Juan de Fuca

18400

Last Correction: 11/24/2015. Cleared through:
LNM: 0316 (1/19/2016), NM: 0516 (1/30/2016), CHS: 1215 (12/25/2015)

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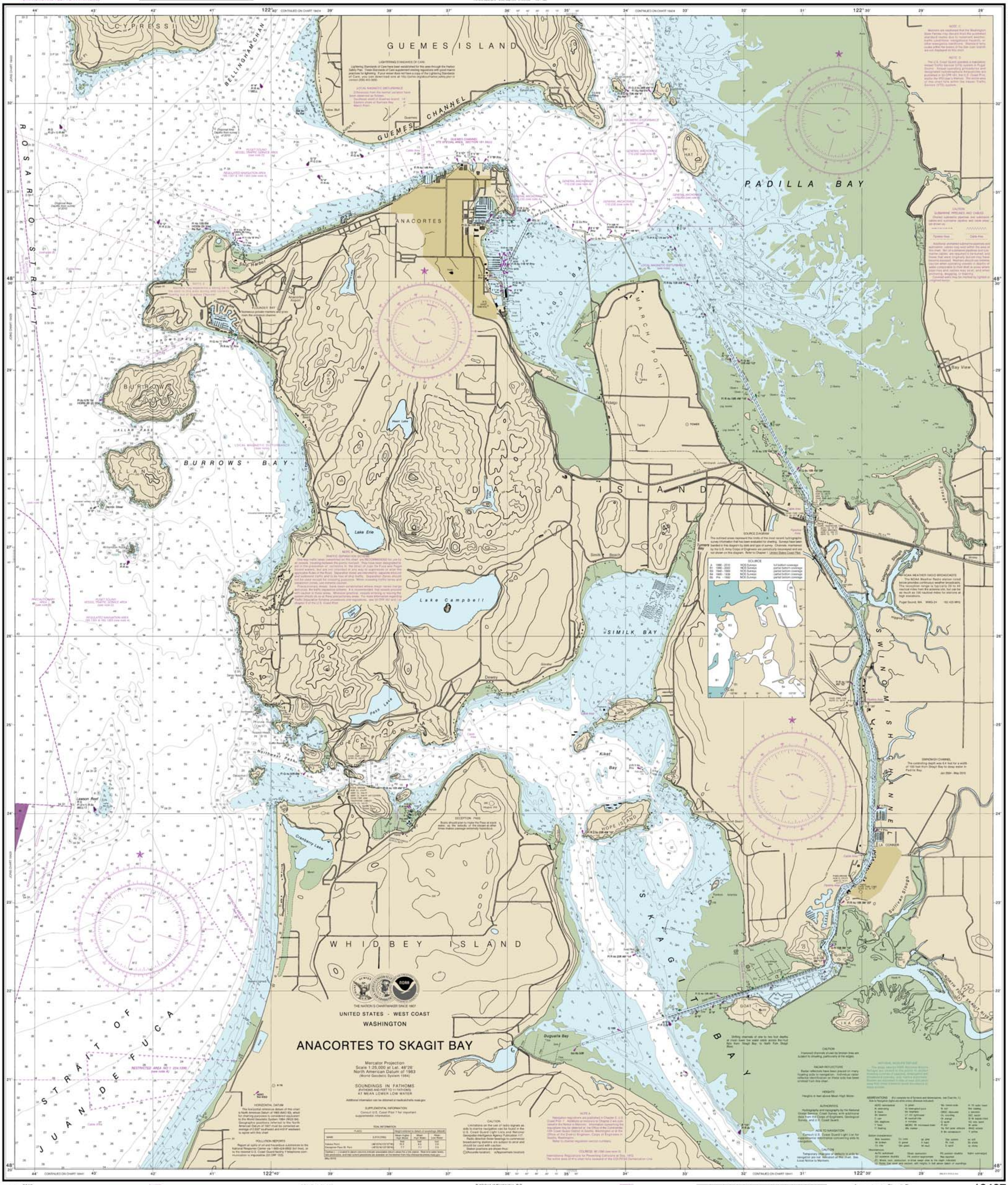
SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO 11 FATHOMS)

SCALE 1:25,000



24th Ed., May 2013

18427

Last Correction: 1/6/2016. Cleared through:
LNM: 0316 (1/19/2016), NM: 0516 (1/30/2016), CHS: 1215 (12/25/2015)

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Anacortes to Skagit Bay
SOUNDINGS IN FATHOMS - SCALE 1:25,000

18427

SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO 11 FATHOMS)