4.1 OPERATIONAL SAFETY/RISK OF ACCIDENTS

Section 4.1 describes those aspects of the existing environment that may impact operational safety, or that may be affected by an accident associated with the continued operation and proposed Marine Oil Terminal Engineering Maintenance Standards (MOTEMS) compliance-related renovations of the Tesoro Avon Marine Oil Terminal (Avon Terminal) by Tesoro Refining and Marketing Company, LLC (Tesoro or Applicant). Summaries of existing vessel traffic, other San Francisco Bay Area (Bay Area) marine terminals, and accidents involving tank vessels and marine terminals within the Bay Area are provided, followed by a description of measures in place to allow the safe movement of marine vessels in the bay and to respond to emergency situations associated with the transportation of crude oil and petroleum products to and from the Avon Terminal. Finally, this section analyzes the potential for impacts associated with the Tesoro Avon Marine Oil Terminal Lease Consideration Project (Project) and presents appropriate mitigation.

4.1.1 ENVIRONMENTAL SETTING

4.1.1.1 Bay Area, Avon Terminal, and Outer Coast Vessel Traffic

Bay Area

Many types of marine vessels call at terminals in the Bay Area, including passenger vessels, cargo vessels, tankers, tow/tug vessels, dry cargo barges, and tank barges. Section 2.2.2 in Section 2.0, Project Description (also refer to Figure 1-1 in Section 1.0, Introduction), describes the regional setting for the Bay Area, including a discussion of the five refineries, eight ports, 14 marine oil terminals, and other terminal facilities.

Table 4.1-1 presents U.S. Army Corps of Engineers (USACE) data on inbound vessel visits to the Bay Area during 2012.[1] Excluding San Francisco Harbor, over 37,000 vessel calls occurred at terminals in the Bay Area in 2012. Of these, 758 vessels paid calls in the Suisun Bay Channel, which includes the general area of the Avon Terminal. Table 4.1-2 presents Harbor Safety Committee (2013) data on tanker traffic in the Bay Area for 2003 through 2012 and tank barge traffic for 2008 through 2012, as presented in the San Francisco, San Pablo, and Suisun Bay Harbor Safety Plans for 2004 through 2013. The number of tanker arrivals for this 10-year period ranged from a high of 868 in 2006 to a low of 699 in 2010. Tank barge arrivals varied from a high of 474 in 2008 to a low of 306 in 2011. For the 5-year period from 2008 through 2012, the total annual tank vessel traffic (tanker and tank barge) varied from 1,012 to 1,243. Table 4.1-3 shows the

[1] 2012 is the most recent year of data available and is generally representative of the baseline conditions for the Project. Numbers for outbound transits are approximately the same. A vessel that visits multiple terminals is included in the count for each terminal visited in Table 4.1-1. With the exception of San Francisco Harbor, these numbers do not reflect vessel traffic transits originating in San Francisco Bay.

number of vessel calls to marine oil terminals in San Francisco Bay in 2008 (2,863 vessels) and 2013 (2,466 vessels). Table 4.1-4 summarizes the volumes of various petroleum products loaded and offloaded at Bay Area marine oil terminals in 2012. Lightering (transfer of oil from one vessel to another, normally from a large tanker—whose draft is too deep to allow it to call at a certain terminal with a full load—to a smaller tanker) also occurs in San Francisco Bay at Anchorage No. 9, located south of the San Francisco-Oakland Bay Bridge between China Basin and Central Basin. Lightering has decreased in the Bay Area since the inception of air quality regulations requiring receiving vessels to be equipped with vapor recovery systems.

Table 4.1-1: Inbound Vessel Traffic in San Francisco Bay (2012)

Location	Type of Vessel					Total Number of Vessels
	Dry Cargo	Tanker	Tow or Tug	Dry Cargo Barge	Tank Barge	
San Francisco Bay Entrance	2,375	781	45	8	277	3,486
San Francisco Harbor	40,850	2	828	138	72	41,895
Oakland Harbor	11,052	1	1,612	125	673	13,463
Richmond Harbor	122	382	4,052	38	1,018	5,612
San Pablo Bay/ Mare Island Strait	9,244	447	843	261	274	11,069
Carquinez Strait	1,515	405	881	156	265	3,222
Suisun Bay Channel	183	101	281	132	61	758
Sacramento River Deepwater Channel	22	3	0	0	0	25

Source: USACE 2013

Table 4.1-2: Tank Vessel Traffic within San Francisco Bay

Year	Annual Number of Trips		
	Tankers	Barges	Tank Vessels
2012	712	333	1,045
2011	706	306	1,012
2010	699	371	1,070
2009	758	455	1,213
2008	769	474	1,243
2007*	854	Not Available	Not Available
2006*	868	Not Available	Not Available
2005*	716	Not Available	Not Available
2004*	760	Not Available	Not Available
2003*	763	Not Available	Not Available
Annual Average	**761**	**388**	**1,117**

Source: Harbor Safety Committee 2013
* Only 5 years of data for barges/tank vessels are available.

Table 4.1-3: Vessel Calls to San Francisco Bay Marine Oil Terminals (2008, 2013)

Marine Oil Terminals	2008			2013		
	Tankers	Barges	Total	Tankers	Barges	Total
Shell	67	130	197	65	109	174
Tesoro Amorco	82	3	85	74	0	74
Tesoro Avon	30	80	110	54	16	70
Phillips 66 Rodeo (formerly ConocoPhillips)	77	179	256	66	125	191
Phillips 66 Richmond	0	177	177	0	114	114
Plains All American Martinez	87	119	206	34	79	113
Shore Terminals Crockett	34	24	58	43	32	75
Plains All American Richmond	10	333	343	6	344	350
Chevron	410	370	780	402	233	635
BP West Coast Richmond	22	8	30	32	5	37
BP Lubricants	0	12	12	1	11	12
Kinder Morgan Richmond	5	0	5	10	0	10
Valero	134	22	156	99	99	198
IMTT Richmond	5	443	448	9	368	377
G.P. Resources - North	0	0	0	6	30	36
Total all Marine Oil Terminals	**963**	**1,900**	**2,863**	**901**	**1,565**	**2,466**

Sources: California State Lands Commission (CSLC) 2014a, CSLC 2014b, CSLC 2014c

Table 4.1-4: Petroleum Product Transfers in San Francisco Bay (2012)

Product	**Load** (barrels)	**Offload** (barrels)
Additives (alkylate, carbob, denatured ethanol, ethanol, isomerate, iso-octane, naphtha, PenHex, reformate, toluene, other)	6,190,230	4,006,199
Crude – ANS	0	24,172,587
Crude – Import	415,000	112,724,729
Crude – Other	0	847,996
Cutter stock	47,250	19,300
DECANT	3,500	413,500
Diesel	23,062,463	5,910,484
Fuel oil	15,218,413	8,607,572
Gasoline	29,391,781	10,631,943
Jet fuel	8,203,903	6,401,815
Light cycle oil	5,211,000	27,744,925
Lube oil	3,187,956	247,800
Other	147,951	150,899
TRANSMIX	14,000	1,000
Totals	**91,093,447**	**201,880,749**

Source: Harbor Safety Committee 2013

Ferry service and recreational and fishing boat traffic also occur in the San Francisco Bay. The Bay Area ferry system makes over 85,000 trips annually (Harbor Safety Committee 2013). High-speed commuter ferries frequently operate in the Central Bay, South Bay, and San Pablo Bay (see Figure 4.1-1), with high concentrations around the San Francisco Ferry Building on San Francisco's north shore, where most Central Bay routes terminate. Many ferries also operate between San Francisco's north shore, Alcatraz, and Sausalito/Tiburon. These ferries do not run along charted routes. The San Francisco Harbor Safety Committee, in conjunction with the U.S. Coast Guard (USCG), has established a recommended Ferry Traffic Routing Protocol for: (1) the area surrounding the Ferry Building terminal along the waterfront of San Francisco, (2) the waters of Central Bay, and (3) the waters of San Pablo Bay. The protocol is intended to increase safety in the area by reducing traffic conflicts.

In 2010, SF Environment (2010) identified 71 marinas in seven Bay Area counties, including Alameda (23), Contra Costa (9), Marin (17), San Francisco (8), San Mateo (8), Solano (4), and Sonoma (2). In 2012, there were approximately 20,000 boat berths around the Bay Area (Harbor Safety Committee 2013), with two-thirds of these located in the Central Bay. In addition, numerous boat ramps and launches encourage use of the bay by both smaller motorized vessels and non-motorized vessels (e.g., canoes, kayaks, windsurfers, and paddleboards). While only a small percentage of boat owners and renters are on the bay at any given time, sunny weekends may bring thousands of pleasure boat users on the bay's waterways. Fishing and recreational boating are discussed in more detail in Section 6.0, Commercial and Sport Fisheries.

Avon Terminal

As noted in Section 1.0, Introduction, Tesoro has applied to the CSLC for a new 30-year lease of sovereign land to continue petroleum import and export operations at the Avon Terminal. Section 2.3 in Section 2.0, Project Description, summarizes the existing components of the Avon Terminal and the renovations that would be made to bring it into compliance with MOTEMS. Section 2.4 describes the operation of the Avon Terminal. As shown in Table 2-4 in Section 2.4.10, annual vessel calls for the Avon Terminal have ranged from 38 to 181, averaging 124 calls per year from 2004 to 2013. The level of shipment activity and throughput is not expected to change substantially during the proposed 30-year lease agreement period. Hence, an annual ship and barge traffic level of approximately 70 vessels to approximately 120 vessels (anticipated maximum) has been used as the basis for the impact analysis.

The land on the lower Suisun Bay near the Avon Terminal is primarily vacant with no structures. The property adjacent to and south of the Avon Terminal is part of the Tesoro Golden Eagle Refinery (Refinery) and is fenced to prohibit public access. The nearest storage tanks are located approximately 1 mile to the south. The nearest residence is located almost 2 miles southwest of the Avon Terminal.

Figure 4.1-1: San Francisco Bay Ferry Routes

Tank vessels transiting between the San Francisco Bay entrance and the Avon Terminal must pass beneath two bridge complexes. The Carquinez Bridge complex, located at the west end of the Carquinez Strait, consists of two bridges: one completed in 1958 carrying northbound traffic and one suspension bridge (the Alfred Zampa Memorial Bridge) completed in 2003 carrying southbound traffic. The channel opening and height restrictions are governed by the older bridge: the channel on each side of the center pier is 998 feet wide, and the minimum vertical clearances are 146 feet through the north span and 134 feet through the south span. The Benicia-Martinez Bridge complex, at the east end of the Carquinez Strait, consists of three separate bridges: the George Miller, Jr. Memorial Bridge, a deck truss bridge opened in 1962 carrying southbound traffic; the Congressman George Miller Benicia-Martinez Bridge, a deck truss bridge opened in 2007 carrying northbound traffic; and the Union Pacific Railroad drawbridge opened in 1930, located between the two vehicle bridges. The drawbridge has the smallest clearances of the three bridges, with a lift span horizontal clearance of 291 feet and vertical clearances of 70 feet (closed) and 135 feet (open).

Outer Coast

Vessels entering and leaving the Golden Gate entrance to the San Francisco Bay do so through the Traffic Separation Scheme (TSS), which consists of a circular Precautionary Area with three traffic lanes (northern, main or western, and southern) exiting from the Precautionary Area. The TSS was recently modified to enhance navigational safety and mitigate the co-occurrence of endangered marine species with commercial vessel traffic. Figure 4.1-2 shows the new TSS. In a special one-time study, data compiled by the USCG Vessel Traffic Center for November 1993 through July 1994 show that approximately 50 percent of the tankers used the western lane, while approximately 25 percent of the tankers used the northern and southern lanes, respectively. For all types of vessel traffic, approximately 25 percent used the western lane, while 37 percent used the northern and southern lanes, respectively. Limited information is available on vessel routes after the vessels leave the traffic lanes. Tankers essentially remain at least 50 miles offshore when transiting to and from Alaska, and 25 miles offshore when transiting to and from other locations. Tank barges normally transit at least 15 miles offshore.

4.1.1.2 Vulnerable Resources

Vulnerable resources are those resources—such as flora, fauna, sensitive or unique habitats, fisheries, recreational areas, water intakes, and other areas of economic importance—that could potentially be harmed by an accident or spill. Vulnerable resources are outlined further with oil spill trajectory modeling in Appendix B and in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries.

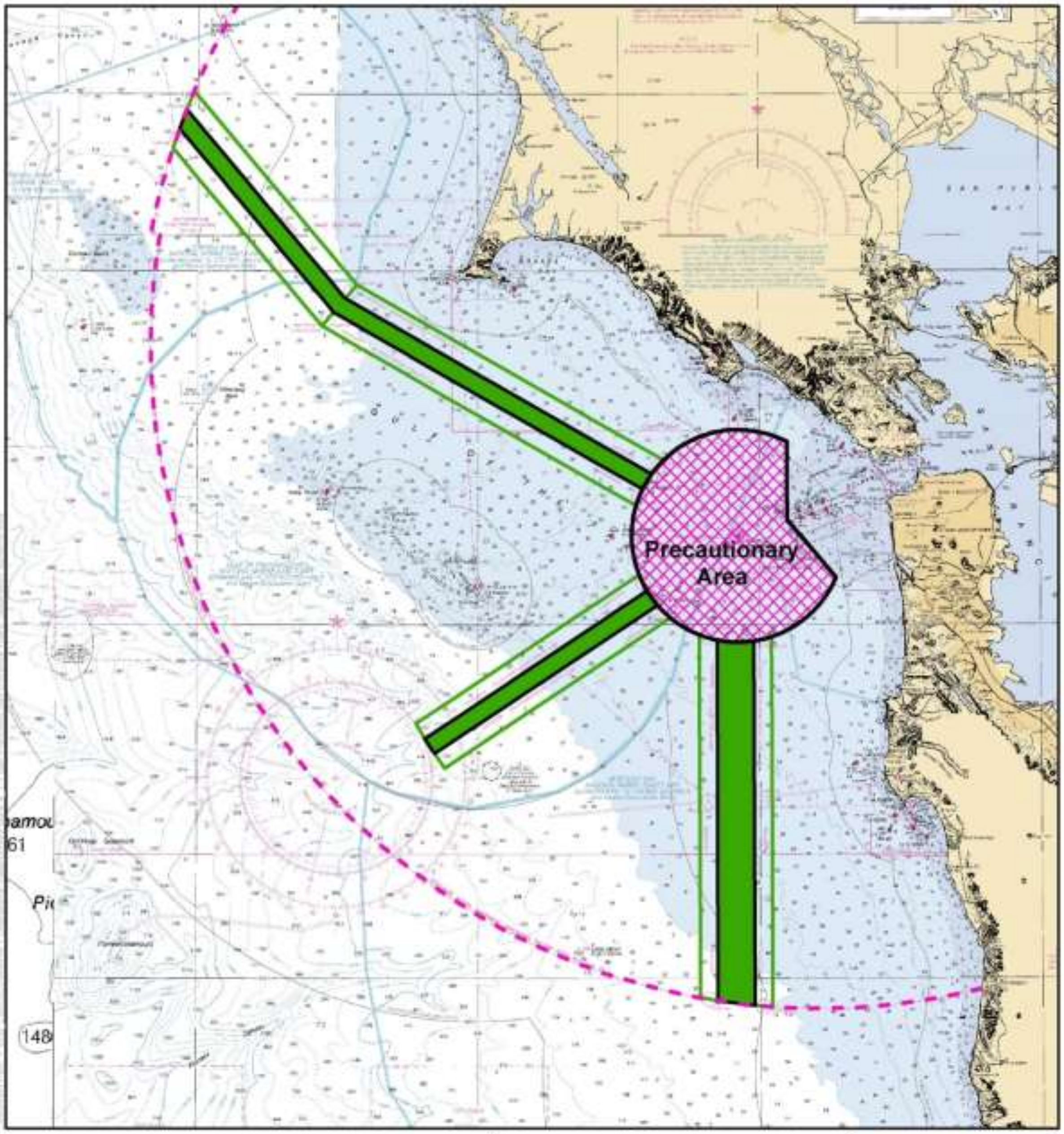

Figure 4.1-2
San Francisco Bay Entrance Traffic Separation Scheme

California State Lands Commission

Avon Marine Oil Terminal Lease Consideration Project

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Vessel Traffic Service Area Boundary
Precautionary Area
Traffic Separation Zone
Traffic Separation Scheme Lane

*Lanes are 1NM Wide on Each Side of Separation Zone

N

0 4.5 9 Miles

source: NOAA / NOS Special Projects / Office of Coast

4.1.1.3 Bay Area and Avon Oil Spill Response Capability

Bay Area

All marine terminals and all vessels calling at the marine terminals are required to have oil spill response plans and a prescribed level of initial response capability. The USCG and California Department of Fish and Wildlife's (CDFW) Office of Spill Prevention and Response (OSPR) have created the Oil Spill Response Organization (OSRO) classification program so that facility and tank vessel operators can contract with and list an OSRO in their response plans, in lieu of providing extensive lists of response resources, to show that the listed organization can meet the response requirements. Tesoro contracts with Marine Spill Response Corporation (MSRC) to serve as the primary OSRO in its Oil Spill Response Plan for offshore, onshore, and shallow-water response services, including the Avon Terminal (refer to Section 2.4.16 in Section 2.0, Project Description). MSRC has an extensive inventory of response equipment located near Benicia/Martinez (see Table 4.1-5) and throughout the Bay Area.

Table 4.1-5: MSRC Benicia/Martinez Spill Response Equipment

Equipment Type	Description
Response boats	• Raider II (38 feet) • Raider IV (38 feet) • Sentinel (90 barrels storage, skimmer, boom) • Mini Spoiler I (18 barrels storage, skimmer, boom) • Mini Spoiler II (18 barrels storage, skimmer, boom)
Other vessels	• Four Mini Barges (100 barrels storage each) • Two Shallow Water Push Boats • Two Fast Tank (35 and 37 barrel storage) • Two 21-foot Small Boats • Six 12-foot Punts • One Kepner Sea Curtain (12 barrel) • One Shallow Water Barge (self-propelled @ 400 barrel)
Skimmers	• One Marco Class III (18,450 barrel/day EDRC[1]) • Two Marco Class I (7,176 barrel/day EDRC) • One 6-inch Oil Mop (480 barrel/day EDRC) • Seven 4-inch Oil Mops (266 barrel/day EDRC) • One GT-185/w adapter (1,371 barrel/day EDRC) • Two Walosep mini (596 barrel/day EDRC) • Two Oil Hawg 6-foot (1,372 barrel/day EDRC) • One Skim Pac (240 barrel/day EDRC)
Boom	• 14,850-foot, 10-inch Curtain Internal Foam • 5,000-foot, 18-inch Curtain Internal Foam • 9,600-foot, 20-inch Harbor Boom

Source: MSRC 2013
[1] EDRC = Effective Daily Recovery Capacity

Methods used for detection of submerged oil include vessel-mounted bottom- or side-scan sonar, divers with cameras, remotely operated vehicles with cameras, aircraft, and photobathymetry (photographic mapping of subsurface details). Other methods include diaper drops, where sorbents (often disposable diapers) wrapped around a lead ball are bounced on the bottom and then checked for the presence of oil; dragnet, where a seine net or chain-link fence is fitted with sorbent materials and towed through the water; and snare drops, where sorbents are attached to a line or chain, submerged, anchored, and later raised to surface. The purpose of these drops is to locate and track oil movement on the bottom.

Containment methods for submerged oil include a bottom boom (a weighted boom placed on the bottom); bubble curtains (massive amounts of bubbles released from a perforated manifold on the bottom that contain oil through turbulence caused by their rising action); water jets (nozzles placed above the surface of the water impinging on the water's surface, thus containing the oil); and a Jackson net (a boom-type device consisting of a double layer of knotless net, with an impermeable plastic membrane between layers fastened at the top and bottom that supports tension lines). The specialized types of equipment used to contain a submerged spill are not listed in EIR Table 4.1-5: MSRC Benicia/Martinez Spill Response Equipment because effective containment of submerged oil is usually almost impossible in areas where currents are present, such as in the vicinity of the Avon Terminal and the outer coast; therefore, it is uncertain which type of equipment might be used. However, the OSROs have access to the specialized equipment needed for a submerged oil spill.

Avon Terminal

In addition to Tesoro's previously described contracted OSRO response capabilities from MSRC, Tesoro maintains on-site spill response capabilities at the Avon Terminal, as well as a contract for assistance by Bay Area Ship Services for initial response, as discussed in Section 2.4.16 in Section 2.0, Project Description. Table 2-6 provides the on-site oil spill response equipment as listed in the Avon Terminal Oil Spill Response Plan (Tesoro 2012). The Tesoro Spill Response Team is composed of approximately 25 personnel trained in oil spill containment and recovery procedures. Training is ongoing on a monthly basis. Key areas of training are boom deployment and boat handling. Bay Area Ship Services provides additional initial response capabilities, including the immediate deployment of 600 feet of harbor boom in 30 minutes. Presently, Tesoro keeps its larger response boats at the Martinez Marina. As part of the MOTEMS renovation, these response boats would be relocated to the Avon Terminal, thus affording a more rapid response in the event of a spill.

Federal and State regulations specify response capability requirements for marine facilities. In response to these regulations, Tesoro was required to submit an oil spill response manual, which includes calculations of a worst-case discharge (WCD) from the Avon Terminal, and shows how and with what assets Tesoro would respond to such a spill. WCD calculations are required by OSPR and USCG regulations. Tesoro is also required to calculate maximum most probable and average most probable release sizes for response planning.

The USCG/OSPR WCD for the Avon Terminal consists of the sum of the volumes of all the pipelines that can be operated simultaneously, plus the amount of oil that can be pumped out before the pumps are shut down for each pipeline. The Tesoro Oil Spill Response Plan lists the WCD from the existing Avon Terminal as 10,443 barrels, which is the sum of 4,236 barrels from the 28 line, which transports gasoline, and 6,207 barrels from the 26 line, which transports fuel oil, vacuum gas oil, and black oil. Tesoro assumed a maximum pumping rate of 5,700 barrels per hour for the 28 line and 8,000 barrels per hour for the 26 line, and 30 minutes to detect the release and shut down the lines. As described in Section 2.4.16 in Section 2.0, Project Description, the pipeline is equipped with pressure sensors designed to detect any large releases quickly because of the pressure drop. In accordance with regulations, the pipeline is equipped with motor-operated valves, which can be activated remotely and closed within 30 seconds. The 30-minute detection time used by Tesoro to calculate the WCD is conservative.

Tesoro is proposing to construct Berth 1A, which would then become the only operational wharf. In this case, only one pipeline could be used to transport product at any given time. Thus, the WCD under proposed Avon Terminal operations would be 4,236 barrels for gasoline and 6,207 barrels for persistent products with an overall WCD of 6,207 barrels.

Pursuant to CSLC regulations (Cal. Code Regs., tit. 2, § 2395), the Avon Terminal is an “onshore marine terminal subject to high-velocity currents” and, therefore, is required to provide sufficient boom appropriate to the conditions at the Avon Terminal, trained personnel, and equipment maintained in a stand-by condition at the berth for the duration of the entire transfer operation, so that a length of at least 600 feet of boom can be deployed within 30 minutes of a spill. Tesoro contracts with Bay Area Ship Services to meet this requirement and maintains 2,200 feet of boom on the wharf (Tesoro 2012).

The USCG requires that marine terminals must be able to respond to a small (50 barrels; 1 barrel equals 42 gallons) spill with the following equipment:

- 1,000 feet of containment boom and a means of deploying it within 1 hour;
- oil recovery devices within 2 hours; and
- oil storage capacity for recovered oily material.

Tesoro’s Oil Spill Response Plan has been certified by the USCG and OSPR as meeting these requirements. This Plan also addresses response preparations for a WCD from the Refinery, which is located adjacent to the Avon Terminal. Because the Refinery has a WCD volume of 280,000 barrels of oil, Tesoro’s response capabilities under the plan are for spills up to 280,000 barrels, which far exceed the volume of any reasonably foreseeable spill from the Avon Terminal.

The Oil Pollution Act of 1990 was enacted, in part, to ensure that shippers and oil companies pay the costs of spills that occur. It also established a $1 billion Oil Spill Liability Trust Fund, funded by a tax on crude oil received at refineries. The State of California also requires businesses that handle a petroleum product to file for a Certificate of Financial Responsibility, in which they must demonstrate to the State in some manner, such as insurance, letter of credit, etc., that they have the financial wherewithal to respond to and cleanup a worst-case spill.

4.1.1.4 Spills from Bay Area Marine Terminals and Avon Terminal

Bay Area

The CSLC maintains a database of tanker and tank barge calls to marine oil terminals and of all spills from marine terminals and vessels while at marine terminals in the San Francisco Bay. This includes spills of all sizes. According to CSLC (2014) data, 75 spills—varying from a teaspoon to 115 gallons (2.74 barrels)—have occurred in the past 10 years (2004 to 2013), which represents approximately eight spills per year, or one spill every 355 vessel calls, for a spill probability of 2.8×10^{-3} per vessel call. Annual tank vessel traffic is approximately 2,660 terminal calls per year (refer to Table 4.1-3). Terminals were the responsible party for approximately 64 percent of the spills, while vessels docked at a terminal were responsible for the remaining 36 percent. The largest spill from a marine oil terminal in the San Francisco Bay since 1992, the year the CSLC started tracking such spills, was 1,092 gallons (26 barrels) (CSLC 2014a, 2014c).

Avon Terminal

Tesoro reported in its Oil Spill Response Plan that there have been eight reportable spills at the Avon Terminal since 1991. These spills also show up in the CSLC spill database. The largest involved 10 gallons of diesel in 2005 (CSLC 2014a, 2014c).

4.1.1.5 Other Major Vessel Incidents

Over the past 40 years, several incidents involving vessels have drawn public attention.

- In 1971, a collision of the Oregon Standard and the Arizona Standard under the Golden Gate Bridge occurred in heavy fog and resulted in a spill of approximately 27,600 barrels of bunker heavy fuel oil. Spilled oil impacted the outer coast to the north as far as Double Point (north of Point Reyes Bird Observatory) in Marin County, and to the south near San Gregorio Beach in San Mateo County, as well as San Francisco Bay. Approximately 4,000 seabirds died as a result of the spill. This incident led to the Bridge-to-Bridge Radiotelephone Act, which requires all vessels to monitor Channel 14 VHF-FM, and the development of the Vessel Traffic Service in San Francisco Bay.

- In 1984, the chemical tanker Puerto Rican experienced an explosion in a void space surrounding a cargo tank while the vessel was in open waters about 8 miles west of the Golden Gate Bridge. The accident resulted in injury to crew members and the release of over 30,000 barrels of lubricating oil and fuel oil, impacting the Farallon Islands, Point Reyes, and Bodega Bay.
- In 1989, the tug Standard IV with an oil barge in tow lost control while approaching its berth at the Richmond Long Wharf. The barge struck the pier, destroying a catwalk and parting the bow lines on the tanker Overseas Juneau. The tanker's bow began to swing away from the pier. The tanker dropped an anchor and hailed a passing light tug. The tug held the tanker's bow against the dock while it made preparations to get underway. The tanker transited to anchorage without any further damage. The barge suffered minor damage and the tug none.
- The partially laden tanker Overseas Philadelphia was moored portside at the Wickland (now Shore) Selby Marine Oil Terminal on February 20, 1997, when the vessel broke loose from its mooring lines and drifted without power into the Carquinez Strait. As a result, the terminal sustained severe damage to the fixed loading arms and the concrete wharf. Reportedly, 420 gallons of jet fuel were released into the Carquinez Strait. The cause may have been due to a surge from the passing of another vessel that caused the breast lines to part and allowed the vessel to swing outward away from the dock. Because no cargo transfer operations were in process at the time of the incident, the spilled contents consisted of jet fuel remaining in the loading arms. Within approximately 8 minutes of the incident, the drifting vessel started its engines and then safely anchored approximately 1 nautical mile from the Wickland (now Shore) Selby Marine Oil Terminal.
- The USCG detained the Singapore-flagged Neptune Dorado in San Francisco on September 24, 2000, after port State inspections revealed safety deficiencies. The four safety deficiencies cited were two inoperative main fire pumps, a leaking starboard boiler oil settling tank, inoperative main vent blowers for the engine room, and leaking fuel oil lines to the main diesel engine. The vessel was allowed to proceed to a terminal and offload its cargo of crude oil in early October after repairs were made.
- In November 2007, a container ship, the Cosco Busan, struck the San Francisco-Oakland Bay Bridge and released almost 1,400 barrels of fuel oil into the water. Oil contamination occurred on the waterfront in the San Francisco Bay, and several beaches in San Francisco and in Marin County were closed due to the oil. On-water and shoreline oil cleanup activities were undertaken, and many

beaches have since been cleaned up and re-opened. As a result of this spill, State legislation was passed in 2008 to improve spill preparedness and response measures, including assigning responsibility for cleanup in the event of a spill.

4.1.1.6 Factors Affecting Vessel Traffic Safety

This section summarizes environmental conditions described in the USCG Pilot, Volume 7, 46th Edition, 2014 (National Oceanic and Atmospheric Administration [NOAA] 2014a); the San Francisco, San Pablo, and Suisun Bays Harbor Safety Plan Year 2012 (Harbor Safety Committee 2013); and San Francisco Bar Pilots (2014) Operations Guidelines for the Movement of Vessels on San Francisco Bay and Tributaries that could have an impact on vessel safety in the Bay Area. More detailed information on many of the areas can be found in the existing conditions description in other sections of this document (e.g., detailed meteorological data can be found in Section 4.4, Air Quality).

Winds

San Francisco Bay Area weather is seasonably variable. Winter is the season with the most significant seas, both in terms of locally driven wind waves and open-ocean swells that are generated by long fetches of strong winds over the eastern Pacific. Winter winds from November to February shift frequently and have a wide range of speeds depending on the procession of offshore high- and low-pressure systems. Spring tends to be the windiest season, with average speeds in the San Francisco Bay of 6 to 12 nautical miles per hour (knots), with wind speeds of 17 to 28 knots up to 40 percent of the time. Summer winds are the most constant and predictable. Wind speed can affect track keeping and mooring operations, and can cause strain on mooring lines during transfer operations.

Fog

Fog is a well-known problem in the Bay Area, particularly around the entrance to the San Francisco Bay (known as the Golden Gate). It is most common during the summer, occasional during fall and winter, and infrequent during spring. The long-term fluctuations are not predictable, but daily and seasonal cycles generally come at expected intervals. The foggiest months are usually July and August, while June is the least foggy. Under normal summer conditions, a sheet of fog appears in the early forenoon and becomes more formidable as the day wears on. This type of fog is normally referred to as sea fog. Fog signals in the Golden Gate operate 15 to 25 percent of the time during August. Another type of fog, referred to as Tule fog, forms in low, damp places such as the Sacramento-San Joaquin River Delta, and is most prevalent in late December and January. This type of fog tends to drift seaward through the Carquinez Strait and other gaps in the Berkeley Hills. Fog signals tend to operate 10 to 20 percent of the time during these months. The reduced visibility caused by fog can increase the potential for collisions and allisions.

Currents

The currents at the entrance to the San Francisco Bay are variable and uncertain, and at times attain considerable velocity. The ebb current has been observed to reach a velocity of over 6.5 knots. Immediately outside the San Francisco Bar, a horseshoe-shaped area of shallow water that begins north of the Golden Gate in Marin County, runs out approximately 5 miles, and curves back to shore just south of the Golden Gate; this area of water has a slight current to the north and west known as the Coast Eddy Current. The currents that have the greatest effect on navigation in the bay and out through the Golden Gate are tidal in nature (i.e., due to the tide rushing in and out of the San Francisco Bay). Currents can affect track keeping, mooring operations, and oil spill response operations.

Tides

Tides in the San Francisco Bay Area are mixed. Usually two cycles of high and low tides occur daily, but with inequality of the heights of the two. Occasionally, the tidal cycle will become diurnal (only one cycle of tide in a day). Depths in the San Francisco Bay are based on mean lower low water (MLLW) level, which is the average height of the lower of the two daily low tides. The mean range of the tide at the Golden Gate is 4.1 feet, with a diurnal range of 5.8 feet. During the periodic maximum tidal variations, the range may reach as much as 9 feet and have lowest low waters 2.4 feet below MLLW datum. Tides affect water depth, which in turn can have potential impacts by groundings. In addition, tidal action has an impact on currents in the San Francisco Bay.

Water Depths

Water depths in the San Francisco Bay are generally shallow and subject to silting from river runoff and dredge spoil recirculation. Therefore, channel depths must be regularly maintained, and shoaling—the deposition of silt and sand that decreases water depth—must be prevented to accommodate deeper-draft vessels. The USACE attempts to maintain the depth of the main ship channel from the Pacific Ocean into the San Francisco Bay at 55 feet; however, the continual siltation results in actual main-channel depths ranging between 49 and 55 feet. Deep-draft vessels in the San Francisco Bay must carefully navigate many of the main shipping channels because channel depths in some areas are barely sufficient for navigation by some modern larger vessels, depending upon how deeply laden the vessel is. While the USACE surveys specific areas of concern on a frequent basis, recent survey charts may not show all seabed obstructions or shallow areas due to highly mobile bottoms (due to localized shoaling). In addition, recent observations indicate that manmade channels may influence tidal currents to a greater degree than earlier anticipated. Water depth impacts underkeel clearance, and groundings are a potential impact. Additional information on water depth and quality at the Avon Terminal is found in Section 4.3, Water Quality.

4.1.1.7 Bay Area Vessel Traffic Control Systems

Navigational Description

The USCG has established a TSS off the entrance to San Francisco Bay (refer to Figure 4.1-2). It includes three directed-traffic areas, each with one-way inbound and outbound traffic lanes separated by defined separation zones, and a Precautionary Area. The TSS is recommended for use by vessels approaching or departing the San Francisco Bay, but is not necessarily intended for tugs, tows, or other small vessels that traditionally operate outside the usual steamer lanes or close to shore. The TSS has been adopted by the International Maritime Organization.

The USCG established the Vessel Traffic Service (VTS) in San Francisco Bay in 1972. The USCG operates the VTS and monitors nearly 400 vessel movements per day. The region is considered a difficult navigation area because of its high-traffic density, frequent episodes of fog, and challenging navigational hazards. The VTS for the San Francisco Bay region has six components: (1) automatic identification system, (2) radar and visual surveillance, (3) VHF communications network, (4) a position reporting system, (5) traffic schemes within the San Francisco Bay, and (6) a 24-hour center that is staffed with specially trained vessel traffic-control specialists.

The VTS area is divided into two sectors—offshore and inshore. The offshore sector consists of the ocean waters within a 38-nautical-mile radius of Mount Tamalpais, excluding the offshore Precautionary Area. The inshore sector consists of the waters of the offshore Precautionary Area eastward to San Francisco Bay and its tributaries extending inland to the ports of Stockton, Sacramento, and Redwood City. In sum, the geographic area served by the VTS includes San Francisco Bay, its seaward approaches, and its tributaries as far as Stockton and Sacramento.

There are seven Regulated Navigation Areas (RNAs) in the San Francisco Bay. These RNAs were established in 1993 by the USCG with input from the Harbor Safety Committee, and are based on the voluntary traffic-routing measures that were previously in existence. The RNAs are codified in 46 Code of Federal Regulations (CFR) 165.1116. RNAs organize traffic-flow patterns to reduce vessel congestion where maneuvering room is limited; reduce meeting, crossing, and overtaking situations between large vessels in constricted channels; and limit vessel speed. All vessels weighing 1,600 gross tons or more, and tugs with a tow of 1,600 gross tons or more (referred to herein as large vessels) navigating in the RNAs are required by the regulations to (1) not exceed a speed of 15 knots through the water; and (2) have engine(s) ready for immediate maneuver, and operate engine(s) in a control mode and on fuel that will allow for an immediate response to any engine order by the Captain.

Position Reporting, Communication, and Surveillance

The USCG VTS at Yerba Buena Island is the communications center for the TSS. The TSS was extensively upgraded in 1997. The upgraded system includes state-of-the-art computer-digitized radar displays shown on electronic charts. The new system automated many of the controller's duties, allowing more time for monitoring traffic. There are three classes of VTS user—passenger vessels, power-driven vessels, and towing vessels. There are four report types that may be required of each. In general, communications with VTS are brief, succinct, and to the point. Power-driven vessels over 40 meters in length are required to call VTS 15 minutes prior to entering a VTS area, when getting underway, at certain specified points, when there are changes to the sailing plan, and when leaving the VTS area.

Pilotage

Pilotage in and out of the San Francisco Bay and adjacent to the waterways is compulsory for all vessels of foreign registry and United States vessels under enrollment not having a federally licensed pilot on board. The San Francisco Bar Pilots provide pilotage to ports in San Francisco Bay and to ports on all tributaries to the bay. Pilots board the vessels in the Pilot Boarding Area outside the Golden Gate entrance, and then pilot the vessels to their destinations. Pilots normally leave the vessels after docking, and reboard the vessels when they are ready to leave and pilot them to sea or other destinations within the Bay Area.

Physical Oceanographic Real Time System (PORTS)

PORTS is designed to provide real-time information to mariners, oil spill response teams, coastal resource managers, and others about San Francisco Bay's water levels, currents, salinity, and winds. The National Ocean Service, OSPR, U.S. Geological Survey, local community, and Marine Exchange of the San Francisco Bay operate PORTS as a partnership to provide service to those who must make operational decisions based on oceanographic and meteorological conditions in the bay. Instruments are deployed at strategic locations in the San Francisco Bay to collect and provide data at critical locations and to allow nowcasting and forecasting using a mathematical model of the bay's oceanographic processes. Data from these sensors are fed to a central data-collection point; raw data from the sensors are integrated and synthesized into information and analysis products, including graphical displays of PORTS data. These displays are available over the Internet and through a voice-response system. Stations 9415102 and s06010, located at the Tesoro Amorco Marine Oil Terminal (Amorco Terminal), are the nearest PORTS to the Avon Terminal (NOAA 2014b).

4.1.2 REGULATORY SETTING

Federal and State laws that may be relevant to the Project are identified in Table 4-1.

4.1.3 SIGNIFICANCE CRITERIA

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would result in any of the following:

- The facility would not conform to its oil spill contingency plans or other plans that are in effect, or operations would not be consistent with federal, State, or local regulations (note: conformance with regulations does not necessarily mean that there are not significant impacts)
- There is a significant risk of fires, explosions, releases of flammable or toxic materials, or other accidents at the Avon Terminal or from vessels that could cause injury, lasting health effects, or death to members of the public
- The Project is located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would create a significant hazard to the public or the environment
- Existing and proposed emergency response capabilities being not adequate to effectively mitigate spills and other accident conditions, such that there is a substantial impact on vulnerable resources

The assessment of impacts related to operational safety and risk of accidents is different from the analysis of impacts in other resource areas because no impact would occur unless there is an accident. The expected probability of accidents must be factored into the analysis. Furthermore, even the occurrence of an accident does not mean significant impacts would result. Whether or not a significant impact may be expected depends on the magnitude of the accident, and as the magnitude of a given potential accident scenario increases, the probability of that accident scenario occurring generally decreases. Thus, the operational safety/risk-of-accidents impact analysis considers both probability and potential consequences of reasonably foreseeable upset scenarios, including (1) spills that can potentially impact the environment and (2) incidents that can potentially impact the safety of the public.

An oil spill, in and of itself, is not an environmental impact. Environmental impacts would occur if a spill affects environmental resources or public safety. This operational safety/risk-of-accidents analysis addresses the expected probability of oil spill accidents of various magnitudes, the extent of areas that may be impacted by such spills, and the potential for significant risks to the public. The extent of areas that may be affected by oil spills is evaluated using results from oil spill trajectory modeling conducted for other projects in the vicinity of the Avon Terminal. How a spill specifically impacts environmental resources is addressed in other resource sections of this Environmental

Impact Report (EIR), as applicable. The analysis evaluates the probability of Project-related accident from both tank vessel traffic and operations at the Avon Terminal. The analysis considers the specific type of vessels, such as tankers and barges, and the number of vessels that would be calling at the Avon Terminal over the lease period; specific design features of the Avon Terminal; and the historical accident record. Information regarding potential hazards during vessel approaches and departures is evaluated based on historical data, information from agencies and organizations knowledgeable of the area, and information from the Harbor Safety Committee.

Risk/safety analysis of potential incidents at the Avon Terminal, the consequences of spill incidents, and their expected frequency of occurrence consider the specific conditions of proposed Avon Terminal continued operations and proposed renovation activities. The worst-case and most likely spill sizes that could occur from the various components of the Avon Terminal have been estimated. The Tesoro Oil Spill Response Plan, approved by the OSPR, provides important input for this analysis, including a worst-case spill and risk and hazard analysis. Tesoro's ability to respond to and mitigate potential incidents has also been evaluated.

4.1.4 IMPACT ANALYSIS AND MITIGATION

The following subsections describe the Project's potential impacts on the environment and public safety. Where impacts are determined to be significant and there are feasible means to reduce or avoid the impact, mitigation measures (MMs) are identified.

4.1.4.1 Proposed Project

Operation

Impact Operational Safety (OS)-1: Potential for oil spills and response capability for containment of oil spills from the Avon Terminal during continued operations. (Significant and unavoidable.)

The presence of petroleum products and handling of petroleum products associated with the continued operation of the Avon Terminal would result in the potential for spills. Consequences would depend on the product released (e.g., gasoline, diesel, or crude oil) and the spill conditions, and could range from relatively small spills that can be contained during first-response efforts with rapid cleanup and less than significant impacts, to spills that are larger or difficult to clean up with significant residual impacts after remediation. Tesoro would be required by regulations to maintain response capabilities for containment of the reasonable WCD spill event.

<u>Potential for Spills from the Avon Terminal</u>

Spills may originate from the Avon Terminal or from tank vessels at the Avon Terminal, and may be due to natural factors (earthquake, tsunami, severe environmental conditions, etc.), human error (berth collision, bad hose connection, ineffective mooring line tending, etc.), or equipment failure. Potential sources of a spill from the Avon Terminal include drip pans, hydraulic hoses, loading hoses and fittings, pipelines and fittings, and valves.

The transfer area on the new Berth 1A would be impounded by a raised berm that drains into a collection system that engages automatically by level control switches. Collection pans would be located under all piping manifolds at the berth and would be designed to collect potential drips from bolted flanges, fittings, and expansion joints. A description of the drip and recovered oil facilities is contained in Section 2.3.2 in Section 2.0, Project Description. A description of the oil/product transfer procedures is contained in Section 2.5.9. The emergency shutdown system is described in Section 2.4.16. With activation of the emergency shutdown system, the pipeline block valves can be closed within 30 seconds.

The MOTEMS apply to all existing and new marine oil terminals in California, and include criteria for audit, maintenance, inspection, structural and seismic analysis and design; mooring and berthing; geotechnical considerations (including site-specific assessment); and analysis and review of the fire, piping, mechanical, and electrical systems. Tesoro is required to comply with the MOTEMS, which became effective on February 6, 2006. A discussion of MOTEMS is contained in Section 2.3.1 in Section 2.0, Project Description.

Tesoro completed its initial MOTEMS audit of the Avon Terminal in March 2008, including comprehensive inspections and evaluations of existing structural and non-structural facilities. The Avon Terminal was evaluated for compliance with MOTEMS again in March 2011 (Gerwick and Eichleay 2011, Eichleay 2011). Based on audit findings, Tesoro completed some seismic structural strengthening, fire system retrofits, and structural and non-structural improvements at the Avon Terminal between 2008 and 2014; however, significant seismic structural upgrades are still required and are one of the primary objectives of the proposed Terminal renovations. Studies and analyses completed as part of the audit include geotechnical (Treadwell & Rollo 2007a and 2008), seismic (Treadwell & Rollo 2007b), fire hazard and risk (HYT Corporation 2011a), and current Avon Terminal conditions (Ben C. Gerwick 2012). Section 2.3.1 in Section 2.0, Project Description, describes work activities that have been completed as a result of the March 2008 and March 2011 MOTEMS audits and those to be completed during 2014 as a result of MOTEMS structural inspections performed in 2012.

In addition, the Project includes renovations intended to bring the Avon Terminal into compliance with all MOTEMS requirements, including addressing the existing facility's seismic structural non-compliance. As described in Section 2.5 in Section 2.0, Project

Description, renovations at the Avon Terminal would include construction of a new berthing area, Berth 1A, and decommissioning of existing Berth 1; renovation of the existing approachway; and demolition and removal of existing Berth 5. As described in Section 2.5.14, renovations to the approachway would include repair and/or removal of existing piles, installation of new piles and pile caps, and removal of the existing trackway/walkway and replacement with a roadway and/or walkway. The accompanying pipeways would either be replaced or repaired (refer to Figure 2-4).

A release from a vessel while at the Avon Terminal is also possible. As a worst-case scenario, the entire contents of a vessel could be released; however, this is not considered a realistic scenario. The CSLC spill database (refer to Section 4.1.1.4) differentiates between spills from marine terminals and spills from tank vessels at marine terminals. The largest release from a tank vessel docked at a marine terminal in the San Francisco Bay between 1992 and 2001 was 420 gallons of jet fuel oil (10 barrels). The largest release from a tank vessel in transit between 2001 and 2013 was 58,082 gallons of fuel oil (1,383 barrels) in 2007.

Spill Planning Volumes

The USCG and OSPR specify three levels of spill planning volumes for use in determining the minimum amount of spill response equipment/capability that must be available within specified timeframes to respond to a release.

- **Reasonable Worst-case Discharge.** The WCD volume is discussed in Section 4.1.1.3, and equates to 6,207 barrels of oil.
- **Maximum Most Probable (Medium Volume) Discharge.** The USCG defines this discharge as the lesser of 1,200 barrels or 10 percent of the volume of the WCD. The WCD is 6,207 barrels, and thus, the maximum most probable discharge is 621 barrels.
- **Average Most Probable (Small Volume) Discharge.** The USCG defines the average most probable discharge as 50 barrels or 1 percent of the WCD (62 barrels in this case). Thus, the average most probable (small) discharge planning volume is 50 barrels.

Probability of Releases

The CSLC spill data, augmented by additional data for larger spills, were used to evaluate the risk of spills from the Avon Terminal. As described in Section 4.1.1.4, the largest spill between 2004 and 2013 for all marine terminals in San Francisco Bay was 115 gallons. The largest recorded spill from a marine oil terminal, including a tank vessel moored at a terminal, since 1992 (the year the CSLC began collecting these data) was 1,092 gallons (26 barrels). These statistics demonstrate that, while oil spills could be expected from the Avon Terminal under the renewed lease, the oil spills most likely to occur are much smaller than response planning scenarios required by existing regulations. Because very few large spills have occurred at terminals within the San Francisco Bay, the CSLC (2014a) integrated worldwide data with the CSLC data to estimate the potential for large spills from marine oil terminals. Figure 4.1-3 presents a graph of the probable size distribution of spill events at marine oil terminals.

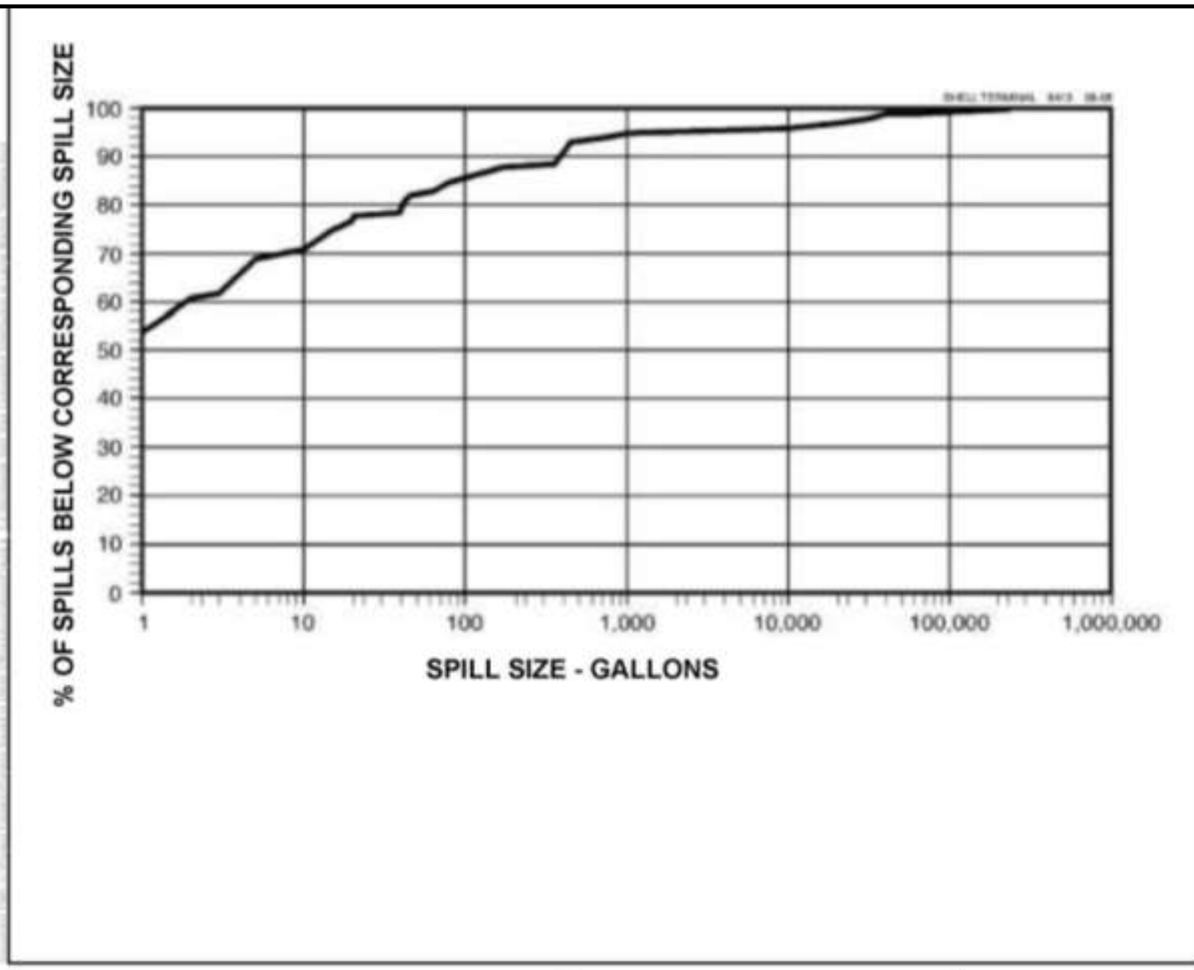

Figure 4.1-3
Worldwide Spill Size Cumulative Distribution at Large Marine Terminals
California State Lands Commission
Avon Marine Oil Terminal Lease Consideration Project

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Results you can rely on
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Because the majority of spills are small, a logarithmic scale was used for the spill size axis. As the figure indicates, 54 percent of spills are likely to be less than 1 gallon, 70 percent are likely to be less than 10 gallons, 86 percent are likely to be less than 100 gallons, and 95 percent are likely to be less than 1,000 gallons.

The maximum number of vessels projected to call annually at the Avon Terminal is 120. Using the 2.8 by 10^{-3} spill probability per vessel call derived in Section 4.1.1.4, on average, one spill approximately every 3.0 years (an annual probability of spill of 0.34) would be anticipated during the renewed lease period. A 1-gallon spill would be expected approximately every 6.4 years on average. The annual probability of a 1,000-gallon spill from the Avon Terminal is 0.02, which is equal to once every 59 years on average. The annual probability of a 1,000-barrel spill from the Avon Terminal is 0.003, which is equal to once every 300 years on average. Because the proposed lease period is 30 years, there is an approximately 10 percent chance of a 1,000-barrel spill at the Avon Terminal over the life of the lease. Larger spills are possible but have even lower probabilities. These probabilities, as applied to the Avon Terminal, are very conservative because the spill data used are for all marine oil terminals, many of which are not, or were not, designed and operated in accordance with the safeguards that the Avon Terminal would have in compliance with MOTEMS. The consequences of a spill would depend on the size of the spill; the effectiveness of the response effort; and the biological, commercial fishery, shoreline, and other resources affected by the spill. A spill of 1 gallon or less would be unlikely to result in significant impacts, while a large spill of 1,000 barrels (42,000 gallons) most likely would result in significant, adverse impacts, even in consideration of response capabilities.

The impacts of spills between 1 gallon and 1,000 barrels (42,000 gallons) would depend on the effectiveness of response efforts and the resources impacted.

<u>Oil Spill Trajectories</u>

Several oil spill trajectory models previously conducted for projects at nearby locations were evaluated to consider the potential extent of impacts that could occur from a range of spill scenarios at the Avon Terminal. These models and their relevance to the Avon Terminal lease renewal environmental impact analysis are summarized in the following paragraphs. Details of each of the models and results are provided in Appendix B. Each of the models simulated a crude oil spill; an equivalent spill of gasoline from the Avon Terminal would be expected to impact a smaller area than shown by modeling because gasoline is less persistent then crude oil. Additionally, the modeled oil spill trajectories did not account for oil spill response measures, and therefore, are very conservative.

The Shore Terminals, LLC, Marine Oil Terminal Lease Renewal EIR (SCH No. 2001042022) (CSLC 2004) presented the results of oil spill trajectory modeling for a 5,830-barrel crude oil spill from the Plains Products Terminal located approximately 0.5 mile west of the Avon Terminal. Using Oilmap, summer and winter trajectory modeling was conducted. The modeling showed that after 3 days, surface oiling could reach the Pittsburg area to the east and just past the Carquinez Bridge into the eastern portion of the San Pablo Bay to the west. During the winter, the oil could also reach the Pittsburg area to the east, but could extend much further into the San Pablo Bay to the west, extending to the Richmond Bridge. The WCD for crude oil with continued Avon Terminal operations would be 6,207 barrels, which is approximately 6 percent more than the modeled release. Given the approximately similar volume and the proximity of the modeled spill location to the Avon Terminal, a similar modeling methodology for a crude oil WCD from the Avon Terminal would be expected to yield similar results.

The CSLC (2004) also presents the results of oil spill trajectory modeling conducted by Clean Seas in 1998 for a 10,000-barrel crude oil spill near the Benicia-Martinez Bridge, which is located 1.75 miles west of the Avon Terminal. This trajectory modeling showed that after 3 days, surface oiling with a thickness of 0.01 millimeter or more could reach the Antioch area to the east and the San Francisco and Oakland area to the west/south. The WCD for crude oil with continued Avon Terminal operations would be approximately 38 percent less volume than the modeled release; less spreading would be expected given that the release volume would be substantially smaller and the release location at the Avon Terminal would be outside of the Carquinez Strait and closer to the shoreline in an area of less-intensive currents compared to the modeled spill location. Nevertheless, there are low-probability spill scenarios that could potentially occur under continued Avon Terminal operations (e.g., 10,000-barrel spill from a vessel approaching or moored at the Avon Terminal) that could be expected to yield similar modeling results.

Tesoro (2012) conducted oil spill trajectory modeling for a 22,178-barrel crude oil release at the Amorco Terminal, which is located approximately 2 miles west of the Avon Terminal, west of the Benicia-Martinez Bridge. The modeling shows that the greatest spreading toward the west and south occurs during winter conditions, with surface oiling after 3 days spreading as far south as San Mateo and west into the Pacific Ocean. The greatest spreading toward the east would occur during summer conditions, with surface oiling after 3 days spreading to the northern reaches of Honker, Suisun, and Grizzly Bays. The modeled release volume is far greater than the WCD for crude oil with continued Avon Terminal operations; however, a release of this magnitude would be possible under extremely low-probability accident scenarios that could occur, such as a large release from a vessel approaching or moored at the Avon Terminal.

While the modeling results discussed above are useful for evaluating potential conservative maximum trajectories, probability is also an important consideration. The areas that would have a 10 percent or greater probability of oiling would be considerably smaller than those discussed above, and the modeled extent of oiling becomes even smaller as the probability of oiling increases (see Appendix B).

Response Capability

Pursuant to CSLC regulations (Cal. Code Regs., tit. 2, § 2395), the Avon Terminal is an “onshore marine terminal subject to high-velocity currents,” and therefore, is required to provide sufficient boom appropriate to the conditions at the Avon Terminal, trained personnel, and equipment maintained in a standby condition at the berth for the duration of the entire transfer operation, so that a length of at least 600 feet of boom can be deployed within 30 minutes of a spill. Tesoro maintains a contract with Bay Area Ship Services to meet this requirement and maintains 2,200 feet of boom at the Avon Terminal (Tesoro 2012).

Tesoro's additional response assets are described in Section 4.1.1.3. Tesoro's response to a release would be a function of the type of product released, the amount of product released, and the environmental conditions present at the time of release. In particular, responses to releases of highly volatile products—such as gasoline—are significantly different than responses to persistent materials such as crude oil and diesel fuel. In general, booms are not deployed to contain highly volatile materials because of the flammable nature of the product. In addition, highly volatile materials tend to evaporate quickly. Typical responses to each type of release are discussed below.

Gasoline and other light hydrocarbons float on the water and are extremely flammable. Containment of these materials may allow explosive concentrations to accumulate. The preferred response is to knock down the vapors, protect shorelines from fouling, and allow evaporation to occur. Tesoro's response guidelines for gasoline and other light hydrocarbons are summarized as follows (Tesoro 2012):

- Identify the source and stop discharge, if possible.
- Eliminate sources of vapor cloud ignition. Use waterfog (a type of firefighting technique using a nozzle setting that creates a fog-type mist) to knock down vapors and disperse material, if available.
- Stay upwind and evacuate nonessential personnel.
- Advise neighboring operations of any threat to their property or personnel.
- Advise boats operating in the area of potential danger and direct them out of the area.
- Determine the direction and expected duration of spill movement.
- Request the USCG to establish VTC in the area.
- Review the location of environmentally and economically sensitive areas. Utilize trajectory analysis to assist in prediction of potentially impacted areas. Determine which of these areas may be threatened by the spill and direct contractors to proceed with boom and skimmers to these specified locations.
- Obtain Explosimeter and other air sampling equipment to assure areas are safe to enter for continued response operations.

The following paragraph describes the steps that Tesoro would most likely follow in the event of a release of Group III or IV crude oils and persistent products.

Tesoro's first step upon discovering a release would be to attempt to stop it (e.g., by activating the emergency shutdown system). Tesoro would then activate its spill-response team. This would include the personnel on duty at the Avon Terminal and spill-response personnel at the Refinery, as well as its initial response contractor, Bay Area Ship Services. The next step would most likely be to deploy the boom at the Avon Terminal. Bay Area Ship Services maintains spill-response boats that are capable of deploying 600 feet of boom at the Avon Terminal within 30 minutes. The boom would be deployed on the down-current side of the spill in an attempt to prevent the oil from drifting to where it could impact sensitive environmental resources and commerce. Additional fast-response vessels, boom-carrying/deploying vessels, boom, personnel, and other response equipment are available from MSRC. The current itself would assist in deploying the boom in the shape of a catenary curve. Oil would be recovered with sorbent material and/or skimmers.

Tesoro maintains sorbent material at the Avon Terminal (refer to Table 2-6 in Section 2.0, Project Description). Numerous skimming vessels and additional sorbent material are available from MSRC (refer to Table 4.1-5). A number of response boats are berthed in Martinez, including the Spill Spoiler and Sentinel, both of which are equipped with skimmers, boom, and 90 barrels of storage. MSRC can also supply oil storage devices to collect the recovered oil. Even though Tesoro is compliant with USCG regulations for spill response, a spill could have significant effects if the spill is large or if sensitive biological resources are affected. The use of dispersants would need to be authorized in consultation with the Environmental Unit within the Planning Section of a Unified Command. Due to a number of concerns, it is not likely that dispersant use would be authorized within the San Francisco Bay, although offshore use may be considered.

The MOTEMS have set minimum requirements for preventative maintenance that include periodic inspection of all components related to transfer operations, including pipelines. Tesoro is required to comply with those requirements, as well as with the CSLC's operational requirements, including Article 5.5 Marine Terminal Oil Pipelines (Cal. Code Regs., tit. 2, §§ 2560-2571). In addition, MMs OS-1a, OS-1b, and OS-1c would substantially reduce the potential for oil spills during continued operation of the Avon Terminal. Nevertheless, a release from the Avon Terminal or a tank vessel berthing at the Avon Terminal could, depending on the size of the spill and effectiveness of initial response actions, result in substantial effects on vulnerable resources. Therefore, the potential impact is significant.

A release at the Avon Terminal would not present a significant safety hazard to members of the public due to the separation distance from public receptor locations, as further described under Impact OS-3. Even for low-probability large spills from the Avon Terminal, it is anticipated that separation distance of the Avon Terminal from public areas would provide time to respond with warnings and access controls before the spill could spread to public areas, which would limit the potential for unsafe levels of exposure to hazardous constituents in the spilled product.

The following MMs (MMs OS-1a through OS-1c) shall be completed by Tesoro within 24 months of lease renewal.

Mitigation Measures:

MM OS-1a: Remote Release Systems. Tesoro Refining and Marketing Company, LLC (Tesoro) shall install remote release systems to allow a vessel to leave the Avon Terminal as quickly as possible in the event of an emergency (fire, explosion, accident, or tsunami) that could lead to a spill. Tesoro shall provide and maintain mooring line quick-release devices that shall be able to be activated within 60 seconds. These devices shall be capable of being engaged by an electric/push-button release mechanism and by an integrated remotely operated release system.

- Tesoro shall document procedures and training for systems use and communications between Avon Terminal and the vessel operator(s).
- Routine inspection, testing, and maintenance of all equipment and systems shall be conducted in accordance with manufacturers' recommendations and necessity and shall be required to ensure safety and reliability, to the satisfaction of California State Lands Commission (CSLC) staff.
- Tesoro may install alternate technology that provides an equivalent level of protection, as reviewed by CSLC staff and approved by the Commission at a publicly noticed meeting.

MM OS-1b: Tension Monitoring Systems. Tesoro Refining and Marketing Company, LLC (Tesoro) shall provide and maintain tension monitoring systems to effectively monitor all mooring line and environmental loads, and avoid excessive tension or slack-line conditions that could result in damage to the Avon Terminal structure or equipment, and/or vessel mooring line failures that could result in spills.

- Line tensions and environmental data shall be integrated into systems that record and relay all critical data in real time to the control room, Avon Terminal operator(s), and vessel operator(s).
- This system shall include, but not be limited to, quick-release hooks only (with load cells), site-specific current meter(s), site-specific anemometer(s), and visual and audible alarms that can support effective preset limits and that are able to record and store monitoring data.
- Tesoro shall document procedures and training for systems use and communications between the Avon Terminal and vessel operator(s).
- Routine inspection, testing, and maintenance of all equipment and systems, in accordance with manufacturers' recommendations and necessity, shall

be required to ensure safety and reliability, to the satisfaction of California State Lands Commission (CSLC) staff.

- Tesoro may install alternate technology that provides an equivalent level of protection, as reviewed by CSLC staff and approved by the Commission at a publicly noticed meeting.

MM OS-1c: Allision Avoidance Systems (AASs). Tesoro Refining and Marketing Company, LLC (Tesoro) shall provide and maintain AASs at the Avon Terminal to prevent damage to the pier/wharf and/or vessel during docking and berthing operations.

- The AASs shall be used and alarmed to monitor vessel drift (both surge and sway) during all mooring operations, and shall be equipped with an AIS receiver to capture passing vessel parameters.
- The AASs shall be integrated with the tension monitoring systems such that all data collected are available in the control room and to Avon Terminal operator(s) at all times and vessel operator(s) during berthing operations. The AASs shall also be able to record and store monitoring data.
- Tesoro shall document procedures and training for systems use and communications between the Avon Terminal and vessel operator(s).
- Routine inspection, testing, and maintenance of all equipment and systems, in accordance with manufacturers' recommendations and necessity, shall be required to ensure safety and reliability, to the satisfaction of California State Lands Commission (CSLC) staff.
- Tesoro may install alternate technology that provides an equivalent level of protection, as reviewed by CSLC staff and approved by the Commission at a publicly noticed meeting.

Rationale for Mitigation The Avon Terminal currently has no mechanisms that would allow the quick release of mooring lines in the event of an emergency. In the event of a fire, tsunami, explosion, or other emergency, quick release of the mooring lines within 60 seconds would allow the vessel to quickly leave the Avon Terminal, which could help prevent damage to the Avon Terminal and vessel and avoid and/or minimize spills. MM OS-1a may also help isolate an emergency situation, such as a fire or explosion, from spreading between the Avon Terminal and vessel, thereby reducing spill potential. By providing mooring-release devices capable of being engaged by a locally initiated electric/push-button release system and by a remotely operated release mechanism, Tesoro would have several different options to cover emergency situations.

The Avon Terminal is located in a high-velocity current area and currently has only limited devices to monitor mooring line strain and integrated environmental conditions. The upgrade to devices with monitoring capabilities, as detailed in MM OS-1b, can warn operators of the development of dangerous mooring situations, allowing time to take corrective action and minimize the potential for the parting of mooring lines, which can quickly escalate to the breaking of hose connections, the breakaway of a vessel, and/or other unsafe mooring conditions that could ultimately lead to a petroleum product spill.

Backed up by an alarm system, real-time data monitoring and control room information would provide the Terminal Person-In-Charge with immediate knowledge of whether safe operating limits of the moorings are being exceeded. Mooring adjustments can be made to reduce the risk of damage and accidental conditions.

Located in a high-velocity current area, the Avon Terminal is subject to “unfavorable” site conditions in accordance with MOTEMS § 3103F.6.7. At present, AASs are used at Berth 1. Installation of an upgraded AAS, as detailed in MM OS-1c, would allow monitoring of an approaching vessel’s speed, approach angle, and distance from the dock to keep the potential impact velocity within the maximum elastic allowable limits of the fender/structural system, and thus, help to prevent damage to the Avon Terminal and/or vessel due to vessel impact that could lead to a spill. Monitoring these factors would ensure that all vessels can safely berth at the Avon Terminal and comply with the minimum standards required in the MOTEMS. Excessive surge or sway of vessels (motion parallel or perpendicular to the wharf, respectively) and/or passing vessel forces may result in sudden shifts/redistribution of mooring forces through the mooring lines, which can quickly escalate to the failure of mooring lines, breaking of loading arm connections, the breakaway of a vessel, and/or other unsafe mooring conditions that could ultimately lead to a spill.

Residual Impacts While these MMs would substantially lower the probability that a spill would occur, there is an inherent risk of oil spills at any facility where petroleum product is routinely transferred over water that can never be fully mitigated. The impacts associated with the potential consequences of a large-volume or WCD spill would remain significant and unavoidable.

Impact OS-2: Potential for spills from Avon Terminal pipelines during non-transfer periods during continued operations. (Significant and unavoidable.)

Spills from the Avon Terminal during non-transfer periods would most likely be associated with a leak or spill from one of the pipelines. As part of the MOTEMS renovation, Tesoro would replace portions of the pipelines and retrofit the pipeline support system (refer to Section 2.3.2 in Section 2.0, Project Description). Tesoro also has an extensive pipeline inspection and maintenance program in place (refer to Section 2.4.15). California Code of Regulations, Title 2, Article 5.5 and MOTEMS have set requirements for preventative maintenance that include periodic testing of oil pipelines and inspection of all Avon Terminal pipeline components. Nevertheless, leaks or spills are possible, and considering the Avon Terminal’s maximum pipeline volume of 6,207 barrels (Tesoro 2012), a substantial spill is possible. Tesoro would respond to a pipeline leak or spill as described under Impact OS-1, according to the extent of the spill and affected area. Nevertheless, a spill from an Avon Terminal pipeline, depending on the size of the spill and the effectiveness of initial response measures, could result in substantial effects on vulnerable resources, as further described in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries. Therefore, the potential impact is significant. A spill from an Avon Terminal pipeline would not present a safety hazard to members of the public for reasons described under Impact OS-1.

After renovation, the Project pipelines would be fully compliant with California Code of Regulations, Title 2, Article 5.5 and MOTEMS release-prevention requirements. Tesoro is required to ensure readiness of spill response capabilities for the WCD from the Avon Terminal, which far exceeds any leak or spill that could occur from the pipeline. These prevention and response capabilities are considered to be inclusive of feasible measures to reduce the risk of oil spills from the Avon Terminal during non-transfer periods. No feasible mitigation measures have been identified that would be capable of substantial further reduction of the risk from releases during non-transfer periods.

Mitigation Measure: No mitigation measures available.

Impact OS-3: Potential for fires and explosions during continued operations, and response capability. (Significant and unavoidable.)

The nearest residential area is almost 2 miles away. The property adjacent to and directly south of the Avon Terminal is part of the Refinery and public access to this area is prohibited. The Benicia-Martinez Bridge is approximately 1.75 miles away. There are no other public gathering areas, such as parks and marinas, located within 2 miles of the Avon Terminal. These areas are too far away to be impacted by heat from a potential fire or flying debris from a potential explosion at the Avon Terminal. Due to separation distance, the risk to the public from a potential fire or explosion at the Avon Terminal is less than significant. If an oil spill were to occur from the Avon Terminal and become ignited, it could drift toward the Benicia/Martinez Bridge and commercial/ recreational vessels in the area. This could present a hazard to the public or property. The intervening distance would provide time to respond and evacuate public areas if needed for safety, so the risk to persons from a potential ignited oil spill is low. Furthermore, because of the extremely low probability of an oil spill with fire, the risk of such an event to the public is less than significant. However, a major fire at the Avon Terminal could result in an oil spill with significant impacts similar to Impact OS-1.

Risk Potential and Safety Features

No fires or explosions have been reported at the Avon Terminal (Tesoro 2012); however, fires and explosions at the Avon Terminal and/or involving vessels are possible. Tank vessels have the potential to be a source of fire or explosion. Tankers are required by 46 CFR Part 34 to have sophisticated firefighting systems, which include fire pumps, piping, hydrants, and foam systems. Tank barges are required to have portable fire extinguishers, and some are equipped with built-in systems. The tank vessel crews are trained in the use of the firefighting equipment, and the onboard firefighting equipment is sufficient to extinguish most fires.

Tank vessels loading or unloading low-flash cargoes (cargoes having a flash point of less than 150 degrees Fahrenheit [ºF]) are required to have properly operating inert gas systems (IGS). An IGS generates an inert gas that is injected into the cargo tanks to displace the oxygen to a level that will not support ignition. The Vessel Person-in-Charge is required to verify that the tanks are inerted and that the IGS is working properly before transfer operations can commence. Products with flash points greater than 150ºF do not generate enough vapors to support ignition unless the product is heated to a temperature above 150ºF. The Avon Terminal does not transfer any products that would produce gas cloud hazard footprints that would cause a toxic health or safety risk to the public.

Another potential area for a fire or explosion is the Marine Vapor Recovery (MVR) system (refer to Section 2.3.2). The purpose of an MVR is to provide fire and explosion protection. To prevent fires and explosions in the system, natural gas is injected into the vapor stream to enrich the recovered vapors (vapors coming off the vessel during loading operations). A hydrocarbon analyzer measures and verifies that the proper enrichment values are met. Nitrogen is used to purge the vapor hose at the end of all vapor transfer operations. An insulating unit electrically isolates the vapor hose from the Avon Terminal. Static charges developed in the hose during vapor transfer will flow back to the vessel. An insulating flange is provided at the berth end of the hose to electrically isolate the hose and the vessel from the berth. A detonation arrester is installed in the vapor pipeline to prevent a flame from passing from the Avon Terminal to the ship.

Tesoro submitted information on the existing MVR as originally designed and installed to the USCG in compliance with the requirements of 33 CFR 154. As part of submission, Tesoro performed a Safeguarding Analysis of the MVR. A Letter of Adequacy for the MVR was issued by the USCG prior to its operation. The USCG reviews the MVR test records as part of its annual facility inspection. As part of the renovation, a new skid-mounted MVR would be installed. Information on this system, including a Safeguarding Analysis, would be submitted to the USCG for review and approval, and a Letter of Adequacy for the MVR would have to be issued prior to its operation.

It is also possible that an oil spill could become ignited. For this to occur, an ignition source would have to be present. Tesoro has numerous measures in place to minimize ignition sources. For example, hot-work permits are required before any welding is allowed. Smoking is not allowed on the wharf or anywhere on Refinery grounds. With the low probability of a release and the measures in place and to minimize the presence of ignition sources, the potential for a fire involving released product is extremely low. In addition, except for the waterway with transient traffic, there are no public receptor locations near the Avon Terminal that could be impacted by a fire.

The probability of a tank vessel explosion at the Avon Terminal is low because of the USCG regulations requiring that tank vessels be equipped with IGS. The CSLC (2014a) calculated the potential hazard areas from a tanker fire and explosion. The radiant-heat footprint capable of causing second-degree burns to exposed skin after 30 seconds of exposure (1,600 British thermal units per square foot per hour) was calculated to be 300 feet around the vessels. The radiant-heat hazard footprint would not pose a significant hazard to the public because there are no residences or other public receptor locations within 300 feet of the Avon Terminal. An explosion involving one of the cargo tanks could send flying debris up to 1,500 feet from the vessel (Reese-Chambers 1981, CSLC 2014a). Except for the waterway with transient traffic, there are no public receptor locations within 1,500 feet of the Avon Terminal. Hence, the public would not be expected to be impacted by flying debris from a vessel explosion. Considering the separation distance, the fire or explosion risk to the public is less than significant. Furthermore, the very low (less than one in a million per vessel call [CSLC 2014a]) probability of a tank vessel explosion makes its occurrence unlikely.

Fire Response Capability

In response to the MOTEMS audit (HYT Corporation 2011a), Tesoro would retrofit the fire protection system on the Avon Terminal to meet the requirements of MOTEMS. In addition, Tesoro has developed a comprehensive Fire Protection Plan for the Avon Terminal (HYT Corporation 2011b). Tesoro also maintains its own fire/emergency response department with full-time trained personnel at the Refinery. These personnel are trained in fighting petroleum fires at the Avon Terminal.

Tesoro is a member of the local Petro-Chemical Mutual Aid Organization, an agreement between large industries in the San Francisco Bay Area to provide aid in the form of spill/hygiene/fire-response equipment and assistance. In addition, the Contra Costa County Fire Protection District would respond to a marine fire and provide support.

The USCG (2008) prepared and issued a Marine Fire Fighting Contingency Plan that addresses risk assessment, including damage potential, strategic planning, management of response efforts, and available response resources. The plan outlines the resources that the USCG provides to manage and coordinate response in the event of a tanker fire.

Minimal discussion of procedures for managing tank vessel fires could be found in Tesoro’s manuals addressing fires, emergency response, or for conducting periodic fire drills. This has been identified as a deficiency in the manual and in planning for emergency response; therefore, the potential for a significant impact results. MM OS-3 would reduce the related risk of impact.

The risk to the public from fire or explosion at the Avon Terminal is less than significant due to separation distance. If an oil spill were to occur at the Avon Terminal and become ignited, it could drift away from the Avon Terminal and present a significant hazard. Consequences of an ignited spill would depend on the spill conditions. The distance between the Avon Terminal and the nearest public area would provide time to respond and evacuate areas if needed for safety, so the risk to the public from a potential ignited oil spill is low. Furthermore, because of the extremely low probability of an oil spill with fire, such an event is not a significant public safety risk.

However, a major fire at the Avon Terminal could result in substantial effects on vulnerable resources, as further described in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries. Therefore, the potential impact on these resources is significant. Tesoro would be required by regulations to maintain response capabilities for containment of the reasonable WCD spill, but significant impacts are still possible.

In addition to the MMs presented below, implementation of MMs OS-1a, OS-1b, OS-1c, and OS-7 would reduce the potential occurrence of a spill that could become ignited.

Mitigation Measure:

MM OS-3: Fire Protection Assessment. Tesoro Refining and Marketing Company, LLC (Tesoro) shall develop a Fire Protection Assessment, including a set of procedures, training, and drills consistent with Marine Oil Terminal Engineering Maintenance Standards (Cal. Code Regs., tit. 24, § 3108F2.2). Tesoro shall also develop a set of procedures and conduct training and drills for managing potential tank vessel fires and explosions for vessels berthed at the Avon Terminal. The procedures shall include the steps to follow in the event of a tank vessel fire and describe how Tesoro and the vessel operator would coordinate activities. The procedures shall also identify other capabilities that can be procured, if necessary, in the event of a major incident. The Fire Protection Assessment shall be submitted to California State Lands Commission (CSLC) staff within 90 days of lease renewal. Tesoro shall update the plan and procedures to cover the new Berth 1A and submit them to CSLC staff for approval prior to any tank vessel docking at Berth 1A. CSLC staff shall have final approval of the plan and procedures.

Rationale for Mitigation Procedures, training, and drills need to be in place in planning for emergency response, so that the Avon Terminal operations crew is provided the appropriate steps to follow to ensure that emergency response measures are implemented without delay in an emergency situation. These measures would help to reduce the probability of a tank vessel fire and increase response capability to further limit impacts of such a fire. Implementation of these measures eliminates the identified deficiency, and thereby reduces the impact to a less-than-significant level.

Residual Impacts While these MMs would substantially lower the probability that a spill would occur, there is an inherent risk of oil spills at any facility where petroleum product is routinely transferred over water that can never be fully mitigated. The impacts associated with the potential consequences of a large-volume or WCD spill caused by a fire at the Avon Terminal would remain significant and unavoidable.

Impact OS-4: Potential for spills and response capability for containment of oil spills for accidents in the San Francisco Bay and outer coast during continued operations. (Significant and unavoidable.)

Spills from accidents in the San Francisco Bay or outer coast could result in impacts on vulnerable resources. Impacts could be limited to a less-than-significant level for those spills that can be contained during first-response efforts without lasting impacts to vulnerable resources; however, impacts from larger spills or spills affecting sensitive resources could be significant and adverse, even considering response capabilities. The nature of these potential impacts are described in the following paragraphs and in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries of this EIR.

Probability of San Francisco Bay Vessel Traffic Accidents

Probability estimates for tanker and barge spills from vessel traffic accidents are based on data developed during the preparation of the Unocal San Francisco Refinery Marine Terminal EIR (Chambers Group Inc. 1994). Table 4.1-6 presents probabilities for oil spills greater than 100 gallons from barges and tankers from three causes: (1) collisions, which are impacts between two or more moving vessels, (2) ramming (or allisions), for which moving vessels run into stationary objects, and (3) groundings.

Table 4.1-6 also identifies the reduction in spill probability for double-bottom and double-hull vessels compared to single-bottom and single-hull vessels. Regulations prohibit single-hull vessels from operating in United States navigable waters, and double-bottom and double-sided vessels cannot operate after the end of 2015. Hence, it has been assumed that all tank vessels calling at the Avon Terminal would be double hull. In accordance with the methodology in the Unocal San Francisco Refinery Marine Terminal EIR (Chambers Group, Inc. 1994), a 0.10 reduction factor can be applied to tanker and barge groundings for double-bottom and double-hull vessels, and a 0.71 reduction factor can be applied to tanker and barge collisions for double-hull vessels. The last column in Table 4.1-6 presents the estimated total probabilities of spills greater than 100 gallons from tankers and barges after applying these reduction factors to the collision and grounding statistics. No reduction is applied for ramming accidents.

The probability estimates in Table 4.1-6 have been used to estimate the probability of a release in the San Francisco Bay from a tank vessel transiting to the Avon Terminal.

The anticipated maximum number of tank vessels that would call at the Avon Terminal is 120. Of the 146 tank vessels that called at the Avon Terminal in 2012 and 2013, 41 (28 percent) were barges. For estimating the probability of a release from Avon Terminal-bound tank vessels, it has been assumed that 34 (28 percent) of future vessel calls would be tank barges and the other 86 would be tankers. Table 4.1-7 presents the annual probabilities of spills from tank vessels calling at the Avon Terminal while transiting the San Francisco Bay. This equates to one spill every 4,500 years.

Table 4.1-6: Probability of Spill Greater than 100 Gallons, per Vessel Calling (by Vessel and Accident Type)

Vessel Type	Spill Probabilities (no reduction factors)				Applying Reduction Factors for Double-Bottom and Double-Hull Vessels
	Collision	Ramming	Grounding	Total	
Tanker	9.12×10^{-7}	1.42×10^{-7}	5.58×10^{-7}	1.61×10^{-6}	8.4×10^{-7}
Barge	4.86×10^{-6}	1.50×10^{-6}	6.02×10^{-7}	6.96×10^{-6}	5.0×10^{-6}

Source: Derived from John A. Volpe National Transportation Center 1991

Table 4.1-7: Expected Number of Annual Spills from Vessels Calling at the Avon Terminal While Transiting the San Francisco Bay

Vessel Type	Probability of Release
Tanker	7.2×10^{-5}
Barge	1.7×10^{-4}
Tankers and barges	2.4×10^{-4}

Release Extent and Impacts

A spill of crude oil from a vessel would not normally present a safety hazard to members of the public. A large spill could shut down vessel traffic in portions of the San Francisco Bay while responders attempt to mitigate the spill.

To provide a basis for evaluating where an oil spill from a vessel could flow and how large an area could be impacted, results from a 20,000-barrel tanker spill scenario near the Carquinez Bridge complex, conducted using the NOAA Trajectory Analysis Planner II (TAPII) software for the Shell Crude Tank Replacement Project Final EIR (Contra Costa County 2011), are summarized below and presented in detail in Appendix B. Both a summer spill and winter spill were modeled. Also, the oil spill trajectory modeling, presented under Impact OS-1 and detailed in Appendix B, is applicable to a tank vessel spill in the vicinity of the Benicia-Martinez Bridge complex. It is acknowledged that a tank vessel spill could occur anywhere along its transit route.

In accordance with TAPII, the level of concern modeled for the oil spill trajectory analysis was based on crude oil sheen thickness for a “silvery sheen,” which equates to approximately 50 gallons present in 1 square nautical mile, or 0.6 barrel per “shoreline zone," as pre-defined in the TAPII model system. Modeling results indicate that probabilities of exceeding the modeled level of concern range from 75 to 100 percent along the shoreline east and west of the Carquinez Bridge in both summer and winter, with higher probabilities of exceedance extending into San Pablo Bay and Suisun Bay for the winter scenario. Results are presented graphically in Appendix B. While the modeling is useful and appropriate for demonstrating the extent to which a spill of this magnitude may be capable of spreading, it is based on the specific modeled spill scenario, including location. Vessels en route to the Avon Terminal could potentially result in an accidental spill at any location along their transit route. Based on the degree of spreading demonstrated by modeling, vulnerable resources in any area of the San Francisco Bay and eastward to the Antioch area could potentially be impacted by a spill. For example, a large spill in the Central Bay could potentially affect vulnerable resources in the South Bay beyond any of the impact areas shown by the modeling in Appendix B.

Although a spill could become ignited, this is an unlikely scenario. If a fire were to occur, the potential for safety impacts on members of the public is low because of the isolated nature of spill locations on the water, away from residential areas. The potential for a tank vessel explosion is remote because tankers are required to be equipped with IGS that maintain an inert gas in the vapor space of the cargo tanks, preventing the formation of a flammable gas-oxygen mixture in the explosive range.

Response to a spill from a tanker is the responsibility of the vessel owner/operator. Under the National Contingency Plan and National Incident Management System, a Unified Command would be formed, with the federal On-scene Coordinator (USCG Captain of the Port) and the State On-scene Coordinator (CDFW/OSPR) coordinating priorities, resources, and efforts to protect the public; facilitating commerce; and mitigating the impacts of the spill. As a result of the Oil Pollution Act of 1990 (OPA 90), each vessel is required to have an oil plan that identifies the worst-case spill (defined as the entire contents of the vessel) and the assets that would be used to respond to the spill. The response capability of tanker companies and barge companies has not been analyzed in detail, but must be documented in their oil spill response manuals. All tanker companies operating within State waters must demonstrate to the USCG and CDFW that they have, either themselves or under contract, the necessary response assets to respond to a worst-case release, as defined under federal and State regulations.

Response to a vessel spill would most likely consist of containment (deploying booms), recovery (deploying skimmers), and protection of sensitive resources. If the oil were to reach the shore and/or foul wildlife, the shoreline and wildlife would be assessed to determine what level, if any, of cleaning would present the least detrimental impacts. MSRC would make its local equipment and manpower available. If required, additional equipment and manpower would be made available from local contractors, OSROs, and MSRC at other locations.

While MSRC can provide the equipment and manpower required by OPA 90 and OSPR, it is unlikely that they could prevent a large spill from causing substantial impacts on vulnerable resources, as described in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries. Therefore, the potential impact remains significant. The Regional Resource Manual and the Area Contingency Plan identify sensitive resources within the Bay Area and methodologies for protecting and cleaning up those areas.

Outer Coast Impacts

The responsibilities and organization for releases outside the San Francisco Bay would essentially be the same as for those inside the bay; however, the response to spills would be somewhat different. First, the environment outside the San Francisco Bay may be more difficult to work in because of sea conditions. Booms become less effective as wave heights increase, losing much of their effectiveness once waves exceed 6 feet. There may be conditions when it would be impossible to provide any response actions. However, when wave energy is such that it is impossible to deploy response equipment, the wave energy causes the oil to be dispersed much more rapidly.

Second, it may not be necessary to try to contain a spill if it does not threaten the shoreline or a sensitive area, although impacts upon sea life and navigation must be considered. In this case, the spiller would monitor the trajectory of the spill in accordance with methodologies presented in the Area Contingency Plan. If the spill could affect the shoreline or a sensitive area, the response efforts would be based upon assessments to determine what level, if any, of cleaning would present the least detrimental impacts.

The MSRC large-response vessels are located inside the San Francisco Bay. It would take the vessels a minimum of 2 hours to get underway and exit the bay, and up to 24 hours to reach areas as distant as offshore of Fort Bragg, approximately 150 miles to the north. Again, additional resources would be available from other response cooperatives and other MSRC sites. While the response capability meets the minimum requirements of OPA 90 and OSPR, a large spill could still result in significant, adverse impacts to sensitive resources, as described in other resource sections of this EIR.

Implementation of MMs OS-4a and OS-4b would reduce the potential for impacts from spills in the San Francisco Bay; however, the consequences of a spill could still result in significant, adverse impacts in the San Francisco Bay or outer coast. This is an unavoidable risk of the Project. No additional feasible MMs have been identified that would further reduce the potential for significant impacts.

Mitigation Measures:

MM OS-4a: USCG Ports and Waterways Safety Assessment (PAWSA) Workshops. Tesoro Refining and Marketing Company, LLC shall participate in U.S. Coast Guard (USCG) PAWSA workshops for the San Francisco Bay Area (Bay Area) to support overall safety improvements to the existing Vessel Traffic Service in the Bay Area or approaches to the bay, if such workshops are conducted by the USCG during the life of the lease.

MM OS-4b: Spill Response to Vessel Spills. Tesoro Refining and Marketing Company, LLC shall respond to any spill near the Avon Terminal from a vessel traveling to or from the Avon Terminal or moored at the Avon Terminal as if it were its own, without assuming liability, until such time as the vessel's response organization can take over management of the response actions in a coordinated manner.

Rationale for Mitigation Vessel owners/operators are responsible for spills from their tankers. Tanker and barge owners/operators are required by federal and State regulations to demonstrate that they have, or have under contract, sufficient response assets to respond to worst-case releases. Tankers and tank barges operating in United States and California waters must certify that they have the required capability under contract. All terminals are under contract with one or more OSRO to respond to spills with all the necessary equipment and manpower to meet the response requirements dictated by regulations. MM OS-4a would further reduce the risk of spills in the San Francisco Bay or near approaches to the bay by requiring Tesoro's participation in USCG Ports and Waterways Safety Assessment workshops for the Bay Area to improve transit issues and response capabilities in general, and to support overall safety improvements to the existing VTS in the future.

While vessel owners/operators are responsible for their spills, if a spill were to occur near the Avon Terminal, Tesoro and its contractors may be in a better position to provide immediate response to a spill using their own equipment and resources, rather than waiting for mobilization and arrival of the vessel's response organization. The Tesoro staff is fully trained to take immediate action in response to spills. Such action could result in a quicker response and more effective control and recovery of spilled product. MM OS-4b would require Tesoro to respond to any spill from a vessel traveling in the San Francisco Bay to or from the Avon Terminal or moored at its wharf, without assuming liability, until the vessel's response organization can take over management of the response actions in a coordinated manner. This requirement would further limit the potential for impacts from spills in the San Francisco Bay from vessels calling at the Avon Terminal.

Residual Impacts While these MMs would substantially lower the probability that a spill would occur, there is an inherent risk of oil spills at any facility where petroleum product is routinely transferred over water that can never be fully mitigated. The impacts associated with the potential consequences of a large-volume or WCD spill would remain significant and unavoidable.

Impact OS-5: Potential for a significant hazard to the public or environment as a result of being included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5. (Less than significant.)

The Cortese List (consisting of databases identified in Gov. Code, § 65962.5) was consulted to identify whether the Project site is known to have hazardous materials or waste contamination within the Project footprint. The Refinery was identified as a hazardous materials site, and the Avon Terminal is possibly included as part of the same property. Investigations at the Refinery found that the site contains several large, separate-phase petroleum hydrocarbon plumes, and soil and groundwater areas are contaminated with metals. Monitoring is being conducted off site, and no ground-breaking activities would be conducted as part of the Project. In addition, the closest sensitive receptor, a residential neighborhood, is located almost 2 miles away, which is too far to be impacted. Existing regulations and requirements would limit the potential for exposure of persons or the environment to hazardous materials to safe levels, such that the risk to the public and the environment would be less than significant.

Mitigation Measure: No mitigation required.

Renovation

Impact OS-6: Potential for oil spills and response capability for containment of oil spills from the Avon Terminal during renovation. (Less than significant.)

MOTEMS renovation activities have the potential to increase vessel traffic congestion in the area, thereby increasing the potential for collisions or other accidents that could lead to the release of fuel or other petroleum products. In addition, refueling vessels used for renovation activities could result in spills.

The Avon Terminal renovation process and equipment is described in Section 2.5 in Section 2.0, Project Description. Typical marine vessel construction equipment would include derrick and flatbed barges, impact and vibratory hammers, and tugboats used for moving barges. The anticipated average number of barges is six and the anticipated peak number of barges is 12. Some construction materials, such as steel and concrete piles, would be delivered to the site by barge. It is anticipated that barges would be present for approximately 19 months. It is also estimated that approximately 150 round trips by barge would be required to dispose of demolished material, supply new materials, and provide equipment for the project.

Annually, approximately 2,000 (1,000 inbound and 1,000 outbound) commercial vessels transit into Suisun Bay, passing the Avon Terminal area (refer to Table 4.1-1). In addition, there is some recreational boat traffic, although the exact amount is not known. The two nearest marinas are located west of the Benicia-Martinez Bridge complex in the cities of Martinez and Benicia. Commercial and other vessel traffic using East Bulls Head Channel would pass by the renovation area. The Avon Terminal is located approximately 300 feet south of East Bulls Head Channel, which is 350 feet wide.

The renovation vessels would generally be stationed at or near the Avon Terminal, leaving adequate room for passing vessels. The renovation contractor would be required to inform the USCG of the type and placement of vessels, and the schedule, before the work begins. The USCG would disseminate this information to mariners using the Local Notice to Mariners (LNM) process. The LNM is the primary means for disseminating information concerning aids to navigation, hazards to navigation, and other items of marine information of interest to mariners. These notices are published weekly and are also available on the Internet. All renovation vessels are required to be marked and have lighting in accordance with USCG regulations. In addition, there is an established RNA in the area of the Benicia-Martinez Bridge complex. Large vessels are prohibited from transiting through this RNA when visibility is less than 1,000 yards. Thus, it is expected that vessel traffic in the area would be fully aware of the renovation activity and have adequate room to avoid it, and as a result, congestion would not occur. Hence, the risk of increased vessel accidents from renovation that could affect the public or cause an oil spill would be less than significant.

Marine vessels would be used to assist with renovation activities. These vessels would be significantly smaller than the tankers that would be unloading at the Avon Terminal during operations. The renovation vessels would adhere to the San Francisco Bay VTS and navigation rules, and renovation would be a temporary activity. Typical hazardous materials that would be located on renovation-related vessels include fuels, lubricants, and solvents, some of which may be flammable or combustible. These materials are required to be stored in approved containers. Small marine fueling facilities are regulated by OSPR under California Code of Regulations, Title 2, Division 1, subdivision 4. The regulation defines a small marine facility as either a mobile transfer unit or a fixed facility that is not a marine terminal that dispenses primarily nonpersistent oil, and may dispense small amounts of persistent oil, primarily to small craft. While tugs would most likely be refueled at fixed facilities, other renovation vessels, such as derrick barges, may be refueled by mobile transfer unit. The regulations cited above require these units to have oil spill plans (section 817.03) and specify oil spill prevention and response, including transfer and vessel operations. In the event of a release during renovation, the vessel involved in the spill would activate its spill plan. Tesoro would also activate its response capability, if required. With the relatively small volumes involved, and spill prevention measures required by regulations, the probability of a substantial release occurring from renovation vessels is low. Furthermore, spill response capabilities in place and required under existing regulations would be adequate to mitigate reasonably foreseeable spills from renovation vessels without risk to the public or substantial impact on vulnerable resources. Considering these factors, the risk to the public or the environment from a potential oil release from renovation vessels is less than significant.

Mitigation Measures: No mitigation required.

Impact OS-7: Potential for spills from Avon Terminal pipelines during non-transfer periods during renovation. (Significant and unavoidable.)

The vast majority of the renovation activities would take place during non-transfer periods. Before construction of the new pipelines, the existing pipelines would be purged of their contents, and thus, the only time a release from the pipelines could occur would be before or during the purging process. The maximum volume that could be released by an accident during purging of the existing pipelines would be equal to the volume of the largest pipeline, which is 6,207 barrels. Existing Tesoro spill response capabilities exceed requirements for any reasonably foreseeable pipeline spill scenario that could occur during renovation. Tesoro would deploy its response capabilities described under Impact OS-1, as appropriate, in the event that such a spill were to occur. Nevertheless, a spill of up to 6,207 barrels, depending on the size of the spill and the effectiveness of initial response measures, could result in substantial effects on vulnerable resources, as further described in Section 4.2, Biological Resources; Section 4.3, Water Quality; Section 4.9, Land Use and Recreation; Section 4.11, Visual Resources, Light and Glare; and Section 6.0, Commercial and Sport Fisheries. Therefore, the potential impact is significant.

A spill from the pipelines at the Avon Terminal would not present a significant safety hazard to members of the public due to the separation distance from public receptor locations, as further described under Impact OS-3. It is anticipated that separation distance of the Avon Terminal from public areas would provide time to respond with warnings and access controls before the spill could spread to public areas, and thus, the potential for unsafe levels of exposure to hazardous constituents in the spilled product would be limited. MM OS-7 would reduce the potential for a spill to occur during pipeline purging, and thereby reduce the risk of significant impact. Even with the implementation of MM OS-7, a spill could result in significant, adverse impacts. This is an unavoidable risk of the Project. No additional feasible MMs have been identified that would further reduce the potential for significant impacts.

Mitigation Measure:

MM OS-7: Pipeline Purging and Removal Plan. Prior to work on existing pipelines or pipeline support systems, Tesoro Refining and Marketing Company, LLC shall prepare a Pipeline Purging and Removal Plan, identifying practices and procedures to be implemented to minimize the potential for work on the pipelines to result in a spill of oil from the pipelines. The plan shall be signed by a California Professional Engineer with experience in oil spill prevention and submitted to California State Lands Commission staff for review and approval prior to commencing work. The plan shall be implemented for work on the existing pipelines until the pipelines are adequately purged of oil and no longer present threat of a spill.

Rationale for Mitigation Purging the pipelines of oil before work or removal commences would minimize the potential for work on the pipelines to result in a spill of oil from the pipelines.

Residual Impacts While this MM would substantially lower the probability that a spill would occur, there is an inherent risk of oil spills at any facility where petroleum product is routinely transferred over water that can never be fully mitigated. The impacts associated with the potential consequences of a large-volume or WCD spill would remain significant and unavoidable. A spill of oil from the pipelines could occur before or during the purging process.

Impact OS-8: Potential for fires and explosions during renovation, and response capability. (Less than significant.)

Marine vessels would be used to assist with renovation of the Avon Terminal. These vessels would be significantly smaller than the tankers that would be calling during operations. The renovation vessels would adhere to the San Francisco Bay VTS and navigation rules, and renovation would be a temporary activity. Hazardous materials that would be located on renovation-related vessels would include fuels, lubricants, and solvents, some of which may be flammable or combustible. These materials would be stored in approved containers. There would be a potential for small fuel and oil spills, but the potential risk for fires and/or explosions is extremely low because flammable materials typically present in substantial quantities (e.g., diesel and lubricants) would have low volatility, and would be managed to prevent explosive atmospheres and uncontrolled ignition. The potential for fuel spills would be minimized because refueling would typically take place at approved facilities, which are regulated by OSPR.

Because of the separation distance between the Avon Terminal and public receptor locations, a potential fire or explosion accident associated with Avon Terminal renovation would not pose a significant risk to the public. Separation distances that limit the potential impact on the public to a less-than-significant level are further described under operations impacts, above. Because of the process in place to provide notification of the renovation activity, it is expected that pleasure craft and other non-renovation vessel traffic would avoid the construction activity. Considering this, and with the transient nature of possible occasional boating receptors, the relatively short term of renovation, and the low probability of a fire or explosion accident, the chance that members of the public on vessels could be impacted by a potential fire or explosion is extremely low. Considering the low risk to the public on vessels and separation distance to other public receptors, the potential impact of a fire or explosion accident that would affect the public is less than significant.

Mitigation Measure: No mitigation required.

Impact OS-9: Potential for spills and response capability for containment of oil spills for accidents in the San Francisco Bay and outer coast during renovation. (Less than significant.)

The Avon Terminal renovation process and equipment is described in Section 2.5 in Section 2.0, Project Description. Impact OS-6 addresses the potential for oil spills from the renovation area. Approximately 150 round trips by barge would be required to dispose of demolished material, supply new materials, and provide equipment for the Project. The vessel activities associated with renovation would increase vessel traffic in the bay, thereby increasing the probability of collisions or other accidents that could lead to the release of fuel or other petroleum products. Refueling of renovation vessels could also result in spills.

Renovation vessels would adhere to the San Francisco Bay VTS and navigation rules, and renovation would be a temporary activity. Hazardous materials carried on renovation-related vessels would include fuels, lubricants, and solvents, some of which may be flammable or combustible. These materials are required to be stored in approved containers. While tugs would most likely refuel at fixed facilities, derrick barges and other renovation vessels may be refueled by mobile transfer unit. OSPR regulations for small marine fueling facilities (Cal. Code Regs., tit. 2, div. 1, subd. 4) require these units to have oil spill plans (§ 817.03) and specify oil spill prevention and response, including transfer and vessel operations. In the event of a release from a renovation vessel in the bay, the involved vessel would activate its spill plan. With the regulations in place, including response planning, the low probability for a release, and the relatively low volumes involved, the potential impact of such spills on the public and the environment would be less than significant.

Mitigation Measure: No mitigation required.

4.1.4.2 Alternative 1: No Project

Impact OS-10: Risk of spills, fires, or explosions from displaced product transit. (Significant and unavoidable.)

Under the No Project alternative, Tesoro's lease for the Avon Terminal would not be renewed and the Avon Terminal would be decommissioned, with its components abandoned in place, removed, or a combination thereof. Decommissioning of the Avon Terminal would follow an Abandonment and Restoration Plan. During decommissioning, there would be a risk of a spill during pipeline purging and removal, and from the marine vessels and equipment used. These potential impacts would be similar to those discussed for renovation impacts under Impacts OS-6 and OS-7, except there would be a somewhat reduced level of vessel traffic with a commensurate reduction in the potential for vessel accidents.

Under the No Project alternative, Tesoro may pursue transitioning to the Amorco Terminal to absorb all export operations from the Avon Terminal, thereby increasing throughput at the Amorco Terminal. Tesoro's Amorco Terminal currently operates as an import-only facility, and thus, would only be capable of absorbing the increased throughput if the wharf were substantially upgraded and expanded to accommodate export operations, as well as meet the current combined throughput capacities for both terminals. In particular, additional pipelines would need to be constructed to handle the various petroleum products. Crude oil, gasoline, diesel, and other petroleum products are normally transported in different pipelines to prevent contamination. Section 3.3.1 in Section 3.0, Alternatives and Cumulative Projects, describes many of the modifications to the Amorco Terminal that would be required to allow it absorb the export operations of the Avon Terminal. Additional California Environmental Quality Act (CEQA) evaluation would be required before these modifications could be made.

With no lease renewal for the Avon Terminal, there would be no potential for related spills, fires, or explosions (at the Avon Terminal), or from vessel transit associated with the Avon Terminal. However, the potential for spills, fires, or explosions would likely be transferred to the Amorco Terminal or other marine terminal, with the level of tank vessel traffic in the bay remaining about the same. The petroleum products would then have to be transported to the Refinery by pipelines, rail, and/or trucks.

Use of Amorco Terminal

Using the Amorco Terminal to absorb the tank vessel traffic from the Avon Terminal would present accident risks at the Amorco Terminal similar to those described for the Project under Impacts OS-6 through OS-9, and those described in Impacts OS-1 through OS-4 for the Amoco Terminal in the recently completed Final EIR (CSLC 2014a). Vessel transit risks would be similar, but there could possibly be more congestion at the Amorco Terminal due to the increased number of vessel callings. The Amorco Terminal is located in an area similar to that of the Avon Terminal (away from residences, parks, and marinas), and therefore, would not present a significant safety hazard to members of the public.

Additional pipelines and possibly tanks would need to be constructed to handle the exporting of the petroleum products. In addition, a Marine Vapor Recovery (MVR) system would need to be added and operated during the loading of tank vessels. This potential risk from the additional pipelines would be similar to that at the Avon and

Amorco Terminals combined. The potential risk from the vapor recovery system would be similar to that of the proposed new MVR system at the Avon Terminal.

Use of Pipelines

Pipeline spills of petroleum products generally result in less of an impact on the environment than tank vessel transportation spills. The probability of a spill is not necessarily lower; however, the maximum amount of material that can be released from a pipeline is generally less than that which can be released from a tanker. In addition, material spilled on land generally causes less environmental impacts than material spilled on water, although this is a function of the size and location of the spill and the environment impacted by the spill.

Failure rates for pipelines are generally described in terms of spills per unit length per year, and factor in pipeline characteristics of age, design, depth of burial, corrosion protection, wall thickness, and operating temperature. A failure rate range of 0.03 to 0.5 releases per year per 100 miles of pipeline has been cited (CSLC 2011, CSLC 2014a). The following spill estimates for pipelines with diameters greater than 16 inches have been cited (see Table 4.1-8).

Table 4.1-8: Spill Estimates for Pipelines with Diameters Greater than 16 inches

Leaks	0.08 per 100 miles per year for “old” pipelines 40 years or older
	0.03 per 100 miles per year for “existing” pipelines (approximately 20 years old)
	0.012 per 100 miles per year for “new” pipelines (in first 10 years)
Ruptures	0.04 per 100 miles per year for “old” pipelines
	0.016 per 100 miles per year for “existing” pipelines
	0.006 per 100 miles per year for “new” pipelines

A leak is defined as a relatively small rate of release from a pipeline. A typical cause would be a small hole that results in corrosion pitting, a leaking flange, or valve. A rupture represents a relatively high rate of release, as might occur if the pipe were breached by an external force.

The maximum spill volume is a combination of drainage potential and the pumping rate for the period of time before the breached segment can be isolated. Worst-case calculations of spill volumes are normally based on the assumption of complete drainage, by gravity, of the section of pipe between high ground and the point of rupture (called drainage volume). Additional spillage depends on the flow rate and response time to shut down the pipeline. The drainage volume assumes that the drainage will be complete. This may not necessarily be the case because (1) the breach may be less than a full rupture, (2) a block valve within the affected pipe section may be successfully closed before complete evacuation occurs, or (3) a check valve in an uphill stretch can prevent backflow of oil between high ground and the valve. The gradient of the terrain determines the hydrostatic force available to drain the pipe after the pumps are turned off. Draining will take much longer in nearly flat terrain. Between 1980 and 1990, the average spill size from 16-inch-diameter crude oil pipelines was 2,680 barrels (CSLC 2011a, CSLC 2014a). This is the volume in 2 miles of 16-inch-diameter pipe. A pipeline leak or rupture, depending on its size and location, could result in a significant, adverse impact where sensitive resources are affected. Spills in areas where they can be contained and cleaned up (such as roadways) could be remediated to a level such that impacts would be less than significant.

While an existing infrastructure of pipelines exists among the marine oil terminals and refineries in the Bay Area, additional pipelines and/or pipeline connections would most likely be required. Pipeline construction work would result in a risk of accidents during construction, such as construction equipment fuel spills and releases from damage to third-party utilities, including oil and gas pipelines. Pipeline construction typically results in less-than-significant risk of release impacts because of the requirement for detailed construction planning and the preconstruction identification of utilities in the area.

Truck and/or Rail Transportation

Shipping of petroleum products via pipeline is generally considered to be the safest means of bulk transportation. The California State Fire Marshal, Hazardous Liquid Pipeline Risk Assessment (EDM 1993) indicated that the fatality rate for bulk transportation by rail was 40 times higher than by pipeline. The same study indicated that the fatality rate for bulk transportation by truck was 300 times higher than by pipeline. As a result, any increased volumes being shipped by truck or rail would increase the potential impacts on the public compared to using a pipeline. When comparing the relative safety of pipeline, truck, and rail transportation of bulk hazardous liquids, Aspen (2003) noted the following:

- The frequency of unintentional releases was three to four times higher for a mix of rail and truck transportation than for similar volumes transported exclusively by pipeline.
- The frequency of all injuries, regardless of severity, was roughly 30 times higher for a mix of rail and truck transportation than for similar volumes transported exclusively by pipeline.
- The frequency of fatalities was approximately 50 times higher for a mix of rail and truck transportation than for similar volumes transported exclusively by pipeline.
- The frequency of small releases was higher for truck and rail transportation, while the frequency of large spill volumes was higher for pipeline transportation. This was due primarily to the limited size of the truck and rail car volumes; the release size is limited to the volume of the damaged car(s).

Summary

The No Project alternative would displace oil handling from the Avon Terminal to other transportation methods. Tesoro's lease for the Avon Terminal would not be renewed and the existing Avon Terminal would be decommissioned. Decommissioning of the Avon Terminal would follow an Abandonment and Restoration Plan that would have environmental impacts similar to those addressed for construction under the proposed lease renewal. In addition, there could be increased construction impacts associated with the need for infrastructure improvements at other facilities or to accommodate other methods of transportation, such as pipelines. No material reduction would be expected in the level of tank vessel traffic in the bay, and therefore, no significant reduction in vessel-related risks would be expected. Considering these factors, this alternative would not be capable of eliminating or materially reducing any potentially significant impact of the proposed release renewal.

Mitigation Measures: Should this alternative be selected, MMs would be determined during a separate environmental review under CEQA.

4.1.4.3 Alternative 2: Restricted Lease Taking Avon Terminal Out of Service for Oil Transport

Impact OS-11: Risk of spills, fires, or explosions from displaced product transit. (Significant and unavoidable.)

In this alternative, the Avon Terminal would be taken out of service and put into caretaker status. Under caretaker status, the Avon Terminal components would not be abandoned or removed, but would be purged of oil products. The potential impacts would be similar to those described for the No Project alternative, except that marine vessel traffic would be negligible under this alternative. Similar to the No Project alternative, it is expected that this alternative would displace oil handling from the Avon Terminal to other transportation methods, as described under Impact OS-10. Considering these factors, this alternative would not be capable of eliminating or materially reducing any potentially significant impact of the proposed release renewal.

Mitigation Measures: Should this alternative be selected, MMs would be determined during a separate environmental review under CEQA**.**

4.1.5 CUMULATIVE IMPACT ANALYSIS

Impact CUM-OS-1: Upset conditions. (Significant and unavoidable.)

All terminals and tanker/barge operators are required by federal and State regulations to demonstrate that they have, or have under contract, sufficient response assets to respond to worst-case releases. Even so, oil spills can result in significant, adverse impacts on the environment depending on whether first-response efforts can contain and clean up the spill without substantial impacts on vulnerable resources. The renewal of the Avon Terminal lease would contribute incrementally to the significant cumulative risk to the environment from potential oil spills in the Bay Area and outer coast.

Spills from a Marine Terminal

As discussed in Section 4.1.1.4, 75 spills from marine terminals in the San Francisco Bay occurred between 2004 and 2013. While the potential exists for spills at all marine terminals operating within the bay, the probability varies depending on the design and operational procedures in place. The potential impacts of spills vary depending on the location of the terminals and the response equipment and procedures available.

Spills from Tank Vessels Inside and Outside the San Francisco Bay

Chambers Group, Inc. (1994) analyzed historical data to estimate tanker and barge traffic within the San Francisco Bay. Based on the amount of tanker and barge traffic along various routes within the San Francisco Bay, cumulative probabilities of a spill were (1) developed for various sections within the bay, then (2) used to conduct probabilistic oil spill modeling for cumulative tanker and tank barge traffic within the bay. Table 4.1-9 shows the expected mean time between spills for all tanker and tank barge traffic inside and outside the San Francisco Bay for three minimum-size spills.

Table 4.1-9: Expected Mean Time between Spills Inside and Outside the San Francisco Bay—All Tank Vessels

Spill Size (barrels)	Expected Mean Time Between Spills (Years)	
	Inside Bay	Outside Bay
238	36	Not calculated
1,000	48	42
10,000	238	123

Based on estimated mileage traveled within the San Francisco Bay, vessel traffic associated with the Avon Terminal is approximately 5.3 percent of the total probability of a spill from tanker and tank barge traffic in the bay. This percentage was estimated based on estimating the distance from the Golden Gate Bridge to each of the marine terminals in the bay, then estimating the total distance traveled by all tank vessels by multiplying the distance to each marine oil terminal by the number of tank vessel calls during 2013. The total distance traveled by tank vessels calling at the Avon Terminal was then divided by the total miles traveled by all tank vessels to get the percentage for the Avon Terminal. Chambers Group, Inc. (1994) also used data from the Marine Exchange that listed the last and next ports of call for all tankers calling at marine oil terminals in the Bay Area to estimate the number of annual tanker trips along various routes outside the bay.

Spill Response

An impact on spill response capability could occur if two or more spills occurred at the same time; however, the probability of this is extremely low. Having many marine terminals and extensive vessel traffic in the San Francisco Bay tends to increase the total amount of spill response equipment and services available.

All terminals and tanker/barge operators are required by federal and State regulations to demonstrate that they have, or have under contract, sufficient response assets to respond to worst-case releases. All terminals are under contract with one or more OSROs. These OSROs can provide all the necessary equipment and manpower to meet the requirements of existing regulations; however, oil spills can result in significant, adverse impacts on the environment depending on whether first-response efforts can contain and clean up the spill without substantial impacts on vulnerable resources. MMs previously described for Project Impacts OS-1 and OS-4 would reduce the potential for significant cumulative impacts to the extent feasible. No further mitigation for potential cumulative impacts is recommended. Even with MMs applied, there is a cumulative risk of oil spills that could have significant environmental impacts, as described in other sections of this EIR.

Mitigation Measures: MMs OS-1a, Remote Release Systems; OS-1b, Tension Monitoring Systems; OS-1c, Allision Avoidance Systems; OS-7, Pipeline Purging and Removal Plan; OS-4a, USCG Ports and Waterways Safety Assessment Workshops; and OS-4b, Spill Response to Vessel Spills apply to this impact.

Rationale for Mitigation Implementation of Project-specific MMs would help reduce the cumulative impacts of a Project-related oil spill.

Residual Impacts The Project's contribution to cumulative impacts of oil spills would remain significant and unavoidable.

4.1.6 SUMMARY OF FINDINGS

Table 4.1-10 includes a summary of anticipated impacts on operational safety and associated MMs.

Table 4.1-10: Summary of Operational Safety Impacts and Mitigation Measures

Impact	Mitigation Measure(s)
Proposed Project	
OS-1: Potential for spills and response capability for containment of oil spills from the Avon Terminal during continued operations.	OS-1a: Remote Release Systems OS-1b: Tension Monitoring Systems OS-1c: Allision Avoidance Systems

Impact	Mitigation Measure(s)
OS-2: Potential for spills from Avon Terminal pipelines during non-transfer periods during continued operations.	No additional mitigation measures available
OS-3: Potential for fires and explosions during continued operations, and response capability.	OS-3: Fire Protection Assessment (Also refer to MMs OS-1a, OS-1b, OS-1c, and OS-7)
OS-4: Potential for spills and response capability for containment of oil spills for accidents in the San Francisco Bay and outer coast during continued operations.	OS-4a: USCG Ports and Waterways Safety Assessment (PAWSA) Workshops OS-4b: Spill Response to Vessel Spills
OS-5: Potential for a significant hazard to the public or environment as a result of being included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5.	No mitigation required
OS-6: Potential for spills and response capability for containment of oil spills from the Avon Terminal during renovation.	No mitigation required
OS-7: Potential for spills during renovation from Avon Terminal pipelines during non-transfer periods during renovation.	OS-7: Pipeline Purging and Removal Plan
OS-8: Potential for fires and explosions during renovation, and response capability.	No mitigation required
OS-9: Potential for spills and response capability for containment of oil spills for accidents in the San Francisco Bay and outer coast during renovation.	No mitigation required
Alternative 1: No Project	
OS-10: Risk of spills, fires, or explosions from displaced product transit.	Should this alternative be selected, MMs would be determined during a separate environmental review under CEQA
Alternative 2: Restricted Lease Taking Avon Terminal Out of Service for Oil Transport	
OS-11: Risk of spills, fires, or explosions from displaced product transit.	Should this alternative be selected, MMs would be determined during a separate environmental review under CEQA
Cumulative Impacts	
CUM-OS-1: Upset conditions.	Refer to MMs OS-1a, OS-1b, OS-1c, OS-7, OS-4a, and OS-4b

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