



Vancouver Energy Operations Facility Oil Handling Manual

Plan No. OP.05 | Revision 00

Approved by:

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Date: 26 June 2015

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Vancouver Energy
Operations Facility Oil Handling Manual
EFSEC Application for Site Certification No. 2013-01
Docket No. EF131590
26 June 2015



Prepared for

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Vancouver Energy Operations Facility Oil Handling Manual

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1. Introduction

1.1 Purpose of Plan

This operations facility oil handling manual has been prepared for the Tesoro Savage Petroleum Terminal LLC's (Company) Vancouver Energy (Facility) to satisfy the requirements for an operations manual as found in Washington State statutes and the federal requirements of the U.S. Coast Guard (USCG) for facilities transferring oil in bulk.

This document is a PRELIMINARY version of the manual that will be prepared, implemented, and submitted as necessary to applicable state and federal agencies in accordance with applicable laws and regulations prior to the beginning of operations of the Facility. This manual has been developed based on Facility design completed at the time of writing. The Company will update this manual based on additional consultation conducted during the permitting effort for the Facility and the final design of the Facility. This preliminary manual is intended to be indicative of the planning and response strategies to be implemented by the Company at the Facility.

The purpose of this operations facility oil handling manual is to provide information and operational procedures for the transfer of oil product in bulk. The manual is written to address the operations manual requirements found at Washington Administrative Code (WAC) Chapter 173-180-420, and at Title 33 Code of Federal Regulations (CFR) Part 154, Subpart B. A regulatory cross reference is provided in Appendix N.

1.2 Submittal Agreement

This section complies with the regulations of the Washington State Department of Ecology (Ecology) found at WAC 173-180-420(2)(a) through (d).

1.2.1 Name, Address, and Phone Number of the Submitting Party

Vancouver Energy
Tesoro Savage Petroleum Terminal LLC
5501 NW Old Lower River Road
Vancouver, Washington 98660

Submitted by:
Kelly Flint, Senior Vice President and Corporate Counsel, Savage Companies
Telephone: 801-944-6600

1.2.2 Verification of Acceptance and Commitment to Execution

The undersigned, owner and operator of this Class 1 Facility, verifies acceptance of the operations manual and commits to execution of the operations manual. The undersigned is a person with the authority to bind the corporation, who owns this Facility and to make appropriate expenditures in order to execute the provisions of this operations manual.

By: _____ Date _____
Title: _____

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2. Facility Description

2.1 Geographic Location

This section complies with the regulations of USCG found at 33 CFR Section 154.310 (a)(1), and Ecology regulations found at WAC 173-180-420(3)(a).

The Facility is located at the Port of Vancouver USA (Port) within the City of Vancouver (City) in Clark County, Washington. The site is located on the Washington shore of the Columbia River. The site address is 5501 NW Lower River Road, Vancouver, Washington 98660. The marine dock is located at Port Terminal No. 4, on the north side of the Columbia River, at River Mile 103.5, approximately 2.5 miles downriver of the Interstate 5 bridge. The facility is located at latitude 45° 39' 6" N and longitude 122° 43' 52" W. The facility location is shown in Figure 1.

2.2 Physical Description

This section complies with the regulations of USCG regulations found at 33 CFR Section 154.310(a)(2) and Ecology regulations WAC 173-180-420(3)(a) (ii) and (xiii).

The Facility provides transloading services for pipeline quality crude oil from railcars to marine vessels. The Facility site is approximately 47.4 acres in size and comprises elements within the following "area" groupings, as illustrated in Figure 2 and detailed in Table 1, Summary of Facility Areas. More detailed plans are provided in Appendix A.

- Area 200 – Rail Unloading – located at Terminal 5 of the Port
- Area 300 – Storage – located at Parcel 1A of the Port
- Area 400 – Marine Terminal – located at Berths 13 and 14 at the Port
- Area 500 – Transfer Pipelines – located between areas 200, 300, and 400
- Rail Infrastructure – located at Terminal 5 of the Port

The Facility will receive an average of four unit trains per day and unload an average of 360,000 barrels (bbl) of crude oil per day. Six nominal capacity 380,000 bbl tanks are used to store crude oil on site. A transfer pipeline system will be used to convey crude oil from Area 200 to Area 300 for storage, and from Area 300 to Area 400 for vessel loading. The transfer pipeline system can also be operated to move crude oil from Area 200 directly to Area 400.

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Figure 1. Facility Location Map

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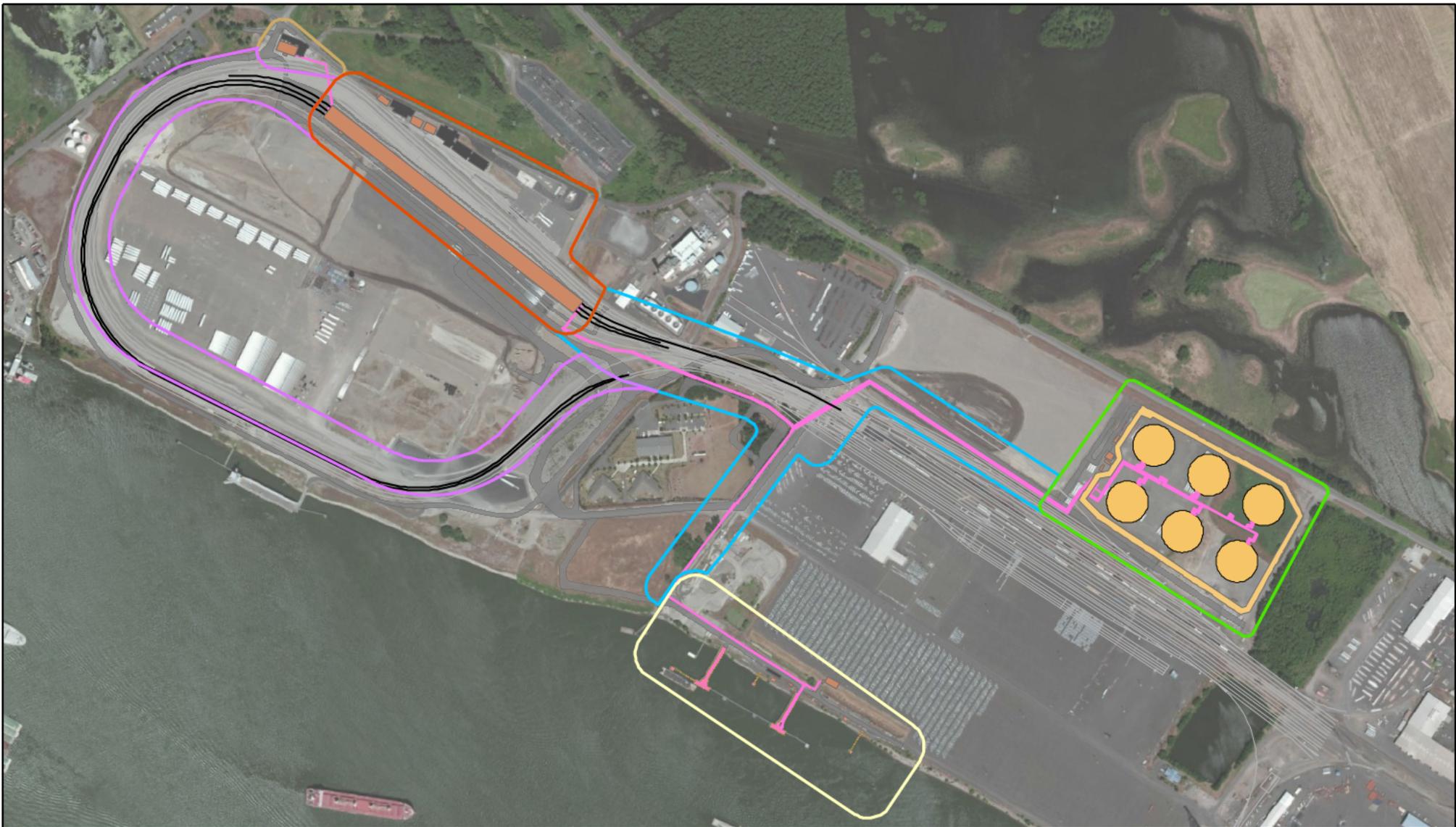


Figure 2 - Site Plan

Proposed Project Facilities

- Containment Berm
- Storage Tank
- Roads
- Marine Terminal
- Parking
- Building
- Rail
- Transfer Pipeline

TSPT Improvement Areas

- 200 - Unloading and Office
- 300 - Storage
- 400 - Marine Terminal

- 500 - Transfer Pipelines
- 600 - West Boiler
- Rail Infrastructure



Tesoro Savage Petroleum Terminal LLC

Date: February 2015

Map Notes: Aerial photo dated July 2010, courtesy of ESRI World Imagery service

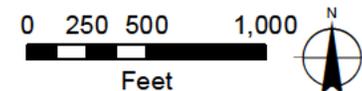




Table 1. Summary of Facility Areas

Facility Area	Project Elements	Acreage
200 – Unloading and Office	Rail Unloading Area Control Rooms/E-houses Fire Pump and Foam Building Admin/Support Buildings	7.8 Acres
300 – Storage	Crude Oil Storage Tanks Secondary Containment Berm Storage Building Pump Basin Control Room/E-house Fire Pump and Foam Building	20.8 Acres
400 – Marine Terminal	Marine Vessel Loading Hoses and Equipment Control Room/E-house Dock Safety Unit Marine Vapor Combustion Units Vapor Blower Skid Spill Prevention, Response and Containment Equipment Dock Improvements Piping from Vessel Loading to Marine Vapor Combustion Units	7.7 Acres
500 – Transfer Pipelines	Transfer Piping from Area 200 to Area 300 Transfer Piping from Area 300 to Area 400*	4.9 Acres
600 – Boiler Building	Boiler Building	0.8 Acre
Rail Infrastructure	Rail Transportation Corridor	5.4 Acres
Total		47.4 Acres

*Transfer piping is arranged to also allow direct transfer from Area 200 to Area 400, bypassing storage in Area 300.

2.2.1 Area 200 – Unloading and Office

Area 200 is located at 5501 NW Old Lower River Road in Vancouver and includes the administrative and support buildings, parking, rail access to the rail unloading facility, and the rail unloading facility. Area 200 is accessible from an unnamed private road owned and maintained by the Port. Area 200 facilities cover an area approximately 7.8 acres in size.

The rail unloading facility is a covered structure through which the trains are pulled and secured for unloading. The structure is approximately 1,850 feet long by 91 feet wide with a maximum height of approximately 50 feet. The building structure is open on the north, west, and east sides, and the southern wall is partially enclosed with built segments along the wall acting as a weather break.

Each of the three tracks includes 30 unloading stations for handling crude oil. Each station uses a completely closed loop of piping to prevent any atmospheric contact with the product during unloading. The entire 1,850 feet of the rail unloading facility includes full coverage rail collection pans, and the interior ground surfaces are constructed of concrete to contain any accident releases, as well as provide catchments for all stormwater that drips from railcars or is blown into the rail unloading facility by the wind.

All mechanical piping is located in concrete secondary containment trenches, and the pump basins used to transfer crude oil from the rail unloading facility to Area 300 storage are in below-grade concrete basins. The collection piping from the rail drip pans and rail unloading facility floor drains are mostly located in these concrete trenches with discharge pumps located in the pump basins. Water collected from within the rail unloading facility is collected in these systems and pumped to two containment tanks



located in the area of the administrative/support buildings. Other than from office buildings, there is no hydraulic connection to storm or sanitary sewers from within the rail unloading footprint.

Several accessory structures and equipment pads are located adjacent to the rail unloading facility, including electrical house (E-house) control rooms, fire pump and foam building, electrical equipment pads, and mechanical equipment pads.

The administrative/support buildings are located north of the rail unloading facility adjacent to Old Lower River Road. This area consists of three proposed modular structures, parking, and associated landscaping. In addition, the containment tanks for discharges from the rail unloading facility are located near the parking lot. A pedestrian bridge connects the administrative/support buildings to the rail unloading facility.

2.2.2 Area 300 – Storage

Area 300 contains storage tanks and associated containment areas, and includes a single pump basin used to transfer crude oil from the storage tanks to the Marine Terminal and associated support buildings and equipment pads.

The storage area includes six double-bottom, internal floating-roof aboveground storage tanks for storing crude oil. The tanks are approximately 50 feet in height and 240 feet in diameter. Each tank has capacity to store 380,000 bbl of crude oil. The maximum volume of oil to be stored is 360,000 bbl.

The containment area includes an earthen perimeter berm approximately 6 feet in height, which is tall in size to contain the release of 110 percent of one entire tank volume and a 100-year rainfall event. Intermediate berms approximately 2 feet tall are positioned between each tank to segregate the containment area. This capacity reflects the most stringent of Washington spill prevention and control and National Fire Protection Association (NFPA) requirements.

Each tank has a fixed roof to keep precipitation from reaching the inside of the tank and an internal floating roof (with dual seals) to control vapor emissions from the tank to the atmosphere. The floating roof is designed to avoid tipping during operations.

The double-bottomed tanks include a leak detection system between the tank floors and are equipped with cathodic protection to prevent corrosion. The entire tank containment area is lined with an impervious membrane to prevent any potential spills from leaving the containment area via infiltration into the ground.

Stormwater flows to a control structure, which passes the water at a controlled flow rate through two parallel oil/water separators for free oil removal. The water then passes into a stormwater pump station equipped with two submersible pumps that discharge to a treatment system. This water is comingled with the parking lot runoff prior to treatment and treated for turbidity, heavy metals, and volatile organics (benzene).

Crude oil stored in the tanks is pumped to the dock for transfer to a ship or barge. Approximately three to six variable speed pumps pump the crude oil, at least one of which would be on standby.

The pumps are housed in the tank storage pump basin located on the west side of the storage tank area. Stormwater flows by gravity from the pump basin through an oil/water separator to the sanitary sewer. There is a valve on the line to interrupt flow to the sewer if necessary.

The support buildings (including a storage building, fire water pump and foam building, control room/E-house, electrical pads, and mechanical pads) are constructed outside the containment area on slab-on-grade foundations. A small storage tank of approximate 500-gallon capacity is located inside the fire pump skid to hold ultra-low sulfur diesel fuel used to fuel the fire pump. The pump basin is isolated from the containment area by its concrete walls; the basin providing secondary containment for the pump machinery.

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2.2.3 Area 400 – Marine Terminal

Crude oil is transferred by 36-inch-diameter pipeline to vessels at Berth 13, located at Area 400. Hoses supported by cranes or a pulley system are connected to the manifold used to transfer the crude oil from the piping system to the vessel being loaded. The hoses are connected to the grounding grid to protect against the buildup of static electricity. The loading system incorporates automatic shutoff valves with a maximum 30 seconds until shutoff. The pipelines serving the dock undergo annual hydrostatic testing as required by federal standards. A steel containment pan capable of holding 3 bbl of discharge is positioned below the deck level for the containment of inadvertent releases, in addition to stormwater, that may fall in the catchment area. The containment pan gravity flows to upland treatment (oil/water separator and carbon filtration) and discharges into on-site swales.

A fire pump and foam building located near the dock-side control house encompasses an emergency fire pump and fire protection systems associated with the Marine Terminal. A small storage tank of approximate 500-gallon capacity is located within the fire pump skid to hold ultra-low sulfur diesel fuel.

Prior to oil transfer, a fence boom is placed between the vessel and the shoreline, and floating booms connect with the fence boom on the downstream end (but open on the upstream, offshore side of the moored vessel due to currents).

Marine vessels are generally empty, having inert (noncombustible) gases occupying the cargo tanks, when they arrive at the berth. When the vessel tanks are filled with crude oil, the vapors from previous cargo, vapors from the crude being added to the tank, and the inert gases are displaced from the tank. These vapors are collected and sent to the marine vapor combustion unit (MVCU) system, which combusts the hydrocarbons in the vapors. Piping from the dock conveys the vapors to the MVCUs located north of the access trestle and roadway. Once in the MVCUs, the vapors from the vessel hold are mixed with small amounts of natural gas and combusted in the MVCUs. The resulting combustion gases are expelled from the MVCU stack. Eight units are installed on a 100- by 50-foot concrete slab, housing equipment that has eight stacks approximately 25 feet in height and ranging between 3 and 4 feet in diameter.

2.2.4 Area 500 – Transfer Piping

A combination of above- and belowground steel transfer pipelines convey crude oil from the rail unloading structure in Area 200 to the storage tanks in Area 300 and from the storage tanks to the marine vessel loading system in Area 400. The system includes the following.

- Three 24-inch-diameter, approximately 1,800-foot-long pipelines collect the crude oil unloaded at the rail unloading stations; one of these pipelines is electrically heat-traced to ensure that the viscosity of the crude oil is maintained at approximately 150°F while it is conveyed from the unloading structure.
- Three 24-inch-diameter, approximately 5,500-foot-long pipelines would connect the railcar unloading facility to the storage tanks in Area 300; one of these pipes would be electrically heat-traced to ensure that the viscosity of the crude oil requiring heating would be maintained while it is conveyed from the unloading facility to the storage area.
- One 36-inch-diameter, approximately 5,300-foot-long pipeline connects the storage tanks with the vessel loading system in Area 400.
- One 6- to 12-inch-diameter, approximately 5,300-foot-long pipeline returns crude oil from the vessel loading system back to the storage tanks; this pipeline is provided to handle loading process shutdowns and provide pressure relief and prevent pipe hammer in the pipe conveyance system.
- One 10-inch-diameter, approximately 600-foot-long pipeline delivers hydrocarbon vapor generated during loading of vessels to the MVCU (described in Section 2.2.3).

Piping is constructed to the specifications of American Standards Testing and Materials A53 or A106. Aboveground runs of piping are supported so that the bottom of the piping is a minimum of 1 foot off the ground on vertical supports located every 20 to 25 feet. The vertical supports are fixed on spread footings. Where multiple pipes are placed within the routing, pipelines are either placed side-by-side or

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stacked. Expansion loops are constructed along the transfer pipeline runs to accommodate thermal expansion of the pipelines during operation. Where road or rail crossings occur and in other areas of limited space, the pipelines are located underground or raised above the ground in accordance with standard American Railway Engineering and Maintenance-of-Way Association clearances. Secondary containment with leak detection is provided for pipeline segments installed underground. Runs of aboveground pipeline are standard-walled to ensure ease of inspection and maintenance and designed in accordance with the applicable requirements of WAC 173-180-340 and 49 CFR 195.246 through 49 CFR 195.254. Transfer pipelines are cathodically protected at all underground sections to prevent corrosion.

To allow greater flexibility in operations, the transfer piping system is designed to allow crude oil being unloaded in Area 200 to be directly conveyed to Area 400, Marine Terminal, for loading onto vessels. This capability allows occasional topping off of vessel loads and may allow the Facility to begin limited operation during the construction of the Area 300 storage tanks.

The piping system and associated supports and foundations are designed to applicable seismic protection standards and are electrically grounded to protect against the buildup of static electricity during crude oil conveyance. Manual and automatic isolation valves are located on the piping system at the exit of the railcar unloading facility and at the entrance to the storage tank area.

2.2.5 Area 600 – Boiler Building

Area 600 (Boiler Building) contains a boiler building with a natural-gas boiler. The boiler is used to generate steam for heated crude unloading operations inside Area 200. Area 600 also includes an E-house and associated parking.

2.2.6 Rail Infrastructure

Three rail loops, ranging from approximately 7,700 to 8,100 feet in length, service the Area 200 unloading facility. (The three rail loops servicing Area 200 are located inside of several other loops owned and operated by the Port that are not part of the Facility.) In addition to the three rail loops servicing Area 200, the following rail infrastructure is part of the Facility.

- A connection with cross-over switches capable of departing on any of two of the departure tracks listed below.
- Two tracks located off the loop tracks (of 200- and 700-foot lengths) to serve as a temporary staging location for railcars that have deficiencies and have been removed from the unit train prior to the cars being released back to the rail carrier.

2.3 Firefighting and Safety Equipment

Firefighting equipment is installed and maintained throughout the Facility and includes automatic and engineered controls, to allow control of fires should they occur. Fire suppression equipment and systems are designed to NFPA and American Petroleum Institute (API) requirements, the more stringent Factory Mutual Global insurance requirements, and state and local regulations. Process-related buildings are fireproofed, and emergency egress is provided in accordance with applicable fire and building codes. All automatic fire suppression systems are designed to activate automatically and is equipped with manual trip stations.

Fire suppression systems, linear heat detection, manual release stations, and gas monitors are connected to local audible alarms and visual strobes located in areas 200, 300, 400, and 600. Each area has its own fire alarm system control panel that transmits to a supervising station at the E-house/control room for each area. All alarm signals will also initiate the audible and visual alarm, transmit the alarm signal to the supervising station, and shut down the transfer operation, with all crude oil transfer valves closing within 30 seconds. General firefighting features and the locations of safety equipment are depicted in the figures included in Appendix A.

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3. Hours of Operation

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(3), and Ecology regulations found at WAC 173-180-420(3)(a)(iii).

The Facility operates 24 hours per day, 365 days per year.

4. Sizes, Types, and Numbers of Vessels

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(4), and Ecology regulations found at WAC 173-180-420(3)(b)(i).

The dock facility loads only one vessel at a time. A vessel with a maximum length of 899 feet and a maximum draft of 43 feet at low water can be accommodated. Descriptions of the barges and vessels that use the dock are provided in Table 2 below.

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Table 2. Dimensions of Articulated Tug Barges and Tanker Vessels Anticipated to Dock at the Facility

Vessel Class	27.5 MDWT	46 MDWT	75 MDWT	115 MDWT	125 MDWT	142 MDWT	160 MDWT
Type	Articulated Tug Barges	Oil Tanker					
Length overall [feet]	587.4	601.1	748.0	816.8	869.0	894.7	899.0
Length between perpendiculars [feet]	583.1	570.9	718.5	784.1	825.0	847.0	866.1
Beam [feet]	74.0	105.6	105.64	143.7	136	151.6	157.5
Moulded depth [feet]	40.0	61.7	65.0	68.9	71.5	86.3	77.8
Ballast Condition (for upriver transit)							
Freeboard [feet]	23.8	42.7	44.5	48.4	50.0	54.3	49.8
Draft [feet]	16.2	19.0	20.5	20.5	21.5	32.0	28.0
Displacement (MT)	17,083	23,900	35,325	50,472	47,850	76,300	78,671
Loaded Condition (for downriver transit)							
Freeboard [feet]	9.8	20.7	22.0	25.9	28.5	43.3	34.8
Draft [feet]	30.2	41.0	43.0	43.0	43.0	43.0	43.0
Deadweight [MT]	27,181	46,172	64,100	94,200	86,821	90,700	103,000
Displacement [MT]	32,885	56,368	77,996	112,872	111,299	122,469	125,751
Cargo capacity at max draft, including FWA (bbl)	327,000	319,925	449,772	667,777	614,337	642,428	731,513

Notes:

MT = metric ton

FWA = freshwater allowance



5. Product Information

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(5), and Ecology regulations found at WAC 173-180-420-(3)(a)(viii) – (x).

5.1 Oil Types Transferred at the Facility

The only product transferred at this facility is North American crude oil.

Material Name (Trade Name)	DOT HM Y/N	Description	UN/NA No.	DOT ER Guide No.
Crude Oil	Y	Petroleum crude oil	1267	128
Crude Oil	Y	Combustible or flammable liquids	1993	128

Crude oil appears as a clear to brown liquid, with a rotten egg, petroleum-like odor.

5.2 Handling Hazards, Instructions for Safe Handling, and Firefighting Procedures

Appendix C presents representative crude oil Material Safety Data Sheets and Emergency Response Guidebook, Guide 128, Flammable Liquids (Non-Polar/Water-Immiscible) 2012. These documents address measures for safe handling of crude oil, general measures for spill response, personal exposure to crude oil, and typical firefighting procedures for fires involving crude oil.

In addition to this oil handling manual, the Facility implements the following plans for preventing and responding to crude oil spills.

- Vancouver Energy Operations Spill Prevention, Control, and Countermeasures Plan (SPCCP)
- Vancouver Energy Operations Facility Oil Spill Contingency Plan (OSCP)

6. Transfer Staffing and Duties

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(6), and Ecology regulations found at WAC 173-180-420(3)(b)(iv).

During ship or barge transfer operations, qualified personnel from the ship or barge staff the vessel. The cargo and vapor hoses are connected under the guidance of the vessel's Bosun, Pumpman, and a Deck Officer. One Facility employee is designated as the Terminal Person-in-Charge (TPIC) of the transfer, and one vessel employee (the ship's chief officer) is designated the Vessel Person-in-Charge (VPIC). One Facility employee is designated to monitoring conditions at the storage area, Area 300, from the Area 200 control room.

6.1 Duties of the Terminal Person-in-Charge

- The TPIC is at the site of the transfer operation and is immediately available to the VPIC vessel's oil transfer personnel.
- The TPIC has a current copy of the oil handling manual in his possession and is familiar with its contents.
- The TPIC conducts all transfers in accordance with the oil handling manual.
- The TPIC completes the "Declaration of Inspection" and "Declaration of Security" prior to start of the transfer. An example Declaration of Inspection form is provided in Appendix F.

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- The TPIC maintains communications with vessel personnel and other facility personnel and responds to any emergencies.
- Together with the VPIC, the TPIC conducts the Pretransfer Meeting. During this meeting, all aspects of the transfer are discussed.
- The TPIC is NOT involved with any other duties or activities not related to the transfer operation, while conducting a transfer.

6.2 Duties of the Vessel Person-in-Charge

- The VPIC conducts the deck inspection with the TPIC.
- The VPIC provides oversight of all ship personnel involved in the transfer (Bosun, Pumpman, and Deck Officer).

6.3 Duties of the Tank Farm Monitoring Personnel

- Maintains communications with the TPIC on the dock.
- From the dock control room, start or stop the flow of products as directed by the TPIC on the dock.
- Gauges tanks as required during the transfer operation.
- Assists the TPIC during emergencies.

6.4 Rail to Storage Transfer Staffing

- Staffing includes two operators per train car being unloaded (for connecting transfer hoses, opening valves, etc.). With six unloading stations per track and three tracks, this equals 36 operators at the unloading stations.
- Two operators at the Area 200 control room.

6.5 Storage to Vessel Transfer Staffing

- Two operators at the Area 400 control room (to include the TPIC). The control room will always be attended during transfer and the other operator will assist in making rounds.
- Two operators at the storage area/other.
- Vessel personnel (VPIC and other vessel personnel).

6.6 Rail Direct to Vessel Transfer Staffing

- Staffing includes two operators per train car being unloaded (for connecting transfer hoses, opening valves, etc.). One track with six unloading stations has the capability of direct vessel loading; therefore, this equals 12 operators at the unloading stations.
- Two operators at the Area 200 control room.
- Two operators at the dock control room (to include the TPIC). The control room will always be attended during transfer, and the other operator will assist in making rounds.

7. Procedures for Emergencies/Notification

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(7), (17)(iv), (18), and Ecology regulations found at WAC 173-180-420(3)(d)(i) and (ii).

The Qualified Individual oversees the management of the entire response, establishes the response priorities and objectives, serves as the liaison with corporate management, and works with the state and federal on-scene coordinators in Unified Command. The Qualified Individual meets the requirements of the 33 CFR 154.1026; and is an English-speaking representative of the Facility, available on a 24-hour basis, familiar with the implementation of the OSCP, and trained in the responsibilities of the Qualified Individual.

The designated Qualified Individual is a member of the Tesoro West Coast Regional Response Team or Facility manager, as yet to be determined.

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Oil spill response is discussed in more detail in the OSCP and operational SPCCP provided under separate cover. Emergency response is addressed in the emergency response plan that is included as a section of the operations facility safety program, also provided under separate cover. In summary, initial spill response actions include the following.

- Make an immediate and rapid assessment to determine
 - If anyone has been injured
 - If situation poses hazards to other personnel or the public (i.e., fire, explosion, fumes, etc.)
 - Source of the spill
 - Type of material spilled and approximate size
- Take immediate steps to stop the flow.
- Ensure safety of personnel. If someone requires medical attention or there is an emergency, dial 911.
- Alert the Facility manager and other Facility personnel. The Facility manager will be the initial Incident Commander.
- Evacuate personnel as necessary.
- Shut down and control the source of the spill, if safe to do so. Assess the potential hazards for explosion and airborne toxins.
- If safe to do so, direct facility responders to shut down potential ignition sources.
- Monitor the area for potential explosion and fire hazards. If fire is present, enable fire alarm and water system.
- Ready the area for firefighting.
- Use whatever resources are available to limit the spread of the spill.
- Establish safety zone around the spill.

In the event of an oil spill or other emergency requiring environmental response, the following agencies and other personnel may be contacted.

Table 3. Emergency Notifications

(* Represents after-hours telephone numbers)

Affiliation	Phone No.
A. COMPANY PERSONNEL	
TBD	TBD
B. MANDATORY NOTIFICATIONS	
National Response Center (NRC)	(800) 424-8802*
Washington Emergency Management Division	(800) 258-5990
Port of Vancouver Security	(360) 992-1120
C. SECONDARY NOTIFICATIONS	
USCG Marine Safety Office (MSO) – Portland	(503) 240-9301*
State of Washington Energy Facility Site Evaluation Council (EFSEC)	TBD
State of Washington Department of Ecology – Southwest Office	(360) 407-6300
Oregon Emergency Response System	(800) 452-0311
Clark Regional Emergency Services Agency	(360) 737-1911
City of Vancouver	(360) 487-8600 and/or (360) 693-9302
D. NOTIFICATIONS AS APPROPRIATE	
Federal Agencies	
Environmental Protection Agency Region 10 – Seattle	(206) 553-1264*
National Ocean and Atmospheric Association Seattle (Hazmat)	(206) 526-6317 and/or (206) 526-4911
National Weather Service Portland	(503) 326-2340 and/or (503) 326-2720
Federal Bureau of Investigation, Portland, Oregon	(503) 224-4181*
U.S. Forest Service, Mountlake Terrace, Washington	(800) 627-0062



Affiliation	Phone No.
U.S. Department of the Interior, Portland, Oregon	(503) 326-2489
Tribal Nations	
TBD	TBD
State Agencies	
Washington Highway Patrol	(360) 757-1175*; (360) 753-6540 (emergency only)
Washington State Department of Fish and Wildlife (WDFW)	(800) 258-5990; (360) 534-8233 (pager); (360) 902-8124 (office)
Oregon Emergency Response System	(800) 452-0311
WDFW Oil Spill Response Team	(360) 534-8233 (pager); (360) 902-8124 (office)
Washington State Department of Natural Resources (Regional)	(360) 856-3500
Washington State Department of Parks and Recreation	(360) 755-9231
Washington State Fire Marshall	(360) 596-3900
Oregon Department of Wildlife	(503) 872-5268
Local Agencies	
Port of Vancouver	(360) 992-1120
Vancouver Public Works Operations Center	(360) 693-9302
Clark Public Utilities	(360) 992-3000
Clark County Public Works (waste water)	(360) 397-6118
Vancouver-Clark Parks and Recreation	(360) 487-8311
Clark County Public Health	(888) 727-6230
E. EMERGENCY SERVICES	
Emergency Medical and Hospitals	
Legacy Salmon Creek Hospital	(360) 487-1000
SW Washington Medical Center (Emergency Room)	(360) 514-2064
Clark County/Vancouver Emergency Services	(360) 737-1911 or 911
Clark County Public Health	(360) 397-8215
Oregon Health and Science University, Portland, Oregon	(503) 494-7686
Providence Portland Medical Center	(503) 215-1111
Legacy Good Samaritan Hospital and Medical Center, Portland, Oregon	(503) 413-7711
Fire Departments	
Vancouver Fire Department	(360) 487-7211 or 911
Clark County Fire Marshall	(360) 397-2375, Ext. 2186
Clark County Hazardous Materials	(360) 397-2375
Police Departments	
Vancouver Police Administration	(360) 487-7400 or 911
Clark County Sheriff Administration	(360) 397-2366 or 911
F. RESPONSE CONTRACTORS	
Marine Spill Response Corporation	(800) 645-7745; (360) 417-9287 (office); (206) 799-1621 (Cell)
Clean Rivers Cooperative	(503) 220-2040*
CARDNO ENTRIX, Environmental Consultants	(800) 476-5886*
Global Diving and Salvage Inc. (no contract in place)	(206) 623-0621* and/or (800) 441-3483
NRC (no contract in place)	(800) 337-7455
Harder Mechanical	(503) 281-1112

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8. Duties of Watchman for Unmanned Vessels

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(8).

There will be no unmanned vessels moored at the Facility's dock. All vessels moored at the Facility must maintain surveillance of their respective vessels. All vessels provide a person who is responsible for the security of the vessel and for keeping unauthorized persons off the vessel.

9. Communication Systems

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(9), and Ecology regulations found at WAC 173-180-420(3)(a)(xi).

Voice communication between the terminal dock and the tank farm is maintained with intrinsically safe two-channel portable radios. During transfer operations, the Facility dock personnel maintain both voice and visual contact with vessel crew. The Facility lends one portable radio to vessel personnel during transfer operations. Directions for use are provided in Appendix E.

10. Personnel Shelter

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(10), and Ecology regulations found at WAC 173-180-420(3)(a)(xiv).

The Area 400 dock-side control house is available for use by Facility and vessel personnel as a shelter.

11. Drip and Discharge Collection

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(11), and Ecology regulations found at WAC 173-180-420-(3)(b)(v).

11.1 Area 200 Drip and Discharge Collection

The entire 1,850 feet of the rail unloading facility (Area 200) includes full coverage rail collection pans, and the interior ground surfaces are constructed of concrete. Thereby any releases of product are contained, as is stormwater that drips from railcars or is blown into the rail unloading facility by the wind.

Pumps used to transfer crude oil from the rail unloading facility to Area 300 storage are situated within belowgrade concrete basins. The collection piping from the rail drip pans and rail unloading facility floor drains is direct-buried that feeds to a header pipe located within the concrete secondary containment. Collection discharge pumps are co-located within the underground concrete pump basins. Water collected from within the rail unloading facility is directed to two containment tanks located in the area of the administrative/support buildings. That is then taken to approved sites for recycling/disposal.

11.2 Area 300 Drip and Discharge Collection

With the exception of one manually operated valve, the entire storage area (Area 300) is situated within bermed secondary containment. A drip pan is situated below the valve not in containment. Stormwater from the secondary containment area is discharged through an oil/water separator and carbon filtration.

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11.3 Area 400 Drip and Discharge Collection

The face of the dock at the Marine Terminal (Area 400) includes a containment area for the work areas, including all flanges and transfer hose areas. The containment area is sized to contain the release of at least three 3 bbl within a curbed area.

11.4 Area 500 Drip and Discharge Collection

All flanges and aboveground valves associated with the transfer piping (Area 500) is equipped with drip pans. Underground piping is located within a concrete utilidor that provides secondary containment.

12. Emergency and Shutdown Systems

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(12), and Ecology regulations found at WAC 173-180-420(3)d(iii).

Emergency plans and procedures are described in detail in the emergency response plan that is a section of the operations facility safety program provided under separate cover. The location of the emergency and safety equipment is depicted on the figures in Appendix A.

Fire suppression systems, linear heat detection, manual release stations, and gas monitors are connected to local audible alarms and visual strobes located in areas 200, 300, 400, and 600. Each area has its own fire alarm system control panel that transmits to a supervising station at the E-house/control room for each area. **All alarm signals also initiate the audible and visual alarm, transmit the alarm signal to the supervising station, and shut down the transfer operation, with all crude oil transfer valves closing within 30 seconds.** During crude oil transfer, operators can manually stop transfers by closing either dock valve or depressing the emergency shutdown buttons located on the dock, or the operator in the control room can stop the pumps or change the valve configuration.

12.1 Area 200 – Fire/Safety Systems

The railcar unloading area is served with a foam fire extinguishing system. A closed-head foam-water pre-action sprinkler system is installed inside the rail unloading structure at the roof level, under walkways (as required by code), and in the pump basin areas. The structure is divided into five zones; each zone will be activated either manually from the foam manual release stations or automatically from the linear heat detection installed at the roof level and at the pump basin level for that associated zone. The pump basins are located in the center of each zone respectively between the tracks. Note that this system is a closed-head pre-action foam-water system; therefore, foam-water solution will only be discharged once the fire is large enough to activate the linear heat detection, trip the valve, and then activate the sprinklers above the fire. In the event of a fire, foam would be used to control and extinguish the crude oil pool fire and will also provide cooling to the railcars and any adjacent equipment or building elements.

Manual foam release stations are located at the base and at the top of the stairs of the rail unloading structure and at every egress point of the rail unloading structure.

A closed-head wet-pipe sprinkler system (water only, no foam) is provided for the fire pump/foam building in accordance with NFPA 20, Section 4.12.1.1.2. The wetpipe system contains water under pressure; therefore, when a fire starts and grows large enough to trip a sprinkler at the ceiling/room, a sprinkler or sprinklers are expected to control the fire.

Manual fire pull stations are surface mounted, and typically located within 5 feet of every egress point, near the fire alarm control panel in the rail unloading structure and at exits from the fire pump/foam buildings and E-houses. These manual pull stations, when manually activated, will send an alarm signal

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to the fire alarm panel, activate the audible and visual alarms, and transmit the alarm signal to the supervising station.

The system includes linear heat detectors, gas detectors, temperature monitors, pump monitors, automatic exterior alarm horns and strobes, manual alarm stations, automatic and manual foam release systems, and tamper-resistant systems. The manual foam release stations are mounted on catwalks near stairway exit paths. All systems interface with the Area 200 control room.

Fire hydrants supplied by the City water distribution system are located on the south side of the rail unloading structure, spaced at 300-foot intervals and are accessible to fire department apparatus. The office and support buildings are equipped with ABC-type fire extinguishers.

Hydrogen sulfide (H₂S) and lower explosive limit (LEL) monitors are located at each unloading station. H₂S, LEL, and oxygen (O₂) monitors are located in each pump pit basin. The high and low alarm set-points for the gas detector system are as follows.

Gas Detector	Low Alarm	High Alarm
H ₂ S	10 ppm	15 ppm
LEL	10% LEL	30% LEL
O ₂	19%	24%

Eyewash and emergency shower stations are located near the pump pits and in the control room.

12.2 Area 300 – Fire/Safety Systems

Area 300 (Storage Area) contains six crude oil aboveground storage tanks. Area 300 also has a fire pump/foam building, storage building, E-house, and pump basin. All tanks are located inside a perimeter dike capable of containing 110 percent of the volume of the largest tank plus precipitation from a 24-hour, 100-year storm event. The tanks are positioned so that the distance between each tank is at least 120 feet in all directions. The distance from the tank to the dike varies from 33 to 150 feet.

An automatic fixed foam system is provided for each storage tank to protect the seal area of the internal floating roof. This system will be activated by the linear heat detection system installed at the foam dam of the floating roof or by the manual foam release stations associated with each respective tank. These automatic fixed foam systems are specifically designed to control a potential fire inside a tank. The linear heat detection cable located around the foam dam is connected to the fire alarm system.

Manual foam release stations are located at the base of the stairs on the tanks, at the top of the dike near the closest fire hydrant for each tank, and on a bank of release stations located at the foam/pump house.

The fire pump/foam building is equipped with a closed-head wet-pipe sprinkler system (water only, no foam) in accordance with NFPA 20. The wetpipe system contains water under pressure; therefore, if a fire starts and grows large enough to trip a sprinkler at the ceiling/room, a sprinkler or sprinklers are expected to control the fire.

Manual fire pull stations are surface mounted and typically located at every exit from the fire pump/foam buildings and E-houses within Area 300. These manual pull stations, when manually activated, will send an alarm signal to the fire alarm panel, activate the audible and visual alarms, and transmit the alarm signal to the supervising station.

Fire hydrants for fire department use are located around the perimeter of Area 300, spaced at 300-foot intervals. Two fire hydrants are located inside the dike area near the intersection of the intermediate dikes. These fire hydrants include a monitor nozzle that can be used to cool the tanks, reduce potential fire exposure, and apply the self-healing biodegradable foam.

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Each fire hydrant is equipped with a monitor nozzle and foam eductor and pick-up line that can be placed in a bucket, pail, or other portable device of foam concentrate, which will draw foam concentrate from the pail/container to generate a foam solution. The flow of water from these monitor nozzles are provided to create a cooling effect on the tank wall. The foam eductor provided on each monitor nozzles will allow the fire hydrant to spray a foam water solution and control a small pool fire within the dike area. A predetermined size of foam concentrate will be kept in the fire pump/foam building. When the need arises for its use, such as a small spill or rubbish fire, the foam concentrate will be taken to the appropriate fire hydrant and the hose will be placed in the bucket, pail, or other portable device. The nozzle will draw the foam in at the manufacturer-determined proportioning rate to achieve the desired concentration of foam/water solution.

Additionally, an elevated monitor nozzle supplied with foam-water from the fire pump/foam building is located near the crude oil pump basin with the primary purpose of providing manual fire suppression to the pump basin. This monitor nozzle for the crude oil pump basin is capable of providing a 3 percent foam application to the pump basin area. Using a flow rate of 750 gallons per minute will provide coverage of the crude oil pump basin.

Hydrogen sulfide (H₂S), LEL, and O₂ monitors are located in the pump basin. The high and low alarm set-points for the gas detector system are as follows.

Gas Detector	Low Alarm	High Alarm
H ₂ S	10 ppm	15 ppm
LEL	10% LEL	30% LEL
O ₂	19%	24%

Eyewash and emergency shower stations are located in the storage building and on the north side of the E-house.

12.3 Area 400 – Fire/Safety Systems

Two elevated fire monitors are installed at the marine loading dock. The monitor nozzles are supplied from a pre-action foam system located in the fire pump/foam building. Activation of the foam-water monitor nozzles is by manual foam release stations located in the E-house and throughout Area 400. The controller for the nozzles will be located in the E-house located shoreside. A fire hydrant is provided for fire department use near Area 400, supplied by the City water distribution system. This system is primarily for fires on the berth, but can be used to assist in the event of a vessel fire. Manual foam release stations are located at the loading berth.

The fire pump/foam building is equipped with a closed-head wet-pipe sprinkler system (water only, no foam) in accordance with NFPA 20. The wetpipe system contains water under pressure; therefore, if a fire starts and grows large enough to trip a sprinkler at the ceiling/room, a sprinkler or sprinklers are expected to control the fire.

Manual fire pull stations are surface mounted and typically located at every exit from the fire pump/foam buildings and E-houses for Area 400. These manual pull stations, when manually activated, will send an alarm signal to the fire alarm panel, activate the audible and visual alarms, and transmit the alarm signal to the supervising station.

International hose connections are located on the dock for vessel fire water. Vessels berthing at the Marine Terminal are required to have onboard fire protection systems, as well as contracts with commercial marine firefighting companies, to respond in the event of a shipboard fire.

Eyewash and emergency shower stations are located on the east and west sides of Berth 13.

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12.4 Area 500 – Fire/Safety Systems

The pipeline area (Area 500) is served by previously existing and new (as constructed to serve specific Facility areas) fire hydrants in the vicinity of the pipeline alignment.

12.5 Area 600 – Fire/Safety Systems

Area 600 (West Boiler) contains a boiler building with a natural-gas boiler. The boiler building and surrounding area are served by adjacent fire hydrants. Smoke detectors, automatic and manual alarms, and hand-held fire extinguishers are located as appropriate inside and outside the boiler building as required by local fire code.

Eyewash and emergency shower stations are located along the east, south, and west walls of the boiler building.

12.6 Rail Infrastructure – Fire/Safety Systems

The rail infrastructure operated by the Facility is served by fire hydrants in the vicinity of the rail loop alignment. An overpass exists over the rail line on the east side of the rail loop; emergency services could use this overpass to access the interior of the rail loop.

13. Monitoring Devices

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(13), and Ecology regulations found at WAC 173-180-420(3)(a)(xii)(D).

The pressure, valve positions, volumetric flow rate, tank levels, and total volume transferred are monitored at every transfer from the Area 200 and/or Area 400 control rooms. During crude deliveries, flow is monitored using ultrasonic flow meters as it comes in from railcars and is delivered to storage tanks, and any flow discrepancies trigger an alarm and automated valves close. The pumping stations associated with the transfer also monitor crude oil density and contaminants (sediment and water), and collect regular samples for analysis.

When filling vessels, flow is monitored using ultrasonic flow meters as it is pumped from storage and when it is discharged to the vessel, and any flow discrepancies trigger an alarm and automated valves close.

14. Oil Spill Containment Equipment

This section complies with USCG regulations found at 33 CFR Section 154.310 (a)(14), and Ecology regulations found at WAC 173-180-420(3)(d)(iv).

The Facility maintains the following oil spill response equipment at the dock. The Facility is a member of Clean Rivers Co-op. As a Co-op member, a response contract is in place with Marine Spill Response Corporation (MSRC). In addition to the equipment listed below (Table 4), the Co-op’s spill response equipment is available to the Facility within 2 hours of a spill and will be operated by their personnel. An inventory of equipment available from the Co-op is included in Appendix D. Instructions are found in Appendix E.

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Table 4. On-Site Oil Spill Response Equipment

Item	Access Time	Location
1,600' of 18" Fence Boom	Immediate	VE Dock
1,000' 12" x 6" Containment Boom w/36" Floats	Immediate	VE Dock
2,000' 12" x 6" Containment Boom w/72" Floats	Immediate	VE Dock
1 - 20' ISO Storage Container	Immediate	VE Dock
3 - 12' x 30' Chafing Cloth	Immediate	VE Dock
2 - NOFI "Current Buster 2" High Speed Recovery System	Immediate	VE Dock
2 - Containerized Hydraulic Reels	Immediate	VE Dock
2 - 10-horse power Hydraulic Power Packs	Immediate	VE Dock
4 - High-Capacity Backpack Blowers	Immediate	VE Dock
2 - C-Disk 13/30 Coated Disc Skimmer Systems	Immediate	VE Dock
2 - 10,000-lb Flatbed Trailer w/Ramps	Immediate	VE Dock
1 - 18' Response Boat	Within 15 minutes	Tesoro Terminal Dock
2,800' of 20" Harbor Boom	Within 15 minutes	Tesoro Terminal Dock
8" x 12" Kepner Sea Boom	Within 15 minutes	Tesoro Terminal Dock

Note: Instructions for use of all equipment listed above is contained in Appendix E.

15. Fire Extinguishers

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(15), and Ecology regulations found at WAC 173-180-420(3)(d)(v).

15.1 Fire Extinguisher Location

Portable fire extinguishers are located as depicted in the figures in Appendix A. All extinguishers are dry chemical ABC-type; some hand-held and others on wheels. The number and type of portable extinguishers are based on the requirements of NFPA 10, OSHA Subpart L, Section 1910.157, WAC 296-24-592, and local codes.

15.2 Fire Extinguisher Instructions for Use

Portable fire extinguishers are operated as follows.

1. Positioning 8 to 10 feet from the blaze
2. Holding the unit upright and pulling the pin
3. Squeezing the lever while aimed at base of flame, and sweeping the foam spray from side to side
4. Advancing toward flames over the area that has been extinguished, while maintaining 8- to 10-foot distance

16. Maximum Allowable Working Pressure and Relief Valves

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(16), and Ecology regulations found at WAC 173-180-420(3)(a)(xv).

The maximum allowable working pressure for the loading hoses is as follows.

- Loading hoses (open to vessel) – 50 psi



For transferring product from the rail unloading area, a predetermined pipeline connection (PLC) setpoint from a pressure transmitter signal will automatically power off the facility pump at approximately 100 psi. The pressure transmitter is located on the 10-inch pump discharge pipeline at the pump basin. In addition to the pump shutdown, the system has a pressure relief valve downstream of each pump that will recirculate the crude in the event that the pump discharge piping is blocked and the pressure transmitter fails. This pressure relief valve is set at approximately 110 psi. The system also has thermal pressure relief valves relieving thermal expansion in blocked portions of the piping between the rail unloading area (Area 200) and the storage area (Area 300). These valves are set at varying pressures depending on their location in the piping system.

For transferring product from the storage area (Area 300) to the marine terminal area (Area 400), a predetermined PLC setpoint from a pressure transmitter signal will automatically power off the facility pump at approximately 100 psi. The pressure transmitter is located on the 36-inch pump discharge pipeline at the pump basin. In addition to the pump shutdown, the system has a pressure relief valve on the pump discharge header that will recirculate the crude in the event that the pump discharge piping is blocked and the pressure transmitter fails. This pressure relief valve is set at approximately 110 psi. The system also has thermal pressure relief valves relieving thermal expansion in blocked portions of the piping between the storage area (Area 300) and the marine terminal area (Area 400). These valves are set at varying pressures depending on their location in the piping system.

17. Transferring Procedures

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(17)(i) and (ii), and Ecology regulations found at WAC 173-180-420(3)(a)(xii)(A) and (B) and 173-180-420(3)(b)(ii) and (iii).

There are no loading arms located at the Facility dock. Transfers are from manifold to vessel via two-hose connections.

17.1 Transfer to Vessel

1. Only a single vessel is docked at a time.
2. Only a single vessel is loaded at a time.
3. Once a vessel is all fast and secured in place at a dock and the tugs are released, the dock shore gangway is then lowered to the deck to permit safe access for people to cross back and forth. After the gangway is on and the vessel is "all fast," the full wrap boom is put around the vessel to contain any potential for oil spill. Once the boom is in place, the TPIC comes aboard the vessel and conducts a safety inspection with the ship's Chief Officer VPIC. During the deck inspection, the cargo and vapor hoses are connected under the guidance of the vessel's Bosun, Pumpman, or Deck Officer. After completion of cargo and vapor hose connection, the TPIC and VPIC conduct the Pretransfer Meeting (key meeting). During this meeting, all aspects of the cargo transfer are discussed, such as starting; coming up to rate; topping off; completion of loading; and any safety security concerns, including signals for shutdowns should the primary, secondary, and tertiary means of communication fail. An oil transfer load plan is completed, an example of which is provided in Appendix I.
4. The vessel is pre-boomed, following procedures in Appendix M.
5. The Facility is designed to load the ships using positive displacement pumps on a variable frequency drive, thus allowing adjustment of loading flow rate by increasing or decreasing the speed/flow rate of the pumps as needed. The pumps are also staged so they can be turned off and on in multiple configurations to ensure optimal loading feed to the vessels. Different vessels have different loading configurations. For example, a 46-DWT vessel calling to the Facility might have a header sized at 12 to 24 inches with the dimension of the header dictating the rate at which the vessel can be loaded. As a rule of thumb, vessels start loading at 10 to 25 percent of their maximum rate of fill. The top-off rate also depends on the vessel size and the amount of cargo it will carry. If a vessel is filling to less than 90 percent total cargo volume (as would be the case with some of the proposed larger vessels), the ship may be filled at full or near full rates to the very end. If the ship is filled to 95 to 98 percent of its rated capacity towards the end of the loading cycle, the fill rate is slowed down to the 10 to 25 percent.

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17.2 Transfer from Railcar

The Facility receives crude oil by rail with offloading from tracks located at the Port's Terminal 5. There is one unloading header at each railcar position. The pumps are located between the unloading rails. Each railcar position is protected by a spill containment system.

During railcar unloading, the following procedures are followed.

17.2.1 Railcar Spotting and Bottom Hook-Up

1. The operators ensure that they have the necessary tools/equipment to accomplish this task. They work in teams of one on the ground and one on the mobile platform.
2. The operators don the required personal protective equipment.
3. Prior to starting the transfer, the operator initiates radio communication with team or other authorized personnel to perform a radio check.
4. Railcars are spotted on each of six unloading station.
5. The operator uses the set of railcar chocks, by resting each individual chock on top of the rail on opposite sides of the railcar's wheel; a wheel chock will be placed on the front and rear railcar of each string of railcars. This process is undertaken to prevent any accidental movement during the transfer process.
6. The operator sets the railcar's handbrake by turning the wheel in a clockwise motion; the brake is fully applied when you can no longer turn it. The front and rear railcars for the string of spotted cars will have handbrakes set. The handbrake is located on the railcar's B-end.
7. An operator qualified to do railcar inspections performs a general inspection of the railcar ensuring that it is in good operating condition and provides for a safe work environment.
8. The operator checks the surrounding area for slip or trip hazards, removing any hazards where possible and/or be warned that a hazard exists and to be cautious when working in that specific area.
9. An operator will place a containment pan (unloading fitting will be in the pan) under each railcar.
10. The operator uses the pipe wrench to remove the cap/plug from the railcar's bottom oil valve (BOV).
11. The operator attaches and secures the railcar's appropriate BOV fitting to the railcar's BOV.
12. The operator connects and secures the product hose to the recently installed 90 degree fitting.
13. At this time, the hose may need to be raised and tied off with a rope or strap to ensure the OPW valve and the 90 degree fitting are not sagging, which may create leakage of product.
14. At this time, the operator grasps the ball handle on the hose valve and pushes it down into the locked open position then checks for leaks.
15. Once fitting and hose are properly hooked up and secured, the BOV on the railcar is opened.
16. The operator verifies the product hose is charged to the site glass and not leaking.

17.2.2 Platform Operation and Hook-Up

1. The operator uses 4-point contact to climb the steps on the mobile platform to access the top of the railcar. Once the mobile platform is aligned, the walkway (ramp) is lowered with safety rail completely encompassing the platform area approximately 6 inches above the height of the railing of the platform.
2. The operator on the mobile platform works from side to side moving to the north, hooking up vent hoses/vacuum breakers.
3. The operator inspects the man-way bolts using a wrench to tap each bolt. All bolts must be tool tight, any bolt that moves is not tool tight and will be tightened before moving on.
4. The operator opens the dome cover lid to inspect for loose bolts on the flanges.
5. The operator ensures the vapor and liquid valves are closed, capped, and tool tight and there is no leakage or product loss.
6. The operator inspects the pressure relief device for visible damage, leakage, or product loss.
7. The operator lowers the rope to the operator on the ground to retrieve the vapor hose and pulls the hose up.
8. The operator removes the cap from the vapor valve on the tank car and attaches the vapor hose/vacuum breaker to the tank using a cam lock fitting.
9. The operator then opens the ball valve on the vapor hose (if hose is allocated) by moving the handle to the inline position.
10. The operator then opens the ball valve on the tank car vapor valve by moving the handle to the inline position, being careful to allow the railcar's internal pressure to be relieved.

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11. Before leaving the tank car platform, the operator gathers tools and visually inspects that both the vapor valve on the tank car and the vapor recovery hose valve are open, then verbally acknowledging this by saying, “open, open” to the operator on the ground who will open the main product and vapor valve for that station while checking for leaks.

17.2.3 Initiating the Transfer and Transfer in Progress

1. Once a set of railcars has been hooked up for unloading, the drip pans are in place, the vent fittings and/or vent hoses are hooked up, the railcar BOVs have been opened, and all personnel are clear at both the top and bottom of the railcars, the operator on the ground checks with the operator in the control room via radio and then opens the product and vapor valves at each unloading station.
2. After the railcars are hooked up at each unloading station, an operator in the control room starts the pumps. Once the pumps are started, the operators check for leaks and any abnormalities. If leaks are detected, the BOVs are immediately closed and appropriate steps taken to stop the leak.
3. An operator continually monitors the product flowing into the manifold by observing the sight glass in the VISI FLOW fitting. In addition, the operators continue to check for leaks and any abnormalities on the entire terminal at a minimum of every 30 minutes.

17.3 Completion of Pumping

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(17)(iii), and Ecology regulations found at 173-180-420(3)(a)(xii)(C).

Crude oil is transferred at the terminal by two different methods.

1. Articulated tub barge (ATB) or ship (dispense).
2. Railcar (receive only).

Completion of pumping procedures is described for each of these methods below.

17.3.1 Transfer to Vessel

1. Upon completion of product transfer, the terminal dock operator assists ATB or vessel personnel in draining the hose, disconnecting the hose, and capping the end of the hose prior to the hose being passed over water for storage.
2. The vessel manifolds are fully blanked and secured.
3. The terminal dock operator closes all valves and secures each with a chain and lock.
4. The containment boom around the vessel is removed and the second mate tests gear, the engines are tested ahead and astern, and the steering gear is tested as are communications and alarms.
5. Upon completion of the transfer, the vessel is gauged by an independent third-party cargo surveyor, and cargo quantities are reviewed, confirmed, and documented.

17.3.2 Transfer from Railcar

1. The supervisor notifies other crew members that pumps are down and teardown can begin.
2. Once the product quits flowing through the VISI FLOW sight glass, the operator closes the BOV on the railcar and allows residual product to finish draining from the hose.
3. The operator then closes the main (API) valve on the product hose.
4. Once both valves are closed, the hose is disconnected from the 90 degree fitting and placed on the containment pan after the end of the valve is wiped off with an absorbent wipe.
5. The 90 degree fitting is disconnected from the railcar and a 4-inch plug inserted. The cam lock levers are locked down and the fitting is placed in the containment pan. The end of the 90 degree fitting that the valve was once hooked to is wiped off with an absorbent wipe.
6. The product hose (the end with the API valve on it) is returned back to its holder by snapping it in place.
7. The main product valve and main vapor recovery valve are closed.
8. The containment pan is pulled out from under the railcar, and it is placed beside the main product valve at that station.

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18. Procedures for Spill Reporting and Initial Containment

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(18), and Ecology regulations found at WAC 173-180-420(3)(d)(i).

Refer to Section 7 for reporting information. As previously stated, emergency response is addressed in the emergency response plan that is included as a section of the operations facility safety program, provided under separate cover.

In the event of an oil spill, all operations are shut down immediately using emergency shutdown buttons (see Section 12), and the TPIC shall secure the source of the discharge as soon as it is safe to do so. A Qualified Individual is immediately notified. The Qualified Individual notifies appropriate agencies as described in Section 7. The first responder is prepared to relay information regarding the source, estimated size, crude oil released, location, and other pertinent information available or requested. The Qualified Individual may request assistance from the Oil Spill Response Organization (Clean Rivers) or, under certain situations, may seek assistance from contractors directly (MSRC).

After the source of the discharge has been secured, the TPIC, along with Facility personnel, deploys the containment boom located in Area 400 in accordance with the Facility booming strategy. After the boom is deployed, Facility personnel will take any other measures necessary to contain and begin cleanup of the discharge until Clean Rivers arrives and takes over the cleanup operations, if it is safe to do so.

Transfer operations are not resumed until the system has been inspected and repaired, and the TPIC as well as the Captain of the Port have deemed the system fit for continued operations.

19. Federal, State, and Local Laws and Regulations

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(19), and Ecology regulations found at WAC 173-180-420(3)(a)(iv), and State of Oregon Law, Chapter 340, Division 47.

19.1 Federal Law

Federal law requires the immediate reporting of all spills of oil and hazardous substances to the water. The Federal Water Pollution Control Act amendments of 1972 made it unlawful to discharge oil “into or upon the navigable waters of the United States, adjoining shorelines, or into or upon waters of contiguous zone,” [22 USC 1321 (b)(3)]. Immediate reporting of such discharges is required by both the USCG and EPA. The responsibility is established in National Oil and Hazardous Substances Contingency Plan, 40 CFR 154.1036(b)(1) and (2). Spills on inland waters are the responsibility of the EPA, while the USCG has jurisdiction for coastal waters, ports, and harbors.

19.2 State of Washington Law

State of Washington Law Revised Code of Washington (RCW) 90.48 (Water Pollution Control) defines state laws regarding water pollution. RCW 90.56 provides statutory authority for developing regulations more specific for an oil handling facility’s operations. The following applicable WACs are authorized by RCW 90.56.

- WAC 173-180
- Part A General Requirements
- Part B Oil Transfer Requirements
- Part C Design Standards for Class I Facilities
- Part D Operations Manual Requirements for Class I and Class 2 Facilities
- Part E Training and Certification for Class I and Class 2 Facilities
- Part F Prevention Plans for Class 1 Facilities

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Note that prevention plans prepared according to Part F requirements are often made to also comply with Federal SPCCP requirements found at 40 CFR 112. Additionally, WAC 173-182 includes regulations and response criteria for Facility OSCP, and is inclusive of requirements under the federal Facility Response Plan (40 CFR 112).

19.3 State of Oregon Law

Chapter 340 Division 47 Regulations Pertaining to Oil Spills into Public Waters defines state laws regarding water pollution. This chapter provides statutory authority for developing regulations more specific for an oil handling facility's operations. The following are applicable for oil spills that may affect Oregon waters.

- Chapter 340 Division 47
- 340-047-0015 Notice, Control and Cleanup of Oil Spills Required
- 340-047-0020 Approval Required For Use of Chemicals
- 340-047-0025 Approval Required For Disposal of Spilled Oils

20. Shielding Portable Lighting Procedures

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(20), and Ecology regulations found at WAC 173-180-420(3)(b)(vi).

No portable lighting is used at the Facility. The Facility has adequate fixed lighting to provide safe operations during dark hours.

21. Terminal Training and Qualification Program

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(21), and Ecology regulations found at WAC 173-180-510.

1. The Facility has developed and implemented oil transfer training for key supervisory, operations, maintenance, management, and indirect operations personnel identified pursuant to Subsection (3) of WAC 173-180-510.
 - (a) The Facility has designed a training program, to the maximum extent practicable, to promote job competency and environmental awareness for the purpose of preventing oil spills.
2. Oil transfer training programs are approved by Ecology under WAC 173-180-525.
3. The Facility has identified, in writing, the specific position titles that the Facility has identified to be subject to its oil transfer training requirements. In making this determination, the Facility has evaluated the functions of Facility personnel positions using the following definitions.
 - (a) "Key" means a position with direct responsibility for performing or overseeing the transfer, storage, handling, or monitoring of oil at a facility, or a job function, where typical human factors present the probability of a spill occurring.
 - (b) "Operations" means direct involvement in the transfer, storage, handling, or monitoring of oil at a facility in a capacity that involves the risk of an oil spill to waters of the state. This functional group includes, but is not limited to, the person-in-charge, storage tank operators, pipeline operators, and oil transfer monitors.
 - (c) "Supervisory" means involvement in directly supervising the transfer, storage, handling, or monitoring of oil at a facility by implementing operations policies and procedures that involve the risk of an oil spill to waters of the state.
 - (d) "Maintenance" means direct involvement in maintaining and repairing the equipment used for the transfer, storage, handling, or monitoring of oil at a facility in a capacity that involves the risk of an oil spill to waters of the state.

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- (e) "Indirect operations" means involvement in on-site activities, such as new construction, in a capacity that indirectly involves the risk of an oil spill to waters of the state due to potential impacts to nearby oil handling operations (e.g., operating digging equipment next to an active transfer pipeline). For cases where certain job titles associated with indirect operations cannot be identified in advance, the Facility must identify the types of job orders or work sites that may involve the need for indirect operations oil transfer training.
4. The Facility has identified, in writing, the specific initial classroom and/or on-the-job oil transfer training requirements for each position, including minimum hours that are appropriate for each position given the facility's training needs and human factor risks. For the purposes of this section, "human factors" means human conditions, such as inadequate knowledge or fatigue, which can lead to incompetency or poor judgment, and "human factor risks" means risks of causing an oil spill due to the effects of human factors on competency and judgment.
5. Operations and supervisory personnel training. Requirements for training of operations and supervisory personnel focus on building personnel competency in operating procedures and spill prevention systems specific to the Facility. Oil transfer training requirements incorporate the following training topics at a minimum.
- (a) Overview of all oil handling, transfer, storage, and monitoring/leak detection operations at the Facility;
 - (b) Operating procedures and checklists specific to trainee's job function;
 - (c) Problem assessment, including recognition of human factor risks and how they can be minimized;
 - (d) Awareness of preventative maintenance procedures;
 - (e) Awareness of local environmental sensitivity and oil spill impacts;
 - (f) Major components of Facility's oil spill prevention plan;
 - (g) Major components of Facility's operations manual;
 - (h) Major components of Facility's OSCP;
 - (i) Safe use and handling of response equipment, including, but not limited to, containment, personal protection, and recovery equipment;
 - (j) Decision-making for abnormal operating events and emergencies, including emergency spill prevention and safe shutdown conditions, responsibilities, and procedures;
 - (k) Routine and emergency communications procedures;
 - (l) Overview of applicable oil spill prevention and response laws and regulations; and
 - (m) Drug and alcohol use awareness, pursuant to WAC 173-180-630.
6. Management personnel training: Requirements for initial oil transfer training of management personnel incorporate the following training topics at a minimum.
- (a) Overview of all oil handling, transfer, storage, and monitoring/leak detection operations at the Facility;
 - (b) Management role in operations and oil spill prevention;
 - (c) Recognition of human factor risks and how they can be minimized;
 - (d) Awareness of local environmental sensitivity and oil spill impacts;
 - (e) Major components of Facility's oil spill prevention plan;
 - (f) Major components of Facility's operations manual;
 - (g) Major components of Facility's OSCP;
 - (h) Decision-making for abnormal operating events and emergencies, including emergency spill prevention and safe shutdown conditions, responsibilities, and procedures;
 - (i) Overview of applicable oil spill prevention and response laws and regulations; and
 - (j) Drug and alcohol use awareness, pursuant to WAC 173-180-630.

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7. Maintenance personnel training: Requirements for initial oil transfer training of maintenance personnel incorporate the following training topics at a minimum.
 - (a) Overview of all oil handling, transfer, storage, and monitoring/leak detection operations at applicable maintenance work sites within the Facility;
 - (b) Equipment problem assessment and preventative maintenance procedures;
 - (c) Awareness of local environmental sensitivity and oil spill impacts;
 - (d) Major components of Facility's oil spill prevention plan;
 - (e) Major components of Facility's operations manual;
 - (f) Major components of Facility's OSCP;
 - (g) Emergency spill prevention and safe shutdown conditions, responsibilities, and procedures;
 - (h) Overview of applicable oil spill prevention and response laws and regulations; and
 - (i) Drug and alcohol use awareness, pursuant to WAC 173-180-630.
8. Indirect operations personnel training: Requirements for initial oil transfer training of indirect operations personnel incorporate the following training topics at a minimum.
 - (a) Overview of oil handling, transfer, storage, and monitoring/leak detection operations at specific indirect operations work site within the Facility;
 - (b) Awareness of local environmental sensitivity and oil spill impacts;
 - (c) Notification procedures for emergency spill prevention actions; and
 - (d) For Facility employees, drug and alcohol use awareness, pursuant to WAC 173-180-630.
9. Training topics identified in subsections (5) through (8) of this section, do not prescribe fixed subject titles for class outlines or training organization. Facility may combine or integrate these topics as appropriate and check that information on each topic is presented in the applicable personnel training program.
10. Facility identifies, in writing, the specific oil spill prevention continuing education requirements for each affected position, including minimum hours, which are appropriate given the Facility's training needs and human factor risks. Ongoing training occurs at least annually, and at a minimum addresses
 - (a) Any changes in the core topics identified in subsections (5) through (8) of this section, unless affected personnel have already been informed about the change after its occurrence;
 - (b) Refresher awareness training on environmental sensitivity and oil spill impacts;
 - (c) Review and analysis of oil spills that have occurred during the past year;
 - (d) Refresher training on emergency spill prevention procedures; and
 - (e) For key supervisory, operations, and management personnel, a practice exercise of the Facility's procedures for preventing a spill during a particular abnormal operations event.
11. Existing personnel that have entered their current position prior to adoption of this chapter are regarded as having met the Facility's initial oil transfer training requirements if
 - (a) Facility has documented that those personnel have received the required training in the past; or
 - (b) Facility attests in writing and in detail, how those personnel have had on-the-job training or other experience equivalent to the Facility's initial training requirements, including type and frequency of past training when known.
12. Facility develops follow-up remedial training for personnel clearly responsible for causing an oil spill while functioning in their position, unless such personnel no longer occupy a position identified under subsection (3) of this section.
13. Contractors hired by the Facility to perform key supervisory, operations, maintenance, management, or indirect operations functions, as identified by the Facility under subsection (3) of this section, are considered "personnel"

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for the purposes of this chapter and are subject to the same oil transfer training requirements as Facility employees. The Facility is responsible to validate that such contractors have met the Facility's oil transfer training requirements before they perform a key supervisory, operations, maintenance, management, or indirect operations function.

14. Facility has developed minimum training and/or experience qualifications for trainers who will demonstrate Facility-specific procedures, equipment use, supervise practice sessions, and provide other on-the-job training to new operations personnel.
15. Facility has developed and maintains written oil transfer training materials, such as training manuals or checklists.
16. Oil transfer training is documented, and records are kept at the Facility in a central and accessible location for at least five years from the date of training completion.

22. Hose Marking

This section complies with USCG regulations found at 33 CFR Section 154.310(a)(22).

The Facility only transfers crude oil; therefore, there is no need to have hoses for different products marked.

23. Tank Cleaning Operations and Recordkeeping Procedures

This section complies with USCG regulations found at 33 CFR Section 154.310 (a)(23).

Examples of recordkeeping and inspection forms for the Facility and dock are presented in Appendix G. Periodically, tanks located at the Facility will be cleaned for routine maintenance and inspection (such as API 653 inspection). Cleaning and inspection are performed by a contractor. Tank cleaning and recordkeeping is done in compliance with Washington Solid and Dangerous Waste Regulations.

24. Inspection and Maintenance Schedules

This section complies with Ecology regulations found at WAC 173-180-420(3)(a)(vii).

Bulk storage tanks are inspected every 10 years according to API 653 protocol. Daily, weekly, monthly, and annual inspection and maintenance routines for other equipment is presented in Appendix H.

25. Recordkeeping

This section complies with Ecology regulations found at WAC 173-180-420(3)(a)(v) and 173-180-040. Appendices F, G, and J supplement this section.

Records required by WAC 173-180 will be maintained and available to Ecology for a minimum of three years, except for the following.

1. Preload plans and declaration of inspection forms are kept for at least 30 days from date of the oil transfer operation.
2. The design, construction, and repair records for storage tanks, pipelines, and all oil transfer equipment testing and repair records are kept for the life of the equipment. Inspection, maintenance, and repair records for pumps, valves, manifolds, and other ancillary equipment used in oil transfers are kept for 10 years.
3. Oil transfer personnel training and certification records are kept for five years from the date the persons were certified.
4. All records required in this chapter are available to Ecology for photocopying upon request.

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26. Work Hours

This section complies with Ecology regulations found at WAC 173-180-055.

Personnel with oil transfer duties do not work more than 16 hours in any 24-hour period, no more than 40 hours in any 72-hour period, except in an emergency or spill response operation. “Emergency” means an unforeseen situation that poses an imminent threat to human safety, or the environment, or substantial loss of property. The terminal maintains records (e.g., maintenance records and/or payroll records) demonstrating compliance with work hour restrictions.

27. Operations Manual Review and Approval

This section complies with Ecology regulations found at WAC 173-180-430.

1. Upon receipt of an operations manual, EFSEC (with the assistance of Ecology) determines whether the operations manual is complete. If the agencies determine that an operations manual is incomplete, they will notify the Facility of the deficiencies.
2. When reviewing operations manuals, the agencies consider the following.
 - (a) The ability of the operations manual to provide best achievable protection from damages caused by the discharge of oil into waters of the state;
 - (b) The volume and type of oil(s) addressed by the Facility’s operations manual;
 - (c) The history and circumstances of prior spills by similar types of facilities, including spills reported to the state and federal government in Washington State;
 - (d) Inspection reports;
 - (e) The presence of operating hazards;
 - (f) Sensitivity and value of natural resources within the geographic area covered by the operations manual; and
 - (g) Any pertinent local, state, and federal agency and public comments received on the operations manual.
3. The agencies endeavor to notify the Facility owner or operator within five working days after completing the review whether Ecology approves the operations manual.
4. If the operations manual receives approval, the agencies send the Class 1 facility owner or operator an approval letter describing the terms of approval, including an expiration date (Class 1 facility is defined in RCW 90.56.010, as any structure, group of structures, equipment, pipeline, or device, other than a vessel, located on or near the navigable waters of the state that transfers oil in bulk to or from a tank vessel or pipeline, that is used for producing, storing, handling, transferring, processing, or transporting oil in bulk).
5. Conditional approval as follows.
 - (a) The agencies may approve an operations manual conditionally by requiring a facility owner or operator to operate with specific precautionary measures until acceptable components of the operations manual are resubmitted and approved by the agencies.
 - (b) Precautionary measures may include, but are not limited to,
 - (1) Reducing oil transfer rates;
 - (2) Increasing personnel levels;
 - (3) Restricting operations to daylight hours; or
 - (4) Additional requirements to ensure availability to response equipment.
6. After receiving notification of conditional status from the agencies, a Class 1 facility submits and implements required changes to the agencies within 30 calendar days. The agencies may issue an extension at Ecology’s discretion. Operations manual holders who fail to meet conditional requirements or provide required changes in the time allowed will lose conditional approval status.
7. If the operations manual approval is denied, the agencies must send an explanation of the factors for disapproval and a list of deficiencies to the Class 1 facility owner or operator.

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- (a) The owner or operator of the facility resubmits the operations manual within 90 calendar days of notification of reasons for noncompliance, responding to the reasons and incorporating any suggested modifications.
 - (b) The Facility does not continue oil storage, transfer, production, or other operations until the agencies approve an operations manual for that facility.
8. Approval of a manual by the agencies does not constitute an express assurance regarding the adequacy of the operations manual nor constitute a defense to liability imposed under state law.
9. A facility conducts operations if the Facility properly submitted an operations manual to the agencies, and they have not provided the Facility with a formal response.

28. List of Acronyms and Abbreviations

API: American Petroleum Institute

ATB: articulated tub barge

bbbl: oil barrel and barrels

BOV: bottom oil valve

CFR: Code of Federal Regulations

City: City of Vancouver

Company: Tesoro Savage Petroleum Terminal LLC

DWT: deadweight tonnage

Ecology: Washington State Department of Ecology

EFSEC: Energy Facility Site Evaluation Council

E-house: electrical house

EPA: U.S. Environmental Protection Agency

Facility: Vancouver Energy

H₂S: hydrogen sulfide

LEL: lower explosive limit

MSRC: Marine Spill Response Corporation

MT: metric ton

MVCU: marine vapor combustion unit

NFPA: National Fire Protection Association

NRC: National Response Center

O₂: oxygen

OSCP: Operations Spill Contingency Plan

PLC: predetermined pipeline connection

Port: Port of Vancouver USA

RCW: Revised Code of Washington

SPCCP: Spill Pollution, Control, and Countermeasures Plan

TPIC: Terminal Person-in-Charge

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USCG: U.S. Coast Guard

VPIC: Vessel Person-in-Charge

WAC: Washington Administrative Code

WDFW: Washington Department of Fish and Wildlife

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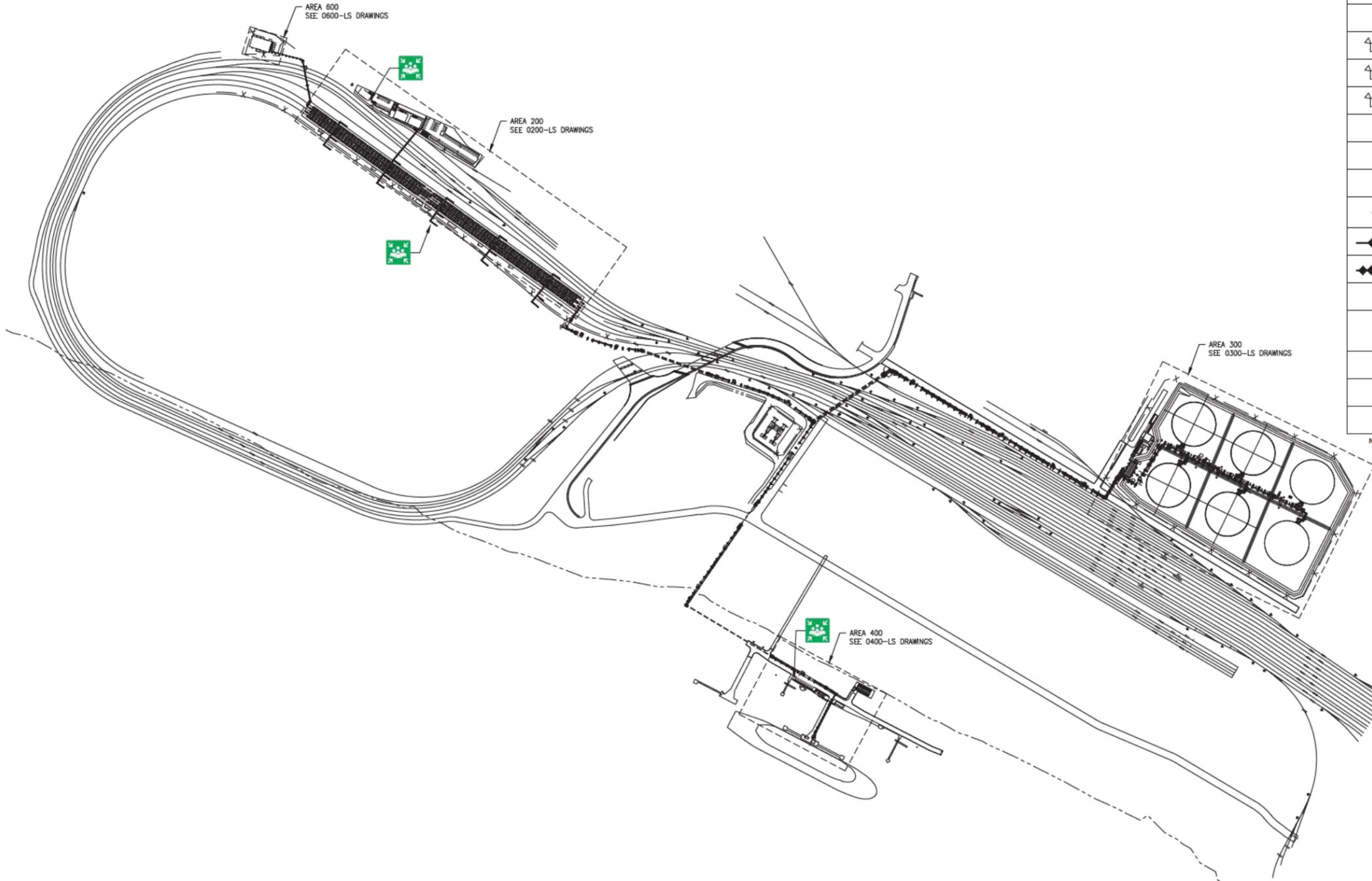
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Operations Facility Oil Handling Manual
EFSEC Application for Site Certification No. 2013-01
Docket No. EF131590



Appendix A
Facility and Dock Plot Plans

OFF-SITE EVACUATION:
ALONG NW OLD LOWER RIVER
RD. APPROX. 500 FEET
NORTHWEST OF THE MAIN OFFICE

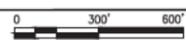


SYMBOLS	LEGEND	DESCRIPTION	PROTECTIVE ELEMENTS
		DRY CHEMICAL EXTINGUISHER - ABC TYPE	
		DRY CHEMICAL EXTINGUISHER - ABC TYPE - WHEELED	
		ILLUMINATED EXIT SIGN	
		EMERGENCY LIGHT - BATTERY POWERED	
		EMERGENCY LIGHT - BATTERY POWERED - EXPLOSION PROOF	
		COMBINED BATTERY POWERED EMERGENCY LIGHT AND ILLUMINATED EXIT SIGN	
		EYE WASH STATION - HEATED	
		EYE WASH STATION - PORTABLE	
		EXIT - EXTERIOR	
$\frac{#/\#}{\#}$		ACCUMULATED EXIT WIDTH AT REQUIRED EXIT (CLEAR WIDTH)	OCCUPANTS / REQUIRED WIDTH PROVIDED WIDTH (BASED ON MOST RESTRICTIVE EXIT COMPONENT)
		2 HOUR FIRE BARRIER	
		3 HOUR FIRE BARRIER	
		MUSTER POINT	
		GAS DETECTOR	GAS DETECTOR SETTINGS: CH4: LOW/10%LEL HIGH/30%LEL H2S: LOW/10ppm HIGH/15ppm O2: LOW/19% HIGH/24%
		SMOKE DETECTOR	
		HORN/STROBE	
		FOAM RELEASE MANUAL SWITCH	

Note: Final drawings will include locations of windsocks, first aid kits, automated external defibrillators, and spill response materials.

- GENERAL NOTES:**
- THESE DRAWINGS ARE CONCEPTUAL IN NATURE AND ARE ONLY MEANT TO SHOW THE DESIGN INTENT.
 - THE EQUIPMENT PLACEMENT SHOWN IS FOR DIAGRAMMATIC PURPOSES ONLY. THE ENGINEER RESPONSIBLE FOR THE INSTALLATION SHALL MAKE ANY FINAL DETERMINATIONS ON DEVIATIONS FROM THIS LAYOUT.
 - ALL EQUIPMENT TO BE INSTALLED SHALL BE IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE (2012), INTERNATIONAL FIRE CODE (2012), NFPA 10 (2010), NFPA 30 (2012), ANSI Z358.1 (2009), AND OTHER APPLICABLE CODES AND STANDARDS, OR AS REQUIRED BY THE "AHJ".
 - EXTINGUISHERS LOCATED IN E-HOUSES ARE ALLOWED TO BE CO₂.
 - FIRE EXTINGUISHERS LOCATED OUTSIDE OR EXPOSED TO WEATHER SHALL BE PROTECTED BY AN ENCLOSURE OR PROTECTIVE COVER.

1 LIFE SAFETY SITE PLAN
SCALE: 1" = 300'



Poole Fire Protection
19910 West 161st Street
Olathe, KS 66062
www.poolefire.com
913.829.8650 office ▲ 913.829.8690 fax



**PERMIT SET
NOT FOR CONSTRUCTION**

NO.	DATE	REVISION	BY	CK'D	APP

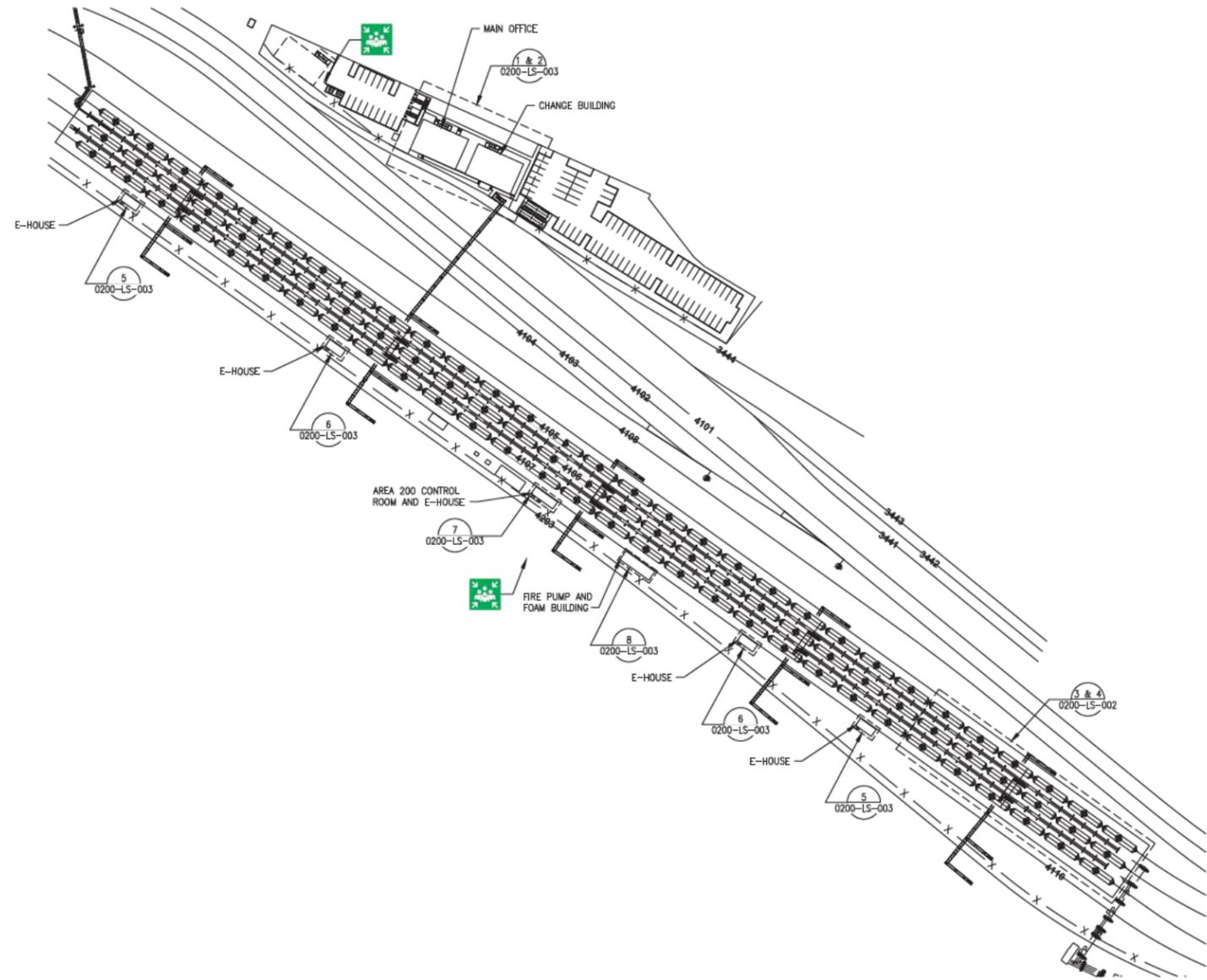
700 NE Multnomah Street, Suite 900
Portland, Oregon 97232-4189
(503) 872-4100 FAX: (503) 872-4101

Tesoro Savage Petroleum Terminal LLC

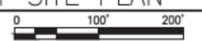
PROJECT: TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
PORT OF VANCOUVER, WASHINGTON

DESCRIPTION: LIFE SAFETY SITE PLAN

DESIGN: R. BENNETT	START DATE: 3/31/2014	SCALE: AS NOTED
DRAWN: D. FLAGOR	PRINT DATE: 04-30-2015	PROJECT MANAGER: L. POOLE
CHECKED: J. POOLE	APPROVED: J. POOLE	SIZE: 24x36
DRAWING NUMBER: 0100-LS-001		SHEET: 1
		REV: A



1 AREA 200 - LIFE SAFETY SITE PLAN
 SCALE: 1" = 100'



Poole Fire Protection
 19910 West 161st Street
 Olathe, KS 66062
 www.poolefire.com
 913.829.8650 office ▲ 913.829.8690 fax



PERMIT SET
NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	CK'D	APP

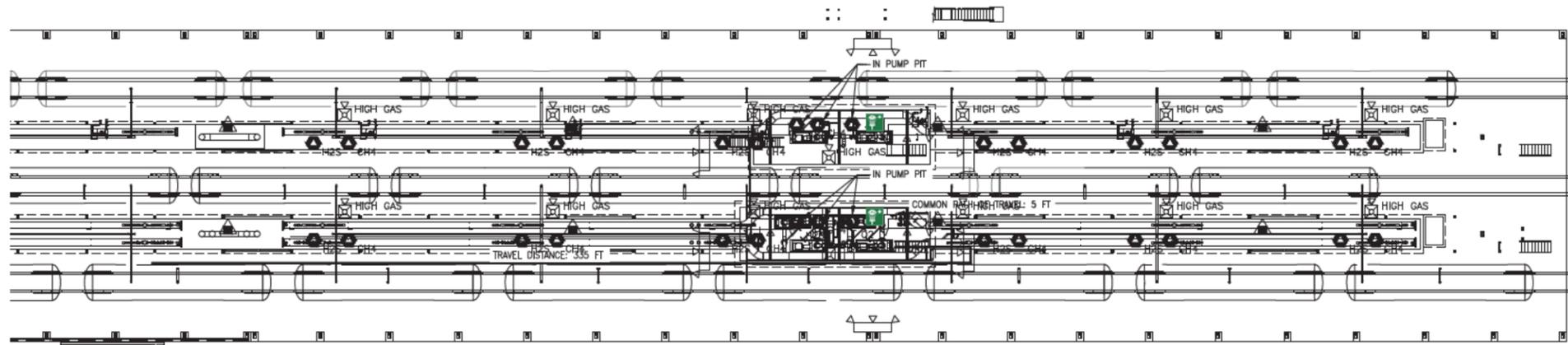
700 NE Multnomah Street, Suite 900
 Portland, Oregon 97232-4189
 (503) 872-4100 FAX: (503) 872-4101

Tesoro Savage Petroleum Terminal LLC

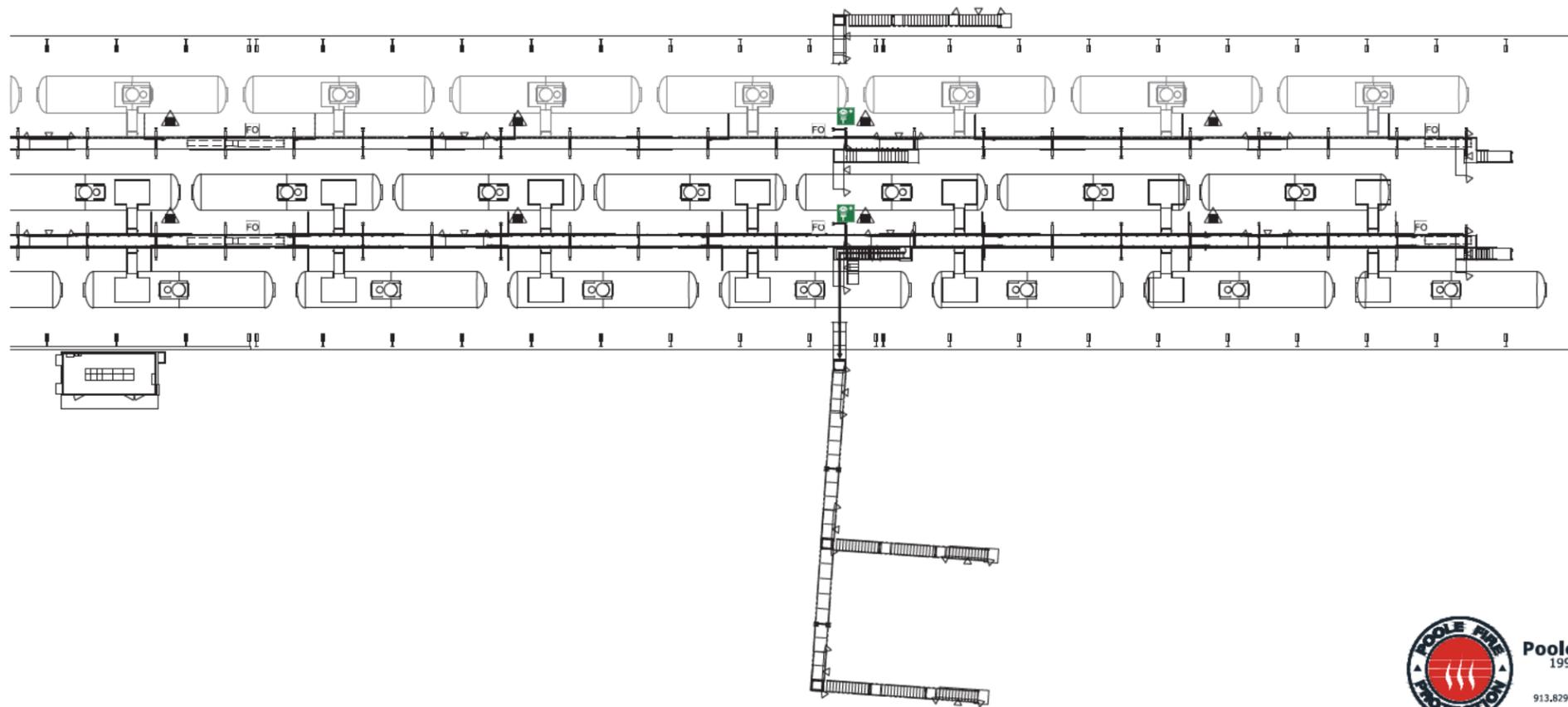
PROJECT:
 TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
 PORT OF VANCOUVER, WASHINGTON

DESCRIPTION:
 AREA 200 - LIFE SAFETY SITE PLAN

DESIGN:	R. BENNETT	START DATE:	3/30/2015	SCALE:	AS NOTED
DRAWN:	D. FLAGOR	PRINT DATE:	04-30-2015	PROJECT MANAGER:	L. POOLE
CHECKED:	J. POOLE	APPROVED:	J. POOLE	SIZE:	24x36
DRAWING NUMBER				SHEET	REV.
0200-LS-001				1/1	A



3 AREA 200 - TYPICAL LIFE SAFETY UNLOADING BUILDING PLAN @ T/RAIL EL 32'-6"



4 AREA 200 - TYPICAL LIFE SAFETY UNLOADING BUILDING PLAN @ EL 57'-8"



Poole Fire Protection
 19910 West 161st Street
 Olathe, KS 66062
 www.poolefire.com
 913.829.8650 office ▲ 913.829.8690 fax



PERMIT SET
NOT FOR CONSTRUCTION

NO.	DATE	REVISION	BY	CK'D	APP

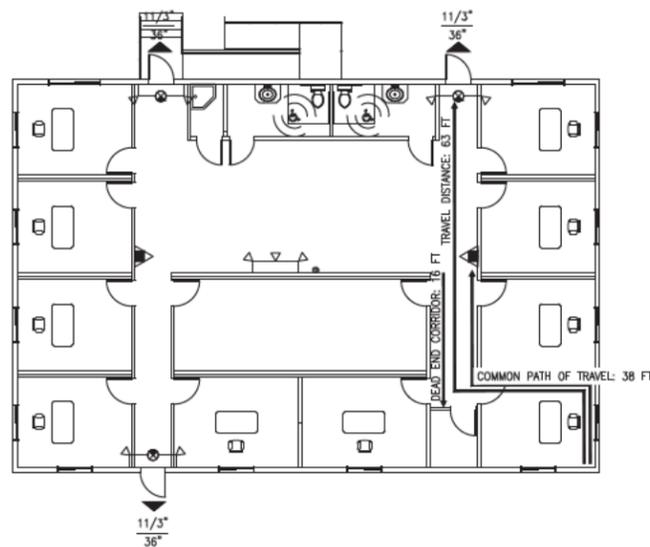
700 NE Multnomah Street, Suite 900
 Portland, Oregon 97232-4189
 (503) 872-4100 FAX: (503) 872-4101

Tesoro Savage Petroleum Terminal LLC

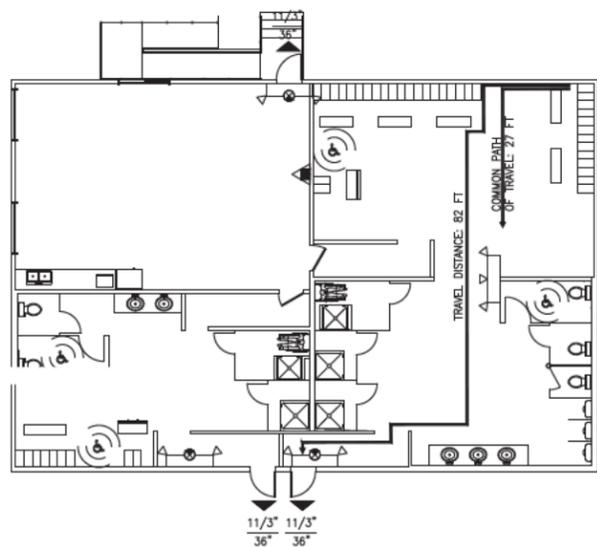
PROJECT:
 TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
 PORT OF VANCOUVER, WASHINGTON

DESCRIPTION:
 AREA 200 - TYPICAL LIFE SAFETY UNLOADING BUILDING PLANS

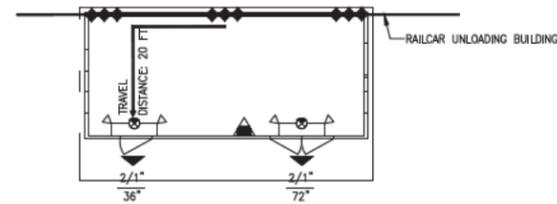
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DRAWN:	D. FLAGOR	PRINT DATE:	04-30-2015	PROJECT MANAGER:	L. POOLE
CHECKED:	J. POOLE	APPROVED:	J. POOLE	SIZE:	24x36
DRAWING NUMBER				SHEET	REV.
0200-LS-002				1	A



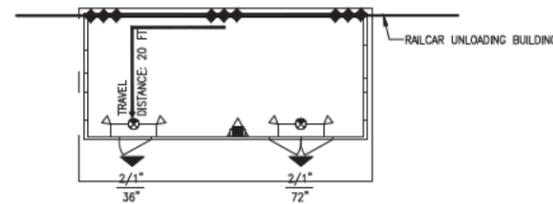
1 AREA 200 - LIFE SAFETY OFFICE BUILDING PLAN
SCALE: 1" = 10'



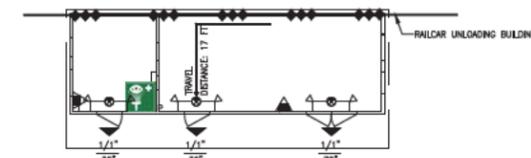
2 AREA 200 - LIFE SAFETY CHANGE BUILDING PLAN
SCALE: 1" = 10'



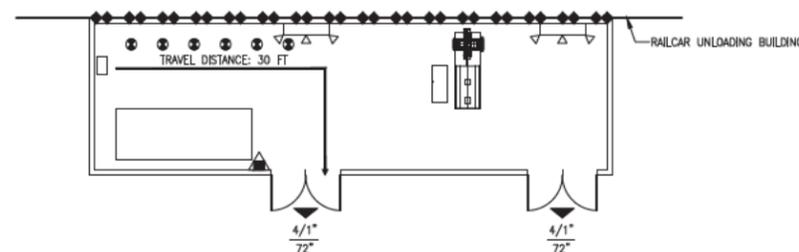
5 AREA 200 - LIFE SAFETY E-HOUSE 1 & 5 PLAN
SCALE: 1/8" = 1'-0"



6 AREA 200 - LIFE SAFETY E-HOUSE 2 & 4 PLAN
SCALE: 1/8" = 1'-0"



7 AREA 200 - LIFE SAFETY CONTROL ROOM/E-HOUSE 3 PLAN
SCALE: 1/8" = 1'-0"



8 AREA 200 - LIFE SAFETY FIRE PUMP AND FOAM BUILDING PLAN
SCALE: 1/8" = 1'-0"



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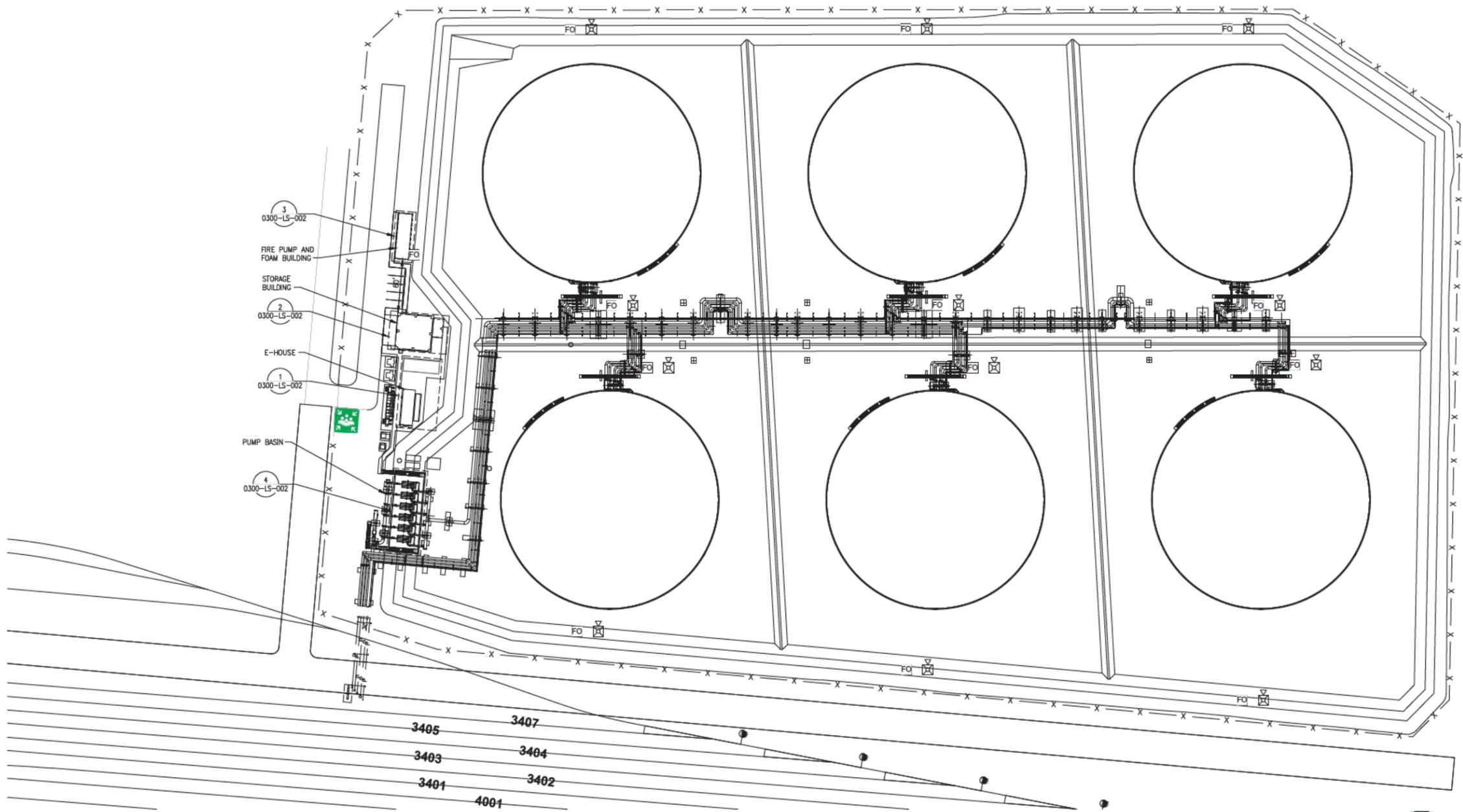
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Portland, Oregon 97232-4189
(503) 872-4100 FAX: (503) 872-4101

VANCOUVER ENERGY
Tesoro Savage Petroleum Terminal LLC

PROJECT:
TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
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AREA 200 - LIFE SAFETY PLANS

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CHECKED: J. POOLE	APPROVED: J. POOLE	SIZE: 24x36
DRAWING NUMBER		SHEET
0200-LS-003		1
		REV. A



1 AREA 300 - LIFE SAFETY SITE PLAN
 SCALE: 1" = 60'
 0 60' 120'



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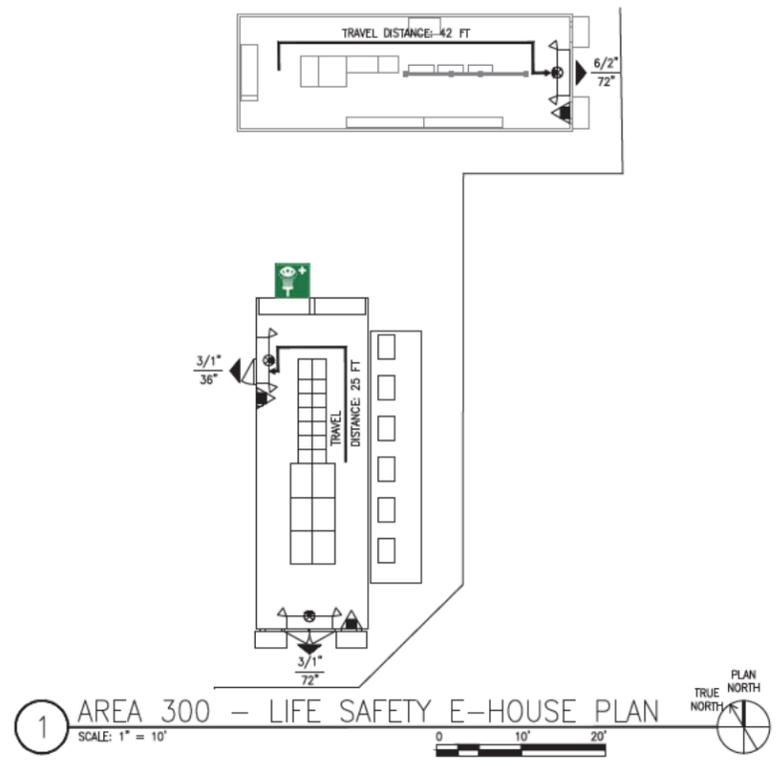
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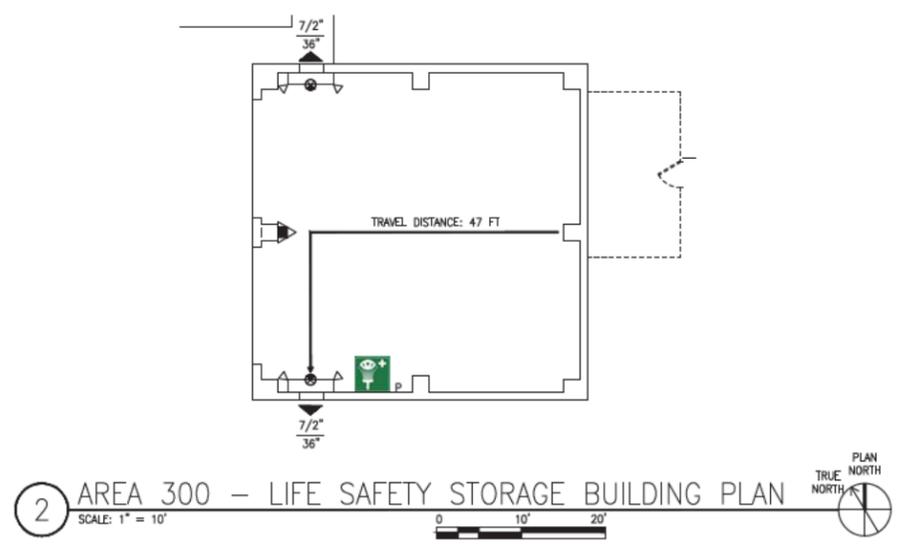
VANCOUVER ENERGY
 Tesoro Savage Petroleum Terminal LLC

PROJECT: TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
 PORT OF VANCOUVER, WASHINGTON
 DESCRIPTION: AREA 300 - LIFE SAFETY SITE PLAN

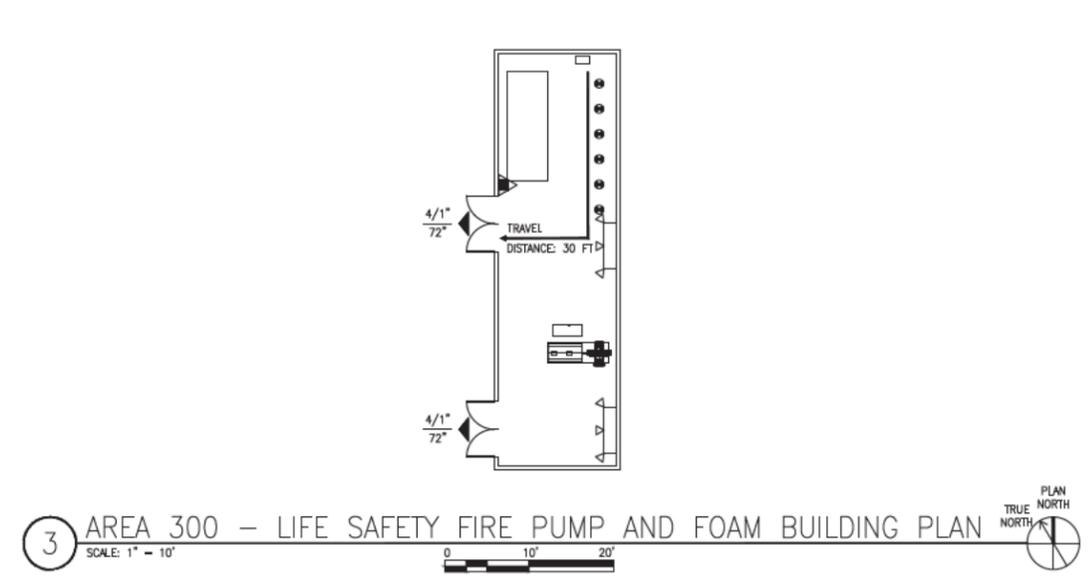
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		REV: A



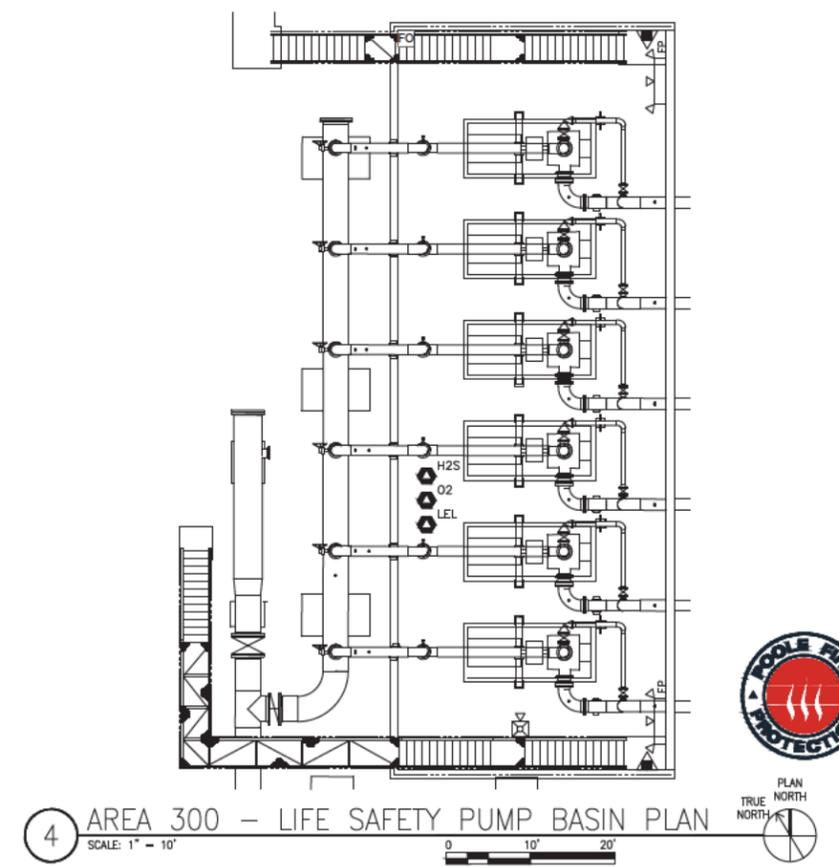
1 AREA 300 - LIFE SAFETY E-HOUSE PLAN
SCALE: 1" = 10'



2 AREA 300 - LIFE SAFETY STORAGE BUILDING PLAN
SCALE: 1" = 10'



3 AREA 300 - LIFE SAFETY FIRE PUMP AND FOAM BUILDING PLAN
SCALE: 1" = 10'



4 AREA 300 - LIFE SAFETY PUMP BASIN PLAN
SCALE: 1" = 10'

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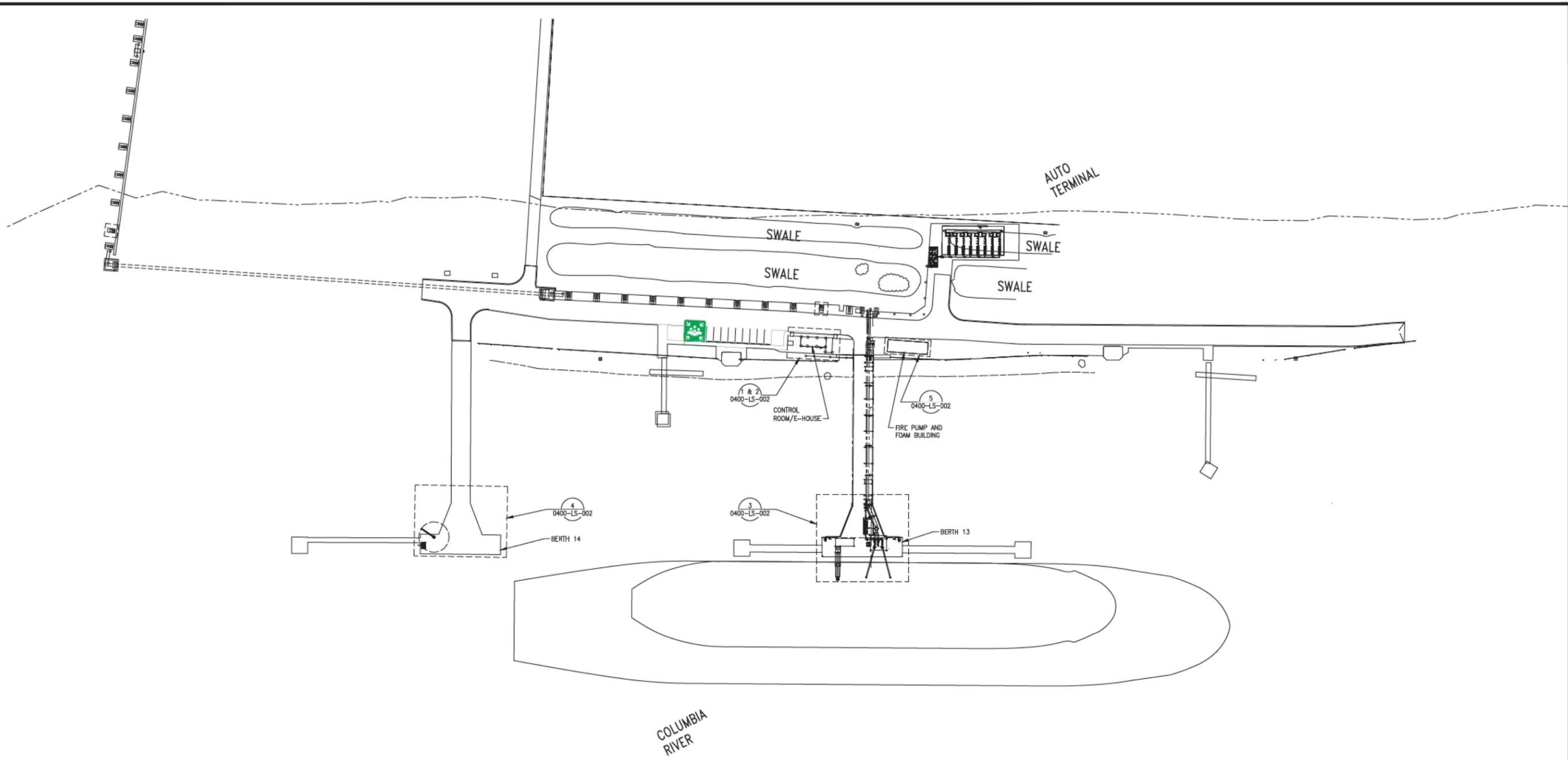
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Portland, Oregon 97232-4189
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CHECKED:	J. POOLE	APPROVED:	J. POOLE	SIZE:	24x36
DRAWING NUMBER				SHEET	REV.
0300-LS-002				1/1	A



1 AREA 400 - LIFE SAFETY SITE PLAN
 SCALE: 1" = 60'
 0 60' 120'



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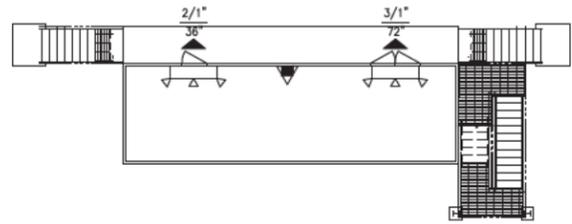
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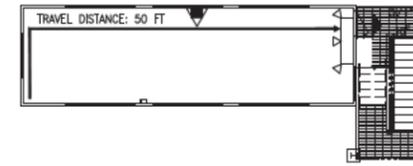
PROJECT: TESORO SAVEAG VANCOUVER ENERGY DISTRIBUTION TERMINAL
 PORT OF VANCOUVER, WASHINGTON

DESCRIPTION:
 AREA 400 - LIFE SAFETY SITE PLAN

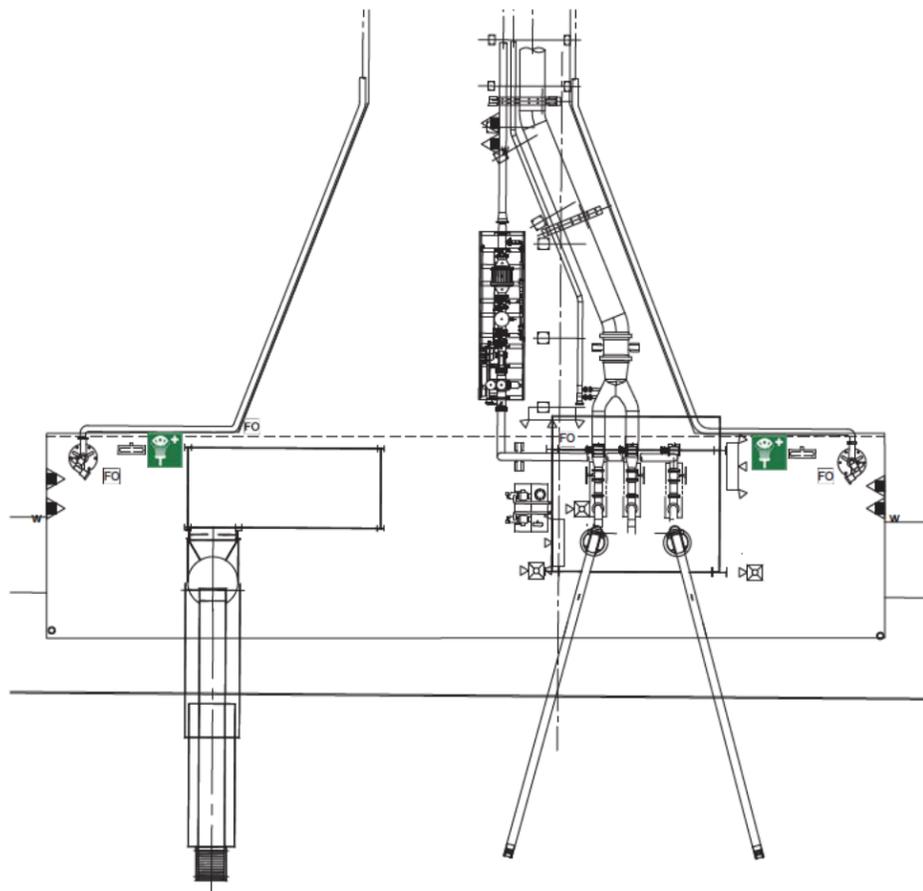
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CHECKED: J. POOLE	APPROVED: J. POOLE	SIZE: 24x36
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		REV: A



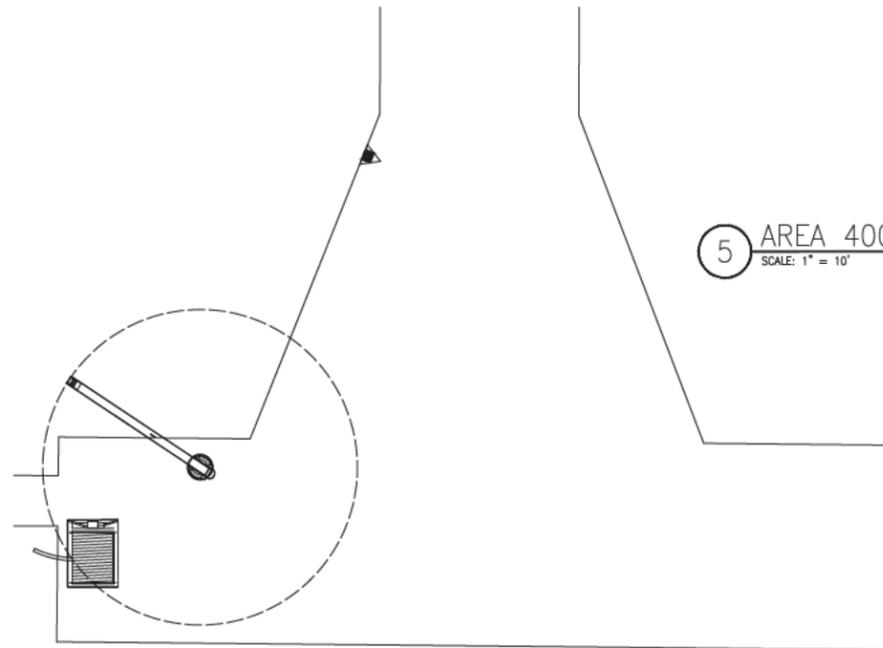
1 AREA 400 – LIFE SAFETY CONTROL ROOM/E-HOUSE BOTTOM FLOOR PLAN
SCALE: 1" = 10'



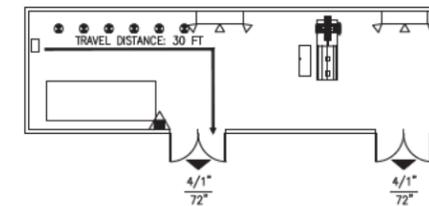
2 AREA 400 – LIFE SAFETY CONTROL ROOM/E-HOUSE UPPER FLOOR PLAN
SCALE: 1" = 10'



3 AREA 400 – LIFE SAFETY BERTH 13 PLAN
SCALE: 1" = 10'



4 AREA 400 – LIFE SAFETY BERTH 14 PLAN
SCALE: 1" = 10'



5 AREA 400 – LIFE SAFETY FIRE PUMP AND FOAM BUILDING PLAN
SCALE: 1" = 10'



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0400-LS-002				1	A

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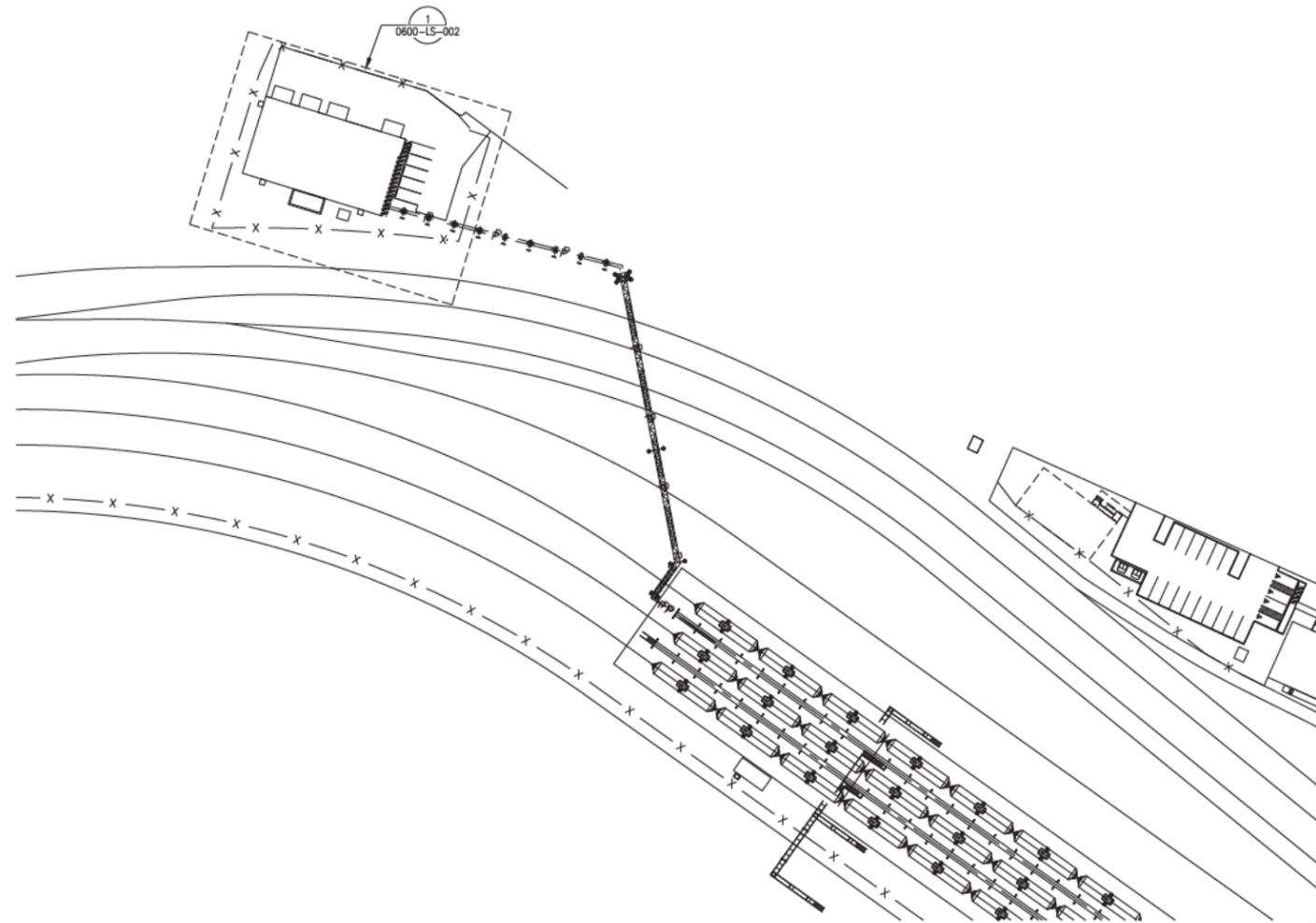
5

6

7

8

9



1 AREA 600 - LIFE SAFETY SITE PLAN
 SCALE: 1" = 60'



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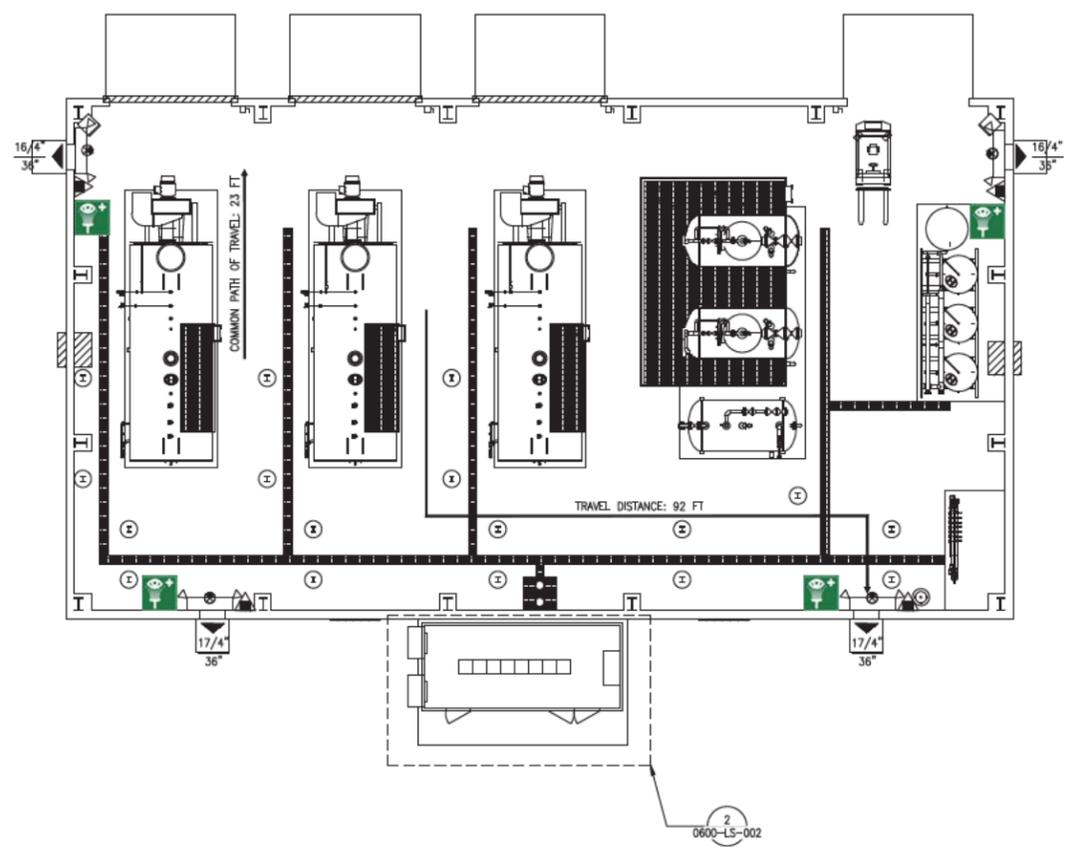
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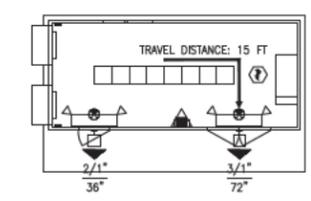
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 AREA 600 - LIFE SAFETY SITE PLAN

DESIGN:	R. BENNETT	START DATE:	3/30/2015	SCALE:	AS NOTED
DRAWN:	D. FLAGOR	PRINT DATE:	04-30-2015	PROJECT MANAGER:	L. POOLE
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0600-LS-001				1/1	A



EVACUATE TO AREA 200 ASSEMBLY AREA

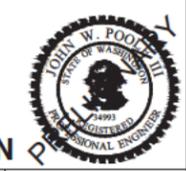
1 AREA 600 - LIFE SAFETY BOILER HOUSE PLAN
 SCALE: 1" = 10'
 0 10' 20'



2 AREA 600 - LIFE SAFETY E-HOUSE PLAN
 SCALE: 1/8" = 1'-0"
 0 4' 8' 16'



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DRAWING NUMBER: 0600-LS-002		SHEET: 1
		REV. A

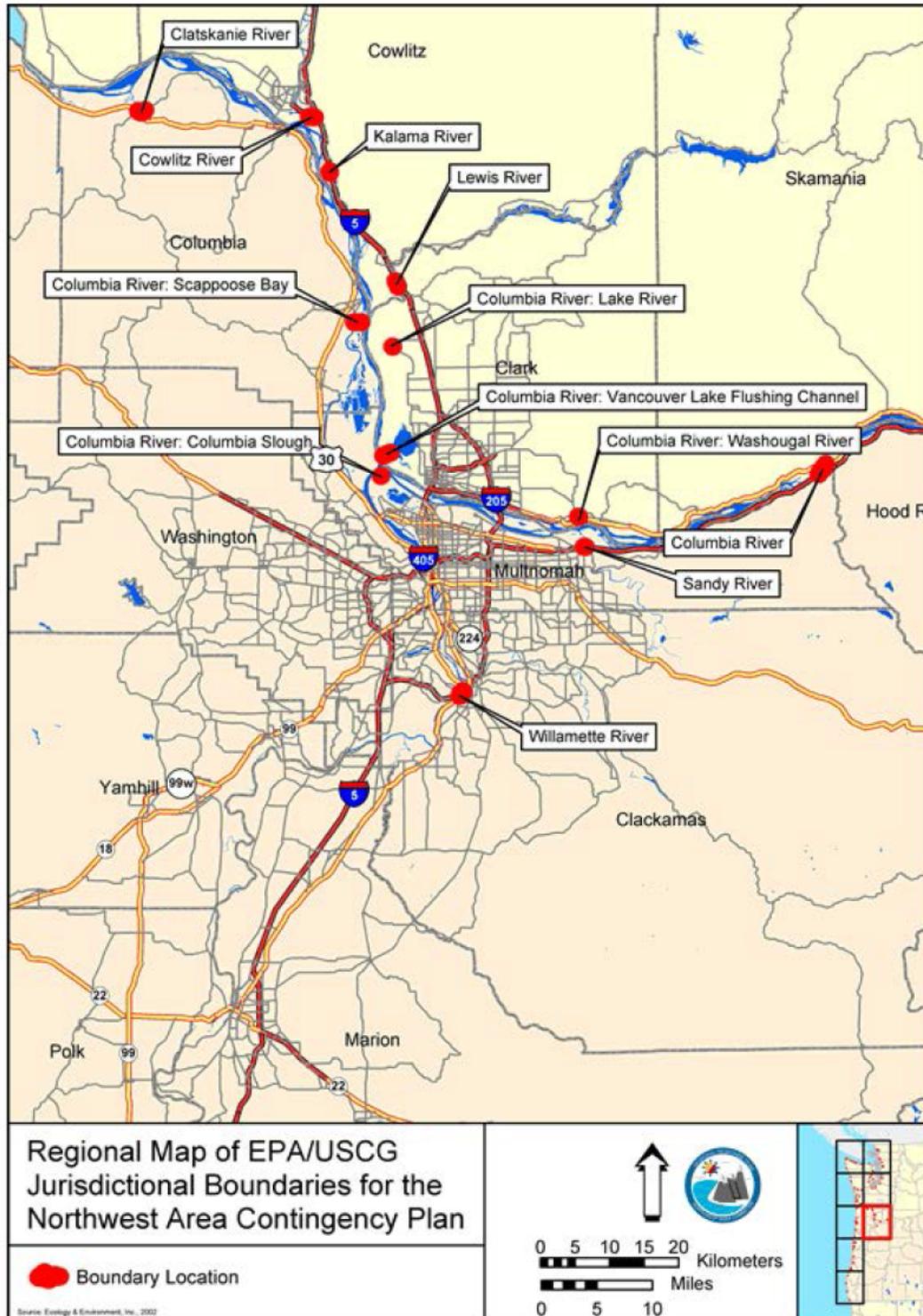
Vancouver Energy
Operations Facility Oil Handling Manual
EFSEC Application for Site Certification No. 2013-01
Docket No. EF131590



Appendix B
USCG Jurisdiction Map



Appendix B USCG Jurisdiction Map



Vancouver Energy Operations Facility Oil Handling Manual			
Document No.	Original Issue Date	Revision Date	Issuing Authority
OP.05	2015-06-26		K. Flint

Page B-1 of B-1

Vancouver Energy
Operations Facility Oil Handling Manual
EFSEC Application for Site Certification No. 2013-01
Docket No. EF131590



Appendix C
Material Safety Data Sheets

Material Safety Data Sheet



1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

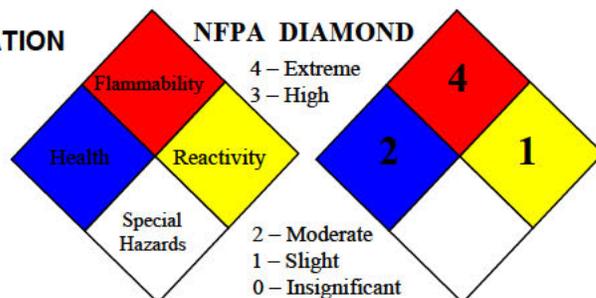
Manufacturer/Supplier: Enbridge Pipelines Inc.
10201- Jasper Avenue
Edmonton, Alberta T5J 3N7
CANADA

Product Name: Bakken Crude Oil
Synonyms: Hydrocarbons of Petroleum

General Information: 780-420-5306

Emergency Telephone Number (24 hrs): CHEMTREC 800-424-9300 USA
CANUTEC 613-996-6666 Canada

Date Prepared: 06/08/2011



2 – PRODUCT COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	Normal % * by Wt./Vol.	Occupational Exposure Limits (ppm)		
			OSHA	ACGIH	NIOSH
Petroleum Hydrocarbons	68919-39-1	100	N/A	N/A	N/A
1t,2-dimethylcyclopentane	28729-52-4	1.8	None	None	None
2-methylhexane	591-76-4	1.0	None	None	None
2-methylpentane	107-83-5	1.8	None	500	100
3-methylhexane	589-34-4	1.6	None	None	None
3-methylpentane	96-14-0	1.3	None	500	100
2-methylheptane	592-27-8	1.4	None	300	None
Benzene	71-43-2	0.4	1	0.5	0.1
cyclohexane	110-82-7	1.0	300	100	300
i-pentane	109-66-0	1.8	1000	600	120
methylcyclohexane	108-87-2	2.3	500	400	400
methylcyclopentane	96-37-7	2.2	None	None	None
n-butane	106-97-8	1.9	800	1000	800
n-heptane	142-82-5	3.4	500	400	85
n-Hexane	110-54-3	3.4	50	50	50
n-Pentane	109-66-0	3.4	600	600	120
n-octane	111-65-9	3.0	500	300	75

n-nonane	111-84-2	2.2	None	200	200
n-decane	124-18-5	2.0	None	None	None
n-undecane	1120-21-4	1.7	None	None	None
n-dodecane	112-40-3	1.5	None	None	None
n-tridecane	629-50-5	1.3	None	None	None
Toluene	108-88-3	0.9	100	20	100
Hydrogen sulfide	7783-06-4	<0.00001	20 ^{Ceiling}	1	10 ^{Ceiling}
Ethylbenzene	100-41-4	0.6	100	20	100
Xylenes	1330-20-7	0-5	100	100	100

* Values do not reflect absolute minimums and maximums; those values may vary from time to time.

N/A - Not Available

3 – HAZARDS IDENTIFICATION

Flammability: Flammable liquid and vapor. Keep away from heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, mechanical/electrical equipment).
HMIS Classification for Flammability: 4

Stability: Stable under normal conditions. Avoid all sources of ignition.
HMIS Classification for Reactivity: 1

Potential Health Effects from Overexposure

Acute Effects:

Ingestion: Ingestion may result in nausea, vomiting, diarrhea and central nervous system depression. Aspiration of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema/hemorrhage and even death.

Skin Contact: Prolonged and repeated contact may cause defatting and drying of the skin and can lead to irritation and/or dermatitis.

Eye Contact: Liquid or vapor contact may cause mild eye irritation, including stinging, watering, redness and swelling. Hydrogen sulfide (H₂S) may cause burning or tearing and visual disturbances at repeated exposures above the TLV.

Inhalation: Prolonged or excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract and may lead to headache, nausea, drowsiness, fatigue, pneumonitis, pulmonary edema, CNS depression, coma and respiratory arrest.

Chronic Health Effects from Overexposures:

Skin and eye irritation. May affect the respiratory and central nervous systems.

Special Toxic Effects:

n-Hexane (CAS 110-54-3)

Target Organs – Excess exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesia of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene (CAS 71-43-2)

Carcinogenicity: Benzene is a known animal carcinogen and is known to produce leukemia in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

4 – FIRST AID MEASURES

Ingestion: Aspiration hazard. Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe damage. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration.

Skin Contact: Wipe material from skin and remove contaminated clothing. Cleanse affected areas thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops, seek medical attention.

Eye Contact: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water for 15 minutes, with eyelids held open. If symptoms persist, seek medical attention.

Inhalation: If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias.

5 – Exposure Controls/ Personal Protection

Eye Protection: Safety glasses or goggles are recommended when there is a possibility of splashing or spraying.

Skin Protection: The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. Depending on conditions, the use of an apron or chemical protective clothing may be necessary.

Respiratory Protection: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations of hydrocarbons are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators

may not provide adequate protection. A respiratory protection program that meets US OSHA's 29 CFR 1910.134, Canadian Labour Code Part II and ANSI Z88.2 requirements must be followed when workplace conditions warrant a respirator's use.

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

6 – FIRE FIGHTING MEASURES

Flash Point:	< 40 °C	Lower Explosive Limit:	Not Established
Auto Ignition Temperature:	Not data available	Upper Explosive Limit:	Not Established

Basic Fire Fighting Procedures: Long-duration fires involving diluent stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11). For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant. Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

Extinguishing Media: Any extinguisher capable of handling Class B fires is recommended, including extinguishing media such as CO₂, dry chemical or foam. Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Firefighting should be attempted only by those who are adequately trained and equipped with proper personal protective equipment.

Unusual Fire and Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flashback or explode. May create vapor/air explosion hazard indoors, outdoors or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

7 – ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources.

Spill management: Wear appropriate breathing apparatus (if applicable) and protective clothing. A vapor suppressing foam may be used to reduce vapors. Try to work upwind of spill. Dike and contain land spills; contain water spills by booming. For large spills remove by mechanical means such as vacuuming or pumping and place in containers. All equipment used when

handling the product must be grounded. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. Do not wash spills into sewers or other public water systems.

Reporting: Report spills to local or federal authorities as appropriate or required.

8 – HANDLING AND STORAGE

The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.

Use appropriate grounding and bonding practices. Stores in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues.

Harmful concentrations of hydrogen sulfide (H₂S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before uploading.

Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear to brown liquid
Physical Form:	Liquid
Substance type (Pure/Mixture):	Mixture
Boiling Temperature:	94 to 1330 °F
Melting Temperature:	Not determined
Vapor Pressure:	about 7.47 psi
Vapor Density:	1.0 - 3.9
Evaporation Rate:	(Ethyl ether =1) >1
Specific Gravity:	0.82
Water Solubility:	Negligible
pH:	Not determined
Viscosity:	5.43 mm ² /s
Color:	Clear to brown
Odor:	Rotten egg, petroleum like odor

10 – STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity.
CHEMICAL STABILITY:	Stable at 70 °F, 760 mmHg pressure.
HAZARDOUS DECOMPOSITION PRODUCTS:	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.
HAZARDOUS POLYMERIZATION:	Will not occur
INCOMPATIBILITY:	Strong oxidizers such as nitrates, chlorates, peroxides.

11 – TOXICOLOGICAL INFORMATION– CHRONIC AND ACUTE HEALTH HAZARDS

This product contains aliphatic naphthas at a level of >0.1%. Lifetime skin painting studies in mice with similar naphthas have shown wither negative or very weak dermal carcinogenic activity following prolonged and repeated skin contact. Some other petroleum fractions that show carcinogenic activity when tested at nonirritating dose levels did not show any significant carcinogenic activity indicating that this tumorigenic response is likely related to chronic irritation and not dose. Some components of aliphatic naphthas, i.e., paraffins and olefins, have been shown to produce a species specific, sex hormonal dependent kidney damage develops via the formation of alpha-2u-globulin, a mechanism unique to the male rat. Humans do not for alpha-2u-globulin; therefore, the kidney effects resulting from this mechanism are not relevant in humans.

This product contains benzene at a level of 0.1%. Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen sulfide gas (H₂S) is toxic by inhalation. Prolonged breathing of 50-100 ppm H₂S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H₂S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H₂S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H₂S, respectively. Over the years a number of acute cases of H₂S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

This product may contain xylenes at a level of >1.0%. Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals. Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

12 – DISPOSAL INFORMATION

Container contents should be completely used and containers should be emptied prior to discard. Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities. This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law

requires disposal at a licensed hazardous waste disposal facility. This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

13 – ENVIRONMENTAL INFORMATION

Spill or Release to the Environment: Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Product may release large amounts of flammable vapors (e.g., methane, ethane and propane) at or below ambient temperature depending on source and process conditions. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory equipment as conditions warrant. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state (provincial) and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount into navigable waters, notify appropriate federal, state (provincial) and local agencies.

Sara Title III Information: This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Toluene	CAS – 108-88-3	Weight % - 0 – 2%
n-Hexane	CAS – 110-54-3	Weight % - up to 11%
Benzene	CAS – 71-43-2	Weight % - 0 – 2%

14 – REGULATORY INFORMATION

USA: All of the components of this product are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

Canada: All the components of this product are on the Canadian Domestic Substances List (DSL), or have been notified under the New Substances Notification Regulations, but have not yet been published in the Canada Gazette.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Classification: Class B2 Flammable Liquids
 Class D2B Other Toxic Effects - Skin Irritant
 Class D2A Other Toxic Effects – Embryotoxic/Fetotoxic

US EPA Reportable Quantity: The estimated reportable quantity (RQ) for this material is based on the weight % shown below:

RQ based on benzene – The RQ for benzene is 10 pounds, which equals 3,333 pounds of natural gas condensate (556 gallons). The RQ is based on 0.3 wt. % benzene.

RQ based on n-Hexane – The RQ for n-Hexane is 5000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 10 wt. % n-Hexane.

RQ based on toluene – The RQ for toluene is 1000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 2 wt. % toluene.

15 – SPECIAL PRECAUTIONS / SUPPLEMENTAL INFORMATION

Keep containers tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area “No Smoking or Open Flame”. Store only in approved containers. Keep away from any incompatible material. Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet US OSHA standards, Canadian Labour Codes and other appropriate fire codes.

Depending on the source of natural gas condensate, there could be some amount of NORM (naturally occurring radioactive materials) in the scale, deposit and sludge associated with this material. Proper measurements should be taken prior to handling this material or any equipment contaminated with this material. If NORM is indicated, refer to API Bulletin E2, “Bulletin on Management of Naturally Occurring Radioactive Materials in Oil and Gas Production,” for additional information.

Empty Containers: “Empty” containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks or other sources of ignition. They may explode and cause injury or death. “Empty” drums should be completely drained, properly bunged and promptly shipped to the supplier or a drum re-conditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other governmental and industrial references pertaining to cleaning, repairing, welding or other contemplated operations.

16 – TRANSPORTATION REQUIREMENTS

General Transportation Information:

DOT Proper Shipping Name (49 CFR 172.101):	Petroleum Crude Oil
DOT Hazard Classes (49 CFR 172.101):	3
UN/NA Code (49 CFR 172.101):	UN1267
Packing Group (49 CFR 172.101):	II
Bill of Lading Description (49 CFR 172.202):	Petroleum Crude Oil
DOT Labels Required (49 CFR 172.101):	Flammable Liquid

Please note that the actual shipping name and associated data can vary due to the properties of the product. Other acceptable shipping names may include Petroleum Distillate n.o.s. 1268, Gasoline UN1203, Flammable liquids, n.o.s. (pentane) UN1993 or Hydrocarbons, Liquid n.o.s. (condensate) UN3295.

PREPARED BY: Enbridge Pipelines Inc.

Disclaimer

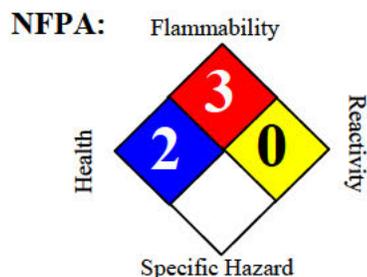
The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet (MSDS). However, MSDS's may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ASTM	American Society for Testing and Materials
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
HMIS	Hazardous Materials Identification System
IARC	International Agency for Research on Cancer
m ³	Cubic meter
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
n.o.s.	Not Otherwise Specified
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
REL	Recommended Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average

Safety Data Sheet

Crude Oil



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Crude Oil			
Synonyms	:	Sour Crude Oil, Sweet Crude Oil, Light Crude Oil, Heavy Crude Oil, Generic Crude Oil, 888100008800			
SDS Number	:	888100008800	Version	:	1.7
Product Use Description	:	Refining feedstock			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	Chemtrec	:	(800) 424-9300
			(Emergency Contact)		

SECTION 2. HAZARDS IDENTIFICATION

Classifications	<p>Flammable Liquid – Category 2 or 3 depending on variable composition. Aspiration Hazard – Category 1. Carcinogenicity – Category 2 Specific Target Organ Toxicity (Repeated Exposure) – Category 2 Specific Target Organ Toxicity (Single Exposure) – Category 3 Eye Irritant – Category 2B Chronic Aquatic Toxicity – Category 2</p>
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Pictograms



Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor.
 May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
 Suspected of causing cancer if repeated over-exposure by inhalation and/or skin contact occurs.
 May cause damage to liver, kidneys and nervous system by prolonged and repeated inhalation or skin contact.
 Causes eye irritation. Can be absorbed through skin.

Repeated or prolonged skin contact can cause irritation and dermatitis.
 May cause drowsiness or dizziness.
 Harmful to aquatic life.
 May release hydrogen sulfide (H₂S) gas, a toxic-by-inhalation material. See Section 11.

Precautionary statements

Prevention

Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Keep away from heat, sparks, open flames, welding and hot surfaces.
 No smoking.
 Keep container tightly closed.
 Ground and/or bond container and receiving equipment.
 Use explosion-proof electrical equipment.
 Use only non-sparking tools (if tools are used in flammable atmosphere).
 Take precautionary measures against static discharge.
 Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
 Wash hands or liquid-contacted skin thoroughly after handling.
 Do not eat, drink or smoke when using this product.
 Do not breathe vapors.
 Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO₂, water spray or fire-fighting foam to extinguish.
 If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 If skin or eye irritation persists, get medical attention.
 If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

Store in a well-ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Petroleum; Crude oil	8002-05-9	100%
N-hexane	110-54-3	0 - 1.5%
Hydrogen Sulfide	7783-06-4	Variable

Sulfur	7704-34-9	Trace - 5%
Benzene	71-43-2	0.1 - 3%
Cumene	98-82-8	Variable Trace < 1%
Naphthalene	91-20-3	Variable Trace < 1%
Xylene	1330-20-7	Variable Trace < 1%
Ethylbenzene	100-41-4	Variable Trace < 1%
Polycyclic Aromatic Compounds		Variable
Toluene	108-88-3	Variable Trace < 1%

SECTION 4. FIRST AID MEASURES

Inhalation	: Move to fresh air. Administer oxygen or artificial respiration if needed. Seek medical attention immediately.
Skin contact	: Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Seek medical attention if irritation or skin thermal burns occur.
Eye contact	: In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek medical attention immediately.
Ingestion	: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray, fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
Specific hazards during fire fighting	: Vapors are heavier than air and may travel long distances to a point of ignition and flash back. Do not allow liquid runoff to enter sewers or public waters. Gas may form explosive mixture with air.
Special protective equipment for fire-fighters	: Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus and fully protective clothing such as bunker gear if needed to prevent exposure.
Further information	: Isolate area, particularly around ends of storage vessels. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions** : Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
- Environmental precautions** : Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors.
- Methods for cleaning up** : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

- Precautions for safe handling** : Handle as a combustible liquid. Keep product and empty containers away from fire, sparks and heated surfaces. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.
- Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure Guidelines**

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_AL	0.5 ppm
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
	Hydrogen sulfide	7783-06-4	STEL	20 ppm
	Cumene	98-82-8	TWA	50 ppm
	Ethylbenzene	100-4-4	TWA	100 ppm
	Naphthalene	91-20-3	TWA	10 ppm
	Toluene	108-88-3	TWA	200 ppm
	Xylenes	1330-20-7	TWA	100 ppm

			Ceiling	300 ppm
	Polycyclic Aromatic Compound (Benzene Soluble)		TWA	0.2 mg/m ³
ACGIH	N-hexane	110-54-3	TWA	50 ppm
	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Cumene	98-82-8	TWA	50 ppm
	Ethylbenzene	100-4-4	TWA	50 ppm
		100-4-4	STEL	125 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Toluene	108-88-3	TWA	20 ppm
	Xylenes	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Polycyclic Aromatic Compound (Benzene Soluble)		TWA	0.2 mg/m ³

Engineering measures	: Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.
Eye protection	: Ensure that eyewash stations and safety showers are close to the workstation location. Goggles, and face shield or full facepiece pressure-demand supplied air respirator as needed to prevent eye and face contact.
Hand protection	: Gloves constructed of nitrile, neoprene, or PVC are recommended. The resistance of specific material may vary from product to product as well as with degree of exposure.
Skin and body protection	: Chemical protective clothing such as DuPont TyChem®, Barricade or equivalent, recommended based on degree of exposure.
Respiratory protection	: A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Hygiene measures : Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners to clean skin. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to discard contaminated leather shoes and gloves. Use good personal hygiene practices.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Typical is a thick, dark yellow to brown or greenish black liquid
Odor	Petroleum asphalt odor. Hydrogen sulfide (H ₂ S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H ₂ S can deaden the sense of smell. H ₂ S concentrations can be measured with an H ₂ S meter or colorimetric indicating tubes.
Odor threshold	Odor threshold varies with the composition of the crude oil
pH	Not applicable
Melting point/freezing point	-30° to 30°C has been reported as a pour point
Initial boiling point & range	Distillation is typically not performed above 300°C at atmospheric pressure
Flash point	-7 to 75°C
Evaporation rate	Higher initially and declines if lighter components evaporate
Flammability (solid, gas)	Flammable gas or vapors released by liquid
Upper explosive limit	Varies with composition but typical is approximately 7%
Lower explosive limit	Varies with composition but typical is approximately 0.7%
Vapor pressure	6 to 45 kPa
Vapor density (air = 1)	No data available
Relative density (water = 1)	0.8 to 1.0 g/mL is typical at 15°C
Solubility (in water)	1 to 2% by weight is maximum reported for soluble components of crude oil
Partition coefficient (n-octanol/water)	2 to > 6 as log Pow
Auto-ignition temperature	Varies with composition
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs
Kinematic viscosity	5 to > 1300 mm ² /s at 38°C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalis.

Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and sulfur dioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	: May cause respiratory tract irritation. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.
Ingestion	Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.
Skin irritation	Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Rare, precancerous warts on the forearms, backs of hands and scrotum have been reported from prolonged or repeated skin contact.
Eye irritation	Irritating to eyes.
Chronic exposure	This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information. Contains benzene, which can cause blood disease, including anemia and leukemia. Suspect reproductive hazard - contains material which may injure unborn child.
Target organs	Skin, Eyes, Central nervous system, Respiratory system, Kidney, Liver

Component:

Petroleum; Crude oil

8002-05-9

Acute oral toxicity: LD50 rat
Dose: 5,001 mg/kg

		<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Skin irritation:</u> Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Result: Mild eye irritation</p>
Toluene	108-88-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 636 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 12,124 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 49 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Xylene	1330-20-7	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,840 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: ca. 4,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 6,350 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Naphthalene	91-20-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rat Dose: 2,501 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 101 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Benzene	71-43-2	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 930 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 44 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p>

Pentane	109-66-0	<p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p> <p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 364 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Cyclohexane	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 14 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m³ Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h</p>

Skin irritation: Classification: Irritating to skin.
Result: Skin irritation

Eye irritation: Classification: Irritating to eyes.
Result: Mild eye irritation

Teratogenicity: N11.00418960

Carcinogenicity

NTP	: Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	Benzene (CAS-No.: 71-43-2)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3) Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

N-hexane	110-54-3	<u>Toxicity to fish:</u> LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h
		<u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h
Sulfur	7704-34-9	<u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC0 Species: Daphnia magna (Water flea) Dose: > 10,000 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : 1267
 Class : 3
 Packing group : II

TDG

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : UN1267
 Class : 3
 Packing group : II

IATA Cargo Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (cargo aircraft) : 364
 Packing instruction (cargo aircraft) : Y341

IATA Passenger Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (passenger aircraft) : 353
 Packing instruction (passenger aircraft) : Y341

IMDG-Code

UN-No. : UN 1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 IMDG-Labels : 3
 EmS Number : F-E S-E
 Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory
 DSL Status : All components of this product are on the Canadian DSL list.
 SARA 311/312 Hazards : Fire Hazard
 Acute Health Hazard
 Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
Xylene	1330-20-7

<u>Components</u>	<u>CAS-No.</u>
hydrogen sulfide	7783-06-4

PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
Xylene	1330-20-7

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9
Toluene	
Xylene	

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Benzene 71-43-2

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Benzene 71-43-2
Toluene 108-88-3

SECTION 16. OTHER INFORMATION

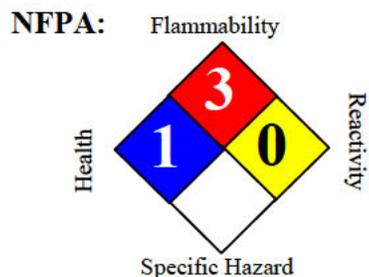
Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 12/07/2012

Safety Data Sheet

Crude oil, sour heavy



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Crude oil, sour heavy			
Synonyms	:	Sour Crude, Crude Oil Sour, RS294, 0000002670, 888100005182			
SDS Number	:	888100005182	Version	:	1.8
Product Use Description	:	Industrial feedstock			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	Chemtrec (Emergency Contact)	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 2 or 3 depending on variable composition.
Aspiration Hazard – Category 1.
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Eye Irritant – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms



Signal Word : DANGER

Hazard Statements : Highly flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by prolonged and repeated inhalation or skin contact.
Causes eye irritation. Can be absorbed through skin.
Repeated or prolonged skin contact can cause irritation and dermatitis.
May cause drowsiness or dizziness.
Harmful to aquatic life.

May release hydrogen sulfide (H₂S) gas, a toxic-by-inhalation material. See Section 11.

Precautionary statements

Prevention

Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Keep away from heat, sparks, open flames, welding and hot surfaces.
 No smoking.
 Keep container tightly closed.
 Ground and/or bond container and receiving equipment.
 Use explosion-proof electrical equipment.
 Use only non-sparking tools (if tools are used in flammable atmosphere).
 Take precautionary measures against static discharge.
 Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
 Wash hands or liquid-contacted skin thoroughly after handling.
 Do not eat, drink or smoke when using this product.
 Do not breathe vapors.
 Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO₂, water spray or fire-fighting foam to extinguish.
 If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 If skin or eye irritation persists, get medical attention.
 If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

Store in a well-ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Petroleum; Crude oil	8002-05-9	80 - 85%
Benzene	71-43-2	5 - 7%
Toluene	108-88-3	5 - 7%
Ethylbenzene	100-41-4	5 - 7%
Xylene	1330-20-7	5 - 7%

Hydrogen Sulfide	7783-06-4	< 0.5%
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SECTION 4. FIRST AID MEASURES

Inhalation	: Move to fresh air. If not breathing, give artificial respiration. Administer oxygen or artificial respiration if needed. Seek medical attention immediately.
Skin contact	: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Seek medical advice if symptoms persist or develop. Seek medical attention if irritation or skin thermal burns occur.
Eye contact	: In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek medical advice if symptoms persist or develop.
Ingestion	: Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray, or fire-fighting foam. LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
Specific hazards during fire fighting	: Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Dangerous fire and explosion hazard when exposed to heat, sparks or flame. Do not allow liquid runoff to enter sewers or public waters.
Special protective equipment for fire-fighters	: Firefighters should wear self-contained breathing apparatus and full protective clothing as need for protection from heat and airborne combustion products. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines.
Further information	: Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	: Carefully contain and stop the source of the spill, if safe to do so. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. WASTE DISPOSAL METHOD: Dispose of in accordance with Local, State, and Federal Regulations.

- Methods for cleaning up** : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).
- Additional advice** : Inform the responsible authorities in case of leakage, or of entry into waterways, soil or drains.

SECTION 7. HANDLING AND STORAGE

- Precautions for safe handling** : Handle as a combustible liquid. Keep product and empty containers away from fire, sparks and heated surfaces. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.
- Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks". Hydrogen sulfide may accumulate in tanks and bulk transport compartments. Consider appropriate respiratory protection (see Section 8). Stand upwind. Avoid vapors when opening hatches and dome covers. Confined spaces should be ventilated and gas tested prior to entry.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Hydrogen sulfide	7783-06-4	STEL	20 ppm
ACGIH	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Toluene	108-88-3	TWA	50 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
	Xylene	1330-20-7	TWA	100 ppm

		1330-20-7	STEL	150 ppm
	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm
Engineering measures	:	Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.		
Eye protection	:	Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.		
Hand protection	:	Gloves constructed of nitrile, neoprene, or PVC are recommended.		
Skin and body protection	:	Chemical protective clothing such as DuPont Tyvek QC, TyChem® or equivalent, recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.		
Respiratory protection	:	If hydrogen sulfide concentration may exceed permissible exposure limit, a positive-pressure SCBA or Type C supplied air respirator with escape bottle is required as respiratory protection. If hydrogen sulfide concentration is below H2S permissible exposure limit a NIOSH/ MSHA-approved air-purifying respirator with acid gas cartridges may be acceptable for odor control, but continuous air monitoring for H2S is recommended. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.		
Hygiene measures	:	Emergency eye wash capability should be available in the vicinity of any potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners to clean skin. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to discard contaminated leather shoes and gloves. Consider disposal of contaminated clothing rather than laundering to prevent the formation of flammable vapors which could ignite via washer or dryer.		

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Typical is a thick, dark yellow to brown or greenish black liquid
Odor	Petroleum asphalt odor. Hydrogen sulfide (H2S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H2S can deaden the sense of smell. H2S concentrations can be measured with an H2S meter or colorimetric indicating tubes.
Odor threshold	Odor threshold varies with the composition of the crude oil
pH	Not applicable
Melting point/freezing point	-30° to 30 °C has been reported as a pour point
Initial boiling point & range	Distillation is typically not performed above 300°C at atmospheric pressure

Flash point	-7 to 75°C
Evaporation rate:	Higher initially and declines if lighter components evaporate
Flammability (solid, gas)	Flammable gas or vapors released by liquid
Upper explosive limit	Varies with composition but typical is approximately 7%
Lower explosive limit	Varies with composition but typical is approximately 0.7%
Vapor pressure	6 to 45 kPa
Vapor density (air = 1)	No data available 0.8 to 1.0 g/mL is typical at 15°C
Relative density (water = 1)	1 to 2% by weight is maximum reported for soluble components of crude oil
Solubility (in water)	2 to > 6 as log Pow
Partition coefficient (n-octanol/water)	Varies with composition
Auto-ignition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Decomposition temperature	5 to > 1300 mm ² /s at 38°C
Kinematic viscosity	

SECTION 10. STABILITY AND REACTIVITY

Reactivity	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalies.
Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and sulfur dioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	May cause respiratory tract irritation. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5
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minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

Ingestion

Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Skin irritation

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Rare, precancerous warts on the forearms, backs of hands and scrotum have been reported from prolonged or repeated skin contact

Eye irritation

Irritating to eyes.

Chronic exposure

This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information. Contains benzene, which can cause blood disease, including anemia and leukemia. Suspect reproductive hazard - contains material which may injure unborn child.

Target organs

Skin, Eyes, Central nervous system, Respiratory system, Kidney, Liver

Component

Petroleum; Crude oil

8002-05-9

Acute oral toxicity: LD50 rat
Dose: 5,001 mg/kg
Acute dermal toxicity: LD50 rabbit
Dose: 2,001 mg/kg
Skin irritation: Result: Mild skin irritation
Eye irritation: Result: Mild eye irritation
Carcinogenicity: N11.00418605

Toluene

108-88-3

Acute oral toxicity: LD50 rat
Dose: 636 mg/kg
Acute dermal toxicity: LD50 rabbit
Dose: 12,124 mg/kg
Acute inhalation toxicity: LC50 rat
Dose: 49 mg/l
Exposure time: 4 h
Skin irritation: Classification: Irritating to skin.
Result: Mild skin irritation
Prolonged skin contact may defat the skin and produce dermatitis.
Eye irritation: Classification: Irritating to eyes.
Result: Mild eye irritation

Xylene

1330-20-7

Acute oral toxicity: LD50 rat
Dose: 2,840 mg/kg
Acute dermal toxicity: LD50 rabbit
Dose: ca. 4,500 mg/kg
Acute inhalation toxicity: LC50 rat
Dose: 6,350 mg/l
Exposure time: 4 h
Skin irritation: Classification: Irritating to skin.
Result: Mild skin irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.
Eye irritation: Classification: Irritating to eyes.
Result: Mild eye irritation

Naphthalene	91-20-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rat Dose: 2,501 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 101 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p> <p><u>Carcinogenicity:</u> N11.00422130</p>
Benzene	71-43-2	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 930 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 44 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes</p>
Pentane	109-66-0	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 364 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Cyclohexane	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 14 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m3 Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit</p>

Dose: 2,001 mg/kg
Acute inhalation toxicity: LC50 rat
 Dose: 171.6 mg/l
 Exposure time: 4 h
Skin irritation: Classification: Irritating to skin.
 Result: Skin irritation
Eye irritation: Classification: Irritating to eyes.
 Result: Mild eye irritation
Teratogenicity: N11.00418960

Carcinogenicity :

NTP	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	Benzene (CAS-No.: 71-43-2)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3) Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	<u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h <u>Toxicity to algae:</u> IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
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SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name : PETROLEUM CRUDE OIL
UN-No. : 1267
Class : 3
Packing group : II

TDG

Proper shipping name : PETROLEUM CRUDE OIL
UN-No. : UN1267
Class : 3
Packing group : II

IATA Cargo Transport

UN UN-No. : UN1267
Description of the goods : PETROLEUM CRUDE OIL
Class : 3
Packaging group : II
ICAO-Labels : 3
Packing instruction (cargo aircraft) : 366
Packing instruction (cargo aircraft) : Y344

IATA Passenger Transport

UN UN-No. : UN1267
Description of the goods : PETROLEUM CRUDE OIL
Class : 3
Packaging group : II
ICAO-Labels : 3
Packing instruction (passenger aircraft) : 355
Packing instruction (passenger aircraft) : Y344

IMDG-Code

UN-No. : UN 1267
Description of the goods : PETROLEUM CRUDE OIL
Class : 3
Packaging group : II
IMDG-Labels : 3
EmS Number : F-E S-E
Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory
DSL Status : All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

CERCLA Reportable Quantity : 118 lbs

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

<u>Components</u>	<u>CAS-No.</u>
Xylene	1330-20-7
Ethylbenzene	100-41-4
Toluene	108-88-3
Benzene	71-43-2

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

<u>Components</u>	<u>CAS-No.</u>
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PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

California Prop. 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.

Ethylbenzene 100-41-4

Benzene 71-43-2

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3

Benzene 71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 02/02/2013

Safety Data Sheet

Crude oil, sour light

NFPA: Flammability



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Crude oil, sour light			
Synonyms	:	Hydrogen sulfide crude; hydrogen sulfide oil; crude oil; sealed oil; separator crude; sour crude; sour oil, petroleum, RS294, 0000002670, 888100005161			
SDS Number	:	888100005161	Version	:	1.3
Product Use Description	:	Refining feedstock			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	Chemtrec	:	(800) 424-9300
			(Emergency Contact)		

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 2 or 3 depending on variable composition.
Aspiration Hazard – Category 1.
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Eye Irritant – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms



Signal Word : DANGER

Hazard Statements : Highly flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by prolonged and repeated inhalation or skin contact.
Causes eye irritation. Can be absorbed through skin.

Repeated or prolonged skin contact can cause irritation and dermatitis.
 May cause drowsiness or dizziness.
 Harmful to aquatic life.
 May release hydrogen sulfide (H₂S) gas, a toxic-by-inhalation material. See Section 11.

Precautionary statements

Prevention

Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Keep away from heat, sparks, open flames, welding and hot surfaces.
 No smoking.
 Keep container tightly closed.
 Ground and/or bond container and receiving equipment.
 Use explosion-proof electrical equipment.
 Use only non-sparking tools (if tools are used in flammable atmosphere).
 Take precautionary measures against static discharge.
 Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
 Wash hands or liquid-contacted skin thoroughly after handling.
 Do not eat, drink or smoke when using this product.
 Do not breathe vapors.
 Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO₂, water spray or fire-fighting foam to extinguish.
 If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 If skin or eye irritation persists, get medical attention.
 If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

Store in a well-ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Petroleum; Crude oil	8002-05-9	100%
N-hexane	110-54-3	0 - 1.5%
Hydrogen Sulfide	7783-06-4	Highly Variable

Sulfur	7704-34-9	1 - 1.5%
Benzene	71-43-2	0.1 - 3%

SECTION 4. FIRST AID MEASURES

Inhalation	: Move to fresh air. Administer oxygen or artificial respiration if needed. Seek medical attention immediately.
Skin contact	: Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Seek medical attention if irritation or skin thermal burns occur.
Eye contact	: In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek medical attention immediately.
Ingestion	: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray, or fire-fighting foam. LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
Specific hazards during fire fighting	: Vapors are heavier than air and may travel long distances to a point of ignition and flash back. Do not allow liquid runoff to enter sewers or public waters. Gas may form explosive mixture with air.
Special protective equipment for fire-fighters	: Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus and fully protective clothing such as bunker gear if needed to prevent exposure.
Further information	: Isolate area, particularly around ends of storage vessels. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	: Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors.

Methods for cleaning up : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Handle as a combustible liquid. Keep product and empty containers away from fire, sparks and heated surfaces. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_AL	0.5 ppm
OSHA Z1	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
OSHA Z1	Hydrogen sulfide	7783-06-4	STEL	20 ppm
ACGIH	N-hexane	110-54-3	TWA	50 ppm
	Hydrogen Sulfide	7783-06-4	TWA	1ppm
		7783-06-4	STEL	5 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Eye protection : Ensure that eyewash stations and safety showers are close to the workstation location. Goggles, and face shield or full facepiece pressure-demand supplied air respirator as needed to prevent eye and face contact.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended. The resistance of specific material may vary from product to product as well as with degree of exposure.

Skin and body protection	: Chemical protective clothing such as DuPont TyChem®, Barricade or equivalent, recommended based on degree of exposure.
Respiratory protection	: A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Hygiene measures	: Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners to clean skin. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to discard contaminated leather shoes and gloves. Use good personal hygiene practices.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Typical is a thick, dark yellow to brown or greenish black liquid
Odor	Petroleum asphalt odor. Hydrogen sulfide (H ₂ S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H ₂ S can deaden the sense of smell. H ₂ S concentrations can be measured with an H ₂ S meter or colorimetric indicating tubes.
Odor threshold	Odor threshold varies with the composition of the crude oil
pH	Not applicable
Melting point/freezing point	-30° to 30°C has been reported as a pour point
Initial boiling point & range	Distillation is typically not performed above 300°C at atmospheric pressure
Flash point	-7 to 75°C
Evaporation rate:	Higher initially and declines if lighter components evaporate
Flammability (solid, gas)	Flammable gas or vapors released by liquid
Upper explosive limit	Varies with composition but typical is approximately 7%
Lower explosive limit	Varies with composition but typical is approximately 0.7%
Vapor pressure	6 to 45 kPa
Vapor density (air = 1)	No data available 0.8 to 1.0 g/mL is typical at 15°C
Relative density (water = 1)	1 to 2% by weight is maximum reported for soluble components of crude oil
Solubility (in water)	2 to > 6 as log Pow

Partition coefficient (n-octanol/water)	Varies with composition
Auto-ignition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Decomposition temperature	5 to > 1300 mm ² /s at 38 °C
Kinematic viscosity	

SECTION 10. STABILITY AND REACTIVITY

Reactivity	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalies.
Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and sulfur dioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	May cause respiratory tract irritation. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.
Ingestion	Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.
Skin irritation	Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Rare, precancerous warts on the forearms, backs of hands and scrotum have been

reported from prolonged or repeated skin contact.

Eye irritation

Irritating to eyes.

Chronic exposure

This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information. Contains benzene, which can cause blood disease, including anemia and leukemia. Suspect reproductive hazard - contains material which may injure unborn child.

Target organs

Skin, Eyes, Central nervous system, Respiratory system, Kidney, Liver

Component:**Petroleum; Crude oil**

8002-05-9

Acute oral toxicity: LD50 rat
Dose: 5,001 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: 2,001 mg/kg

Skin irritation: Result: Mild skin irritation

Eye irritation: Result: Mild eye irritation

Carcinogenicity: N11.00418605

Toluene

108-88-3

Acute oral toxicity: LD50 rat
Dose: 636 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: 12,124 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 49 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Prolonged skin contact may defat the skin and produce dermatitis.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Xylene

1330-20-7

Acute oral toxicity: LD50 rat
Dose: 2,840 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: ca. 4,500 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 6,350 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Naphthalene

91-20-3

Acute oral toxicity: LD50 rat
Dose: 2,001 mg/kg

Acute dermal toxicity: LD50 rat
Dose: 2,501 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 101 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

		<u>Carcinogenicity:</u> N11.00422130
Benzene	71-43-2	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 930 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 44 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
Pentane	109-66-0	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 364 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Cyclohexane	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 14 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m3 Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p>Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p> <p><u>Teratogenicity:</u> N11.00418960</p>

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	Benzene (CAS-No.: 71-43-2)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3) Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

N-hexane	110-54-3	<u>Toxicity to fish:</u> LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h
		<u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h
Sulfur	7704-34-9	<u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC0 Species: Daphnia magna (Water flea) Dose: > 10,000 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION**CFR**

Proper shipping name : PETROLEUM CRUDE OIL
UN-No. : 1267
Class : 3
Packing group : II

TDG

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : UN1267
 Class : 3
 Packing group : II

IATA Cargo Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (cargo aircraft) : 364
 Packing instruction (cargo aircraft) : Y341

IATA Passenger Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (passenger aircraft) : 353
 Packing instruction (passenger aircraft) : Y341

IMDG-Code

UN-No. : UN 1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 IMDG-Labels : 3
 EmS Number : F-E S-E
 Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory
 DSL Status : All components of this product are on the Canadian DSL list.
 SARA 311/312 Hazards : Fire Hazard
 Acute Health Hazard
 Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

CERCLA Reportable Quantity : 104 lbs

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

<u>Components</u>	<u>CAS-No.</u>
N-hexane	110-54-3
Benzene	71-43-2

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

<u>Components</u>	<u>CAS-No.</u>
hydrogen sulfide	7783-06-4

PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Hydrogen Sulfide	7783-06-4
Sulfur	7704-34-9
N-hexane	110-54-3
Petroleum; Crude oil	8002-05-9

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Benzene 71-43-2

WARNING! This product contains a chemical known to the State of California to

cause birth defects or other reproductive harm.

Benzene

71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 02/02/2013

Safety Data Sheet

Crude Oil, Sweet Heavy

NFPA: Flammability



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	: Crude Oil, Sweet Heavy
Synonyms	: Sweet Heavy Crude Oil, RS295, 888100005156
SDS Number	: 888100005156 Version : 1.3
Product Use Description	: Industrial feedstock
Company	: For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway Drive, San Antonio, TX 78259
Tesoro Call Center	: (877) 783-7676 Chemtrec (Emergency Contact) : (800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications	: Flammable Liquid – Category 2 or 3 depending on variable composition. Aspiration Hazard – Category 1. Carcinogenicity – Category 2 Specific Target Organ Toxicity (Repeated Exposure) – Category 2 Specific Target Organ Toxicity (Single Exposure) – Category 3 Eye Irritant – Category 2B Chronic Aquatic Toxicity – Category 2
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Pictograms



Signal Word : DANGER

Hazard Statements	: Highly flammable liquid and vapor. May be fatal if swallowed and enters airways – do not siphon gasoline by mouth. Suspected of causing cancer if repeated over-exposure by inhalation and/or skin contact occurs. May cause damage to liver, kidneys and nervous system by prolonged and repeated inhalation or skin contact. Causes eye irritation. Can be absorbed through skin. Repeated or prolonged skin contact can cause irritation and dermatitis. May cause drowsiness or dizziness. Harmful to aquatic life. May release hydrogen sulfide (H ₂ S) gas, a toxic-by-inhalation material. See
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Section 11.

Precautionary statements**Prevention**

- : Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Keep away from heat, sparks, open flames, welding and hot surfaces.
- No smoking.
- Keep container tightly closed.
- Ground and/or bond container and receiving equipment.
- Use explosion-proof electrical equipment.
- Use only non-sparking tools (if tools are used in flammable atmosphere).
- Take precautionary measures against static discharge.
- Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
- Wash hands or liquid-contacted skin thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Do not breathe vapors.
- Use only outdoors or in a well-ventilated area.

Response

- In case of fire: Use dry chemical, CO₂, water spray or fire-fighting foam to extinguish.
- If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
- If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If skin or eye irritation persists, get medical attention.
- If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

Store in a well-ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Petroleum; Crude oil	8002-05-9	100%
Toluene	108-88-3	0 - 7%
N-hexane	110-54-3	0 - 5%
Benzene	71-43-2	0.1 - 3%

SECTION 4. FIRST AID MEASURES

Inhalation	: Move to fresh air. Administer oxygen or artificial respiration if needed. Seek medical attention immediately.
Skin contact	: Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Seek medical attention if irritation or skin thermal burns occur.
Eye contact	: In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. If symptoms persist, seek medical attention immediately.
Ingestion	: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray, or fire-fighting foam. LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers..
Specific hazards during fire fighting	: Vapors are heavier than air and may travel long distances to a point of ignition and flash back. Do not allow liquid runoff to enter sewers or public waters. Gas may form explosive mixture with air.
Special protective equipment for fire-fighters	: Use NIOSH/MSHA approved positive pressure self-contained breathing apparatus and fully protective clothing such as bunker gear if needed to prevent exposure.
Further information	: Isolate area, particularly around ends of storage vessels. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	: Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors.
Methods for cleaning up	: Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

- Precautions for safe handling** : Handle as a combustible liquid. Keep product and empty containers away from fire, sparks and heated surfaces. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.
- Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure Guidelines**

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
	Hydrogen sulfide	7783-06-4	STEL	20 ppm
ACGIH	Toluene	108-88-3	TWA	50 ppm
	N-hexane	110-54-3	TWA	50 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Hydrogen Sulfide	7783-06-4	PEL	1 ppm
			STEL	5 ppm

- Engineering measures** : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.
- Eye protection** : Ensure that eyewash stations and safety showers are close to the workstation location. Goggles, and face shield or full facepiece pressure-demand supplied air respirator as needed to prevent eye and face contact.
- Hand protection** : Gloves constructed of nitrile, neoprene, or PVC are recommended. The resistance of specific material may vary from product to product as well as with degree of exposure.
- Skin and body protection** : Chemical protective clothing such as DuPont TyChem®, Barricade or equivalent, recommended based on degree of exposure.
- Respiratory protection** : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or

canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Hygiene measures : Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners to clean skin. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to discard contaminated leather shoes and gloves. Use good personal hygiene practices.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Typical is a thick, dark yellow to brown or greenish black liquid
Odor	Petroleum asphalt odor. Hydrogen sulfide (H ₂ S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H ₂ S can deaden the sense of smell. H ₂ S concentrations can be measured with an H ₂ S meter or colorimetric indicating tubes.
Odor threshold	Odor threshold varies with the composition of the crude oil
pH	Not applicable
Melting point/freezing point	-30° to 30°C has been reported as a pour point
Initial boiling point & range	Distillation is typically not performed above 300°C at atmospheric pressure
Flash point	-7 to 75°C
Evaporation rate	Higher initially and declines if lighter components evaporate
Flammability (solid, gas)	Flammable gas or vapors released by liquid
Upper explosive limit	Varies with composition but typical is approximately 7%
Lower explosive limit	Varies with composition but typical is approximately 0.7%
Vapor pressure	6 to 45 kPa
Vapor density (air = 1)	No data available
Relative density (water = 1)	0.9 to 1.0 g/mL is typical at 15°C
Solubility (in water)	1 to 2% by weight is maximum reported for soluble components of crude oil
Partition coefficient (n-octanol/water)	2 to > 6 as log Pow
Auto-ignition temperature	Varies with composition
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	5 to > 1300 mm ² /s at 38°C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalies.
Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and sulfur dioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	: May cause respiratory tract irritation. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.
Ingestion	Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.
Skin irritation	Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Rare, precancerous warts on the forearms, backs of hands and scrotum have been reported from prolonged or repeated skin contact.
Eye irritation	Irritating to eyes.
Chronic exposure	This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information. Contains benzene, which can cause blood disease, including anemia and leukemia. Suspect reproductive hazard - contains material which may injure unborn child.

Target organs

Skin, Eyes, Central nervous system, Respiratory system, Kidney, Liver

Component

Petroleum; Crude oil	8002-05-9	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 5,001 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg</p> <p><u>Skin irritation:</u> Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Result: Mild eye irritation</p> <p><u>Carcinogenicity:</u> N11.00418605</p>
Toluene	108-88-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 636 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 12,124 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 49 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Xylene	1330-20-7	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,840 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: ca. 4,500 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 6,350 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Naphthalene	91-20-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg</p> <p><u>Acute dermal toxicity:</u> LD50 rat Dose: 2,501 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 101 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p> <p><u>Carcinogenicity:</u> N11.00422130</p>
Benzene	71-43-2	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 930 mg/kg</p> <p><u>Acute inhalation toxicity:</u> LC50 rat Dose: 44 mg/l Exposure time: 4 h</p> <p><u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.</p> <p><u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>

Pentane	109-66-0	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 2,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 364 mg/l Exposure time: 4 h <u>Skin irritation:</u> Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Cyclohexane	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 14 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m3 Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation <u>Teratogenicity:</u> N11.00418960</p>

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	Benzene (CAS-No.: 71-43-2)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3) Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	<u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h <u>Toxicity to algae:</u> IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
N-hexane	110-54-3	<u>Toxicity to fish:</u> LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : 1267
 Class : 3
 Packing group : III

TDG

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : UN1267
 Class : 3
 Packing group : III

IATA Cargo Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : I11
 ICAO-Labels : 3
 Packing instruction (cargo aircraft) : 366
 Packing instruction (cargo aircraft) : Y344

IATA Passenger Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : III
 ICAO-Labels : 3
 Packing instruction (passenger aircraft) : 355
 Packing instruction (passenger aircraft) : Y344

IMDG-Code

UN-No. : UN 1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : III
 IMDG-Labels : 3
 EmS Number : F-E S-E
 Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory
 DSL Status : All components of this product are on the Canadian DSL list.
 SARA 311/312 Hazards : Fire Hazard
 Acute Health Hazard
 Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

CERCLA Reportable Quantity : 111 lbs

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

<u>Components</u>	<u>CAS-No.</u>
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
N-hexane	110-54-3
Benzene	71-43-2

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

<u>Components</u>	<u>CAS-No.</u>
Toluene	108-88-3
N-hexane	110-54-3
Benzene	71-43-2

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

<u>Components</u>	<u>CAS-No.</u>
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
N-hexane	110-54-3
Benzene	71-43-2

PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

<u>Components</u>	<u>CAS-No.</u>
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
N-hexane	110-54-3
Benzene	71-43-2

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

<u>Components</u>	<u>CAS-No.</u>
Petroleum; Crude oil	8002-05-9
Toluene	108-88-3
N-hexane	110-54-3
Benzene	71-43-2

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

benzene 71-43-2

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3

Benzene 71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 02/02/2013

Safety Data Sheet

Crude oil, light sweet

NFPA: Flammability



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Crude oil, light sweet			
Synonyms	:	Petroleum Crude Oil, Crude Sweet, 888100005188			
SDS Number	:	888100005188	Version	:	1.3
Product Use Description	:	Industrial feedstock			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	Chemtrec (Emergency Contact)	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 2 or 3 depending on variable composition.
Aspiration Hazard – Category 1.
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Eye Irritant – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms



Signal Word : DANGER

Hazard Statements : Highly flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by prolonged and repeated inhalation or skin contact.
Causes eye irritation. Can be absorbed through skin.
Repeated or prolonged skin contact can cause irritation and dermatitis.
May cause drowsiness or dizziness.
Harmful to aquatic life.
May release hydrogen sulfide (H₂S) gas, a toxic-by-inhalation material. See

Section 11.

Precautionary statements

Prevention

Obtain special instructions before use.
 Do not handle until all safety precautions have been read and understood.
 Keep away from heat, sparks, open flames, welding and hot surfaces.
 No smoking.
 Keep container tightly closed.
 Ground and/or bond container and receiving equipment.
 Use explosion-proof electrical equipment.
 Use only non-sparking tools (if tools are used in flammable atmosphere).
 Take precautionary measures against static discharge.
 Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
 Wash hands or liquid-contacted skin thoroughly after handling.
 Do not eat, drink or smoke when using this product.
 Do not breathe vapors.
 Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO₂, water spray or fire-fighting foam to extinguish.
 If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 If skin or eye irritation persists, get medical attention.
 If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage

Store in a well-ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Petroleum; Crude oil	8002-05-9	80 - 85%
Benzene	71-43-2	5 - 7%
Toluene	108-88-3	5 - 7%
Ethylbenzene	100-41-4	5 - 7%

Xylene	1330-20-7	5 - 7%
Hydrogen Sulfide	7783-06-4	< 0.5%

SECTION 4. FIRST AID MEASURES

Inhalation	: Move to fresh air. If not breathing, give artificial respiration. Administer oxygen or artificial respiration if needed. Seek medical attention immediately.
Skin contact	: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Seek medical advice if symptoms persist or develop. Seek medical attention if irritation or skin thermal burns occur.
Eye contact	: In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek medical advice if symptoms persist or develop.
Ingestion	: Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO ₂ , water spray, fire-fighting foam. LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
Specific hazards during fire fighting	: Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back. Dangerous fire and explosion hazard when exposed to heat, sparks or flame. Do not allow liquid runoff to enter sewers or public waters.
Special protective equipment for fire-fighters	: Firefighters should wear self-contained breathing apparatus and full protective clothing as need for protection from heat and airborne combustion products. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines.
Further information	: Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	: Carefully contain and stop the source of the spill, if safe to do so. Do not flush down sewer or drainage systems, unless system is designed and permitted to

handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. WASTE DISPOSAL METHOD: Dispose of in accordance with Local, State, and Federal Regulations.

- Methods for cleaning up** : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).
- Additional advice** : Inform the responsible authorities in case of leakage, or of entry into waterways, soil or drains.

SECTION 7. HANDLING AND STORAGE

- Precautions for safe handling** : Handle as a combustible liquid. Keep product and empty containers away from fire, sparks and heated surfaces. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.
- Conditions for safe storage, including incompatibilities** : Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks". Hydrogen sulfide may accumulate in tanks and bulk transport compartments. Consider appropriate respiratory protection (see Section 8). Stand upwind. Avoid vapors when opening hatches and dome covers. Confined spaces should be ventilated and gas tested prior to entry.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Hydrogen sulfide	7783-06-4	STEL	20 ppm
ACGIH	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Toluene	108-88-3	TWA	50 ppm

	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm

Engineering measures	: Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.
Eye protection	: Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.
Hand protection	: Gloves constructed of nitrile, neoprene, or PVC are recommended.
Skin and body protection	: Chemical protective clothing such as DuPont Tyvek QC, TyChem® or equivalent, recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.
Respiratory protection	: If hydrogen sulfide concentration may exceed permissible exposure limit, a positive-pressure SCBA or Type C supplied air respirator with escape bottle is required as respiratory protection. If hydrogen sulfide concentration is below H ₂ S permissible exposure limit a NIOSH/ MSHA-approved air-purifying respirator with acid gas cartridges may be acceptable for odor control, but continuous air monitoring for H ₂ S is recommended. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Hygiene measures	: Emergency eye wash capability should be available in the vicinity of any potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners to clean skin. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider the need to discard contaminated leather shoes and gloves. Consider disposal of contaminated clothing rather than laundering to prevent the formation of flammable vapors which could ignite via washer or dryer.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Typical is a thick, dark yellow to brown or greenish black liquid
Odor	Petroleum asphalt odor. Hydrogen sulfide (H ₂ S) has a characteristic rotten egg odor with an odor threshold as low as 10 parts per billion or even less. However, this odor should not be used as a warning property because H ₂ S can deaden the sense of smell. H ₂ S concentrations can be measured with an H ₂ S meter or colorimetric indicating tubes.
Odor threshold	Odor threshold varies with the composition of the crude oil
pH	Not applicable

Melting point/freezing point	-30° to 30°C has been reported as a pour point
Initial boiling point & range	Distillation is typically not performed above 300°C at atmospheric pressure
Flash point	-7 to 75°C
Evaporation rate:	Higher initially and declines if lighter components evaporate
Flammability (solid, gas)	Flammable gas or vapors released by liquid
Upper explosive limit	Varies with composition but typical is approximately 7%
Lower explosive limit	Varies with composition but typical is approximately 0.7%
Vapor pressure	6 to 45 kPa
Vapor density (air = 1)	No data available
Relative density (water = 1)	0.8 to 1.0 g/mL is typical at 15°C
Solubility (in water)	1 to 2% by weight is maximum reported for soluble components of crude oil
Partition coefficient (n-octanol/water)	2 to > 6 as log Pow
Auto-ignition temperature	Varies with composition
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	5 to > 1300 mm ² /s at 38°C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalis.
Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and sulfur dioxide.

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	May cause respiratory tract irritation. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of
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reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

Ingestion

Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Skin irritation

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Rare, precancerous warts on the forearms, backs of hands and scrotum have been reported from prolonged or repeated skin contact.

Eye irritation

Irritating to eyes.

Chronic exposure

This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information. Contains benzene, which can cause blood disease, including anemia and leukemia. Suspect reproductive hazard - contains material which may injure unborn child.

Target organs

Skin, Eyes, Central nervous system, Respiratory system, Kidney, Liver

Component

Petroleum; Crude oil	8002-05-9	<u>Acute oral toxicity:</u> LD50 rat Dose: 5,001 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg <u>Skin irritation:</u> Result: Mild skin irritation <u>Eye irritation:</u> Result: Mild eye irritation <u>Carcinogenicity:</u> N11.00418605
Toluene	108-88-3	<u>Acute oral toxicity:</u> LD50 rat Dose: 636 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 12,124 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 49 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation

Prolonged skin contact may defat the skin and produce dermatitis.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Xylene 1330-20-7

Acute oral toxicity: LD50 rat

Dose: 2,840 mg/kg

Acute dermal toxicity: LD50 rabbit

Dose: ca. 4,500 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 6,350 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Naphthalene 91-20-3

Acute oral toxicity: LD50 rat

Dose: 2,001 mg/kg

Acute dermal toxicity: LD50 rat

Dose: 2,501 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 101 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Carcinogenicity: N11.00422130

Benzene 71-43-2

Acute oral toxicity: LD50 rat

Dose: 930 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 44 mg/l

Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.

Result: Mild skin irritation

Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Risk of serious damage to eyes.

Pentane 109-66-0

Acute oral toxicity: LD50 rat

Dose: 2,001 mg/kg

Acute inhalation toxicity: LC50 rat

Dose: 364 mg/l

Exposure time: 4 h

Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Cyclohexane	110-82-7	<p><u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 14 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
Ethylbenzene	100-41-4	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 3,500 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 15,500 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 18 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Mild skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Risk of serious damage to eyes.</p>
Heptane [and isomers]	142-82-5	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 15,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 103 g/m3 Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation</p>
N-hexane	110-54-3	<p><u>Acute oral toxicity:</u> LD50 rat Dose: 25,000 mg/kg <u>Acute dermal toxicity:</u> LD50 rabbit Dose: 2,001 mg/kg <u>Acute inhalation toxicity:</u> LC50 rat Dose: 171.6 mg/l Exposure time: 4 h <u>Skin irritation:</u> Classification: Irritating to skin. Result: Skin irritation <u>Eye irritation:</u> Classification: Irritating to eyes. Result: Mild eye irritation <u>Teratogenicity:</u> N11.00418960</p>

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	Benzene (CAS-No.: 71-43-2)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3) Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	<u>Toxicity to fish:</u> LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h <u>Acute and prolonged toxicity for aquatic invertebrates:</u> EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h <u>Toxicity to algae:</u> IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
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SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR	Proper shipping name	: PETROLEUM CRUDE OIL
	UN-No.	: 1267
	Class	: 3
	Packing group	: II
TDG		

Proper shipping name : PETROLEUM CRUDE OIL
 UN-No. : UN1267
 Class : 3
 Packing group : II

IATA Cargo Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (cargo aircraft) : 364
 Packing instruction (cargo aircraft) : Y341

IATA Passenger Transport

UN UN-No. : UN1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 ICAO-Labels : 3
 Packing instruction (passenger aircraft) : 353
 Packing instruction (passenger aircraft) : Y341

IMDG-Code

UN-No. : UN 1267
 Description of the goods : PETROLEUM CRUDE OIL
 Class : 3
 Packaging group : II
 IMDG-Labels : 3
 EmS Number : F-E S-E
 Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory
 DSL Status : All components of this product are on the Canadian DSL list.
 SARA 311/312 Hazards : Acute Health Hazard
 Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

CERCLA Reportable Quantity : 118 lbs

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

<u>Components</u>	<u>CAS-No.</u>
Xylene	1330-20-7
Ethylbenzene	100-41-4
Toluene	108-88-3
Benzene	71-43-2

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

<u>Components</u>	<u>CAS-No.</u>
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PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

<u>Components</u>	<u>CAS-No.</u>
Benzene	71-43-2
Toluene	108-88-3
Ethylbenzene	100-41-4
Xylene	1330-20-7
Petroleum; Crude oil	8002-05-9

California Prop. 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.

Ethylbenzene 100-41-4

Benzene 71-43-2

WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene 108-88-3

Benzene 71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 02/02/2013

POTENTIAL HAZARDS**FIRE OR EXPLOSION**

- **HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.**
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a **(P)** may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.
- Substance may be transported hot.
- For UN3166, if Lithium ion batteries are involved, also consult GUIDE 147.
- **If molten aluminum is involved, refer to GUIDE 169.**

HEALTH

- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.

EVACUATION**Large Spill**

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE**FIRE**

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

Small Fire

- Dry chemical, CO₂, water spray or regular foam.

Large Fire

- Water spray, fog or regular foam.
- **Do not use straight streams.**
- Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapor suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean non-sparking tools to collect absorbed material.

Large Spill

- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Vancouver Energy
Operations Facility Oil Handling Manual
EFSEC Application for Site Certification No. 2013-01
Docket No. EF131590



Appendix D
Response Equipment

APPENDIX D RESPONSE EQUIPMENT

D.1 COOPERATIVES AND CONTRACTORS

- Facility and Tesoro are members of the Clean Rivers Cooperative, Inc. (CRCI) As a member of Clean Rivers, Vancouver Energy/Tesoro may also have access to equipment and personnel resources from NRC.
- The Clean Rivers contractor response time to the facility is estimated as two hours. Mobilization times for CRCI equipment resources are summarized in **Figure 7.2**.
- Clean Rivers is classified as a “W3” OSRO by USCG. The response organization for Clean Rivers and their relationship with the Company and with subcontractors, NRCES, described in **Section 7.1.4**.
- Ecology has approved CRCI as a Primary Response Contractor (PRC). CRCI’s response time to the Facility is 1 hour. Primary Response Contractors are private companies or cooperatives that are in partnership with plan holders to act as required response support teams. The PRCs have equipment and crews that are trained and equipped to mitigate leaks and spills when they occur. CRCI’s equipment lists can be found in **Figure D.2** and **Figure D.3**. CRCI’s Equipment Map can be found in **Figure D.4**.

CRCI’s contact information is as follows:

Clean Rivers Cooperative, Inc.
Address: 9420 NW St. Helens Rd.
Portland, Oregon 97231
24-hour hotline: (503) 220-2040
Office: (503) 735-1687

D.1.1 OSRO Classification

- An OSRO Classification process was developed by the USCG to evaluate an OSRO’s potential to respond to and recover oil spills. Plan holders who arrange for USCG classified OSRO services do not have to list their response resources in their plans.
- CRCI is classified by the USCG as a category W3 OSRO for the inland/nearshore operating area in the Columbia River Captain of the Port (COTP).

D.1.2 Other Oil Spill Response Organizations

- Facility and Tesoro are also members of MSRC. A letter of intent to respond can be found in **Figure D.1**. The Company has also obtained permission from Global Diving & Salvage Inc., a PRC in the State of Washington, to list its respond resources for the Washington facilities. See **Figure D.1** for documentation. **Figure D.1** summarizes contractor contact information. **Figure D.2** contains evidence of contracts **Figure D.3** contains response contractor equipment maps.

D.2 NON-DEDICATED VESSELS

- Through contractual agreements, non-dedicated work boats and operators will be available to deploy geographic response plans, enhance skimming, provide platforms as vessel of opportunity skimming systems, logistical support, or other uses during a spill. Such resources could arrive on scene beginning at 48 hours.
- In addition to Clean Rivers, MSRC may also provide non-dedicated vessels to support spill response.

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Figure D.1 – Facility Response Action Contractors

CONTRACTOR AND POINT OF CONTACT	ADDRESS	PHONE/FAX NUMBERS	CONTRACTOR CERTIFICATION	CONTRACT IN PLACE WITH FACILITY?	RESPONSE TIME
Clean Rivers Cooperative Inc. Ernie Quesada	200 SW Market Street, Suite 190 Portland, OR 97201	(503) 220-2040 (24 hr.) (503) 295-3660 (fax)	<ul style="list-style-type: none"> USCG classification W3, River/Canal, Inland and Oceans State of Washington approved primary response contractor 	YES	2 hours
MSRC	455 Spring Park Place Suite 200 Herndon, VA 20170	(703) 326-5600 (Office) (703) 326-5660 (Fax) (800) 645-7745 (24 hr.) (425) 252-1300 (Everett)	<ul style="list-style-type: none"> USCG classification W3, River/Canal, Inland and Oceans State of Washington approved primary response contractor 	YES	2 hours

FIGURE D.2 – EVIDENCE OF CONTRACTS

EVIDENCE OF CONTRACTS
CLEAN RIVERS COOPERATIVE INC. [pending]
MARINE SPILL RESPONSE CORPORATION

CLEAN RIVERS COOPERATIVE INC. [pending]

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Judith A. Roos
Vice President
Marketing, Customer Services & Corporate Relations
(703) 326-5617

April 30, 2015

Mr. Eric Haugstad
Tesoro Corporation Inc.
5501 NW Lower River Road
Vancouver, WA 98660

Re: Letter of Intent

Dear Mr. Haugstad:

This letter certifies that Tesoro Corporation has entered into an Agreement with the Marine Spill Response Corporation (MSRC). Pursuant to this Agreement the Tesoro Vancouver Energy facility and its accompanying facilities are (1) entitled by contract to MSRC response services, and (2) have the right to cite the capability of MSRC in its Facility Response Plan, in accordance with the terms and conditions of the Standard Form MSRC Service Agreement.

The enclosed Execution Instrument to the MSRC Service Agreement dated February 18, 2013 between Tesoro Corporation and MSRC is proof that such a contract exists. In addition, MSRC's contract is an evergreen contract and continues automatically until such time that Tesoro Corporation ceases to be a member of the Marine Preservation Association (MPA).

Please let me know if I may provide further assistance to you in the future.

Sincerely,

Enclosure

220 Spring Street | Suite 500 | Herndon, VA 20170 | Telephone 703.326.5600 | Fax 703.326.5660

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MARINE SPILL RESPONSE CORPORATION
SERVICE AGREEMENT

EXECUTION INSTRUMENT

The MSRC SERVICE AGREEMENT attached hereto (together with this execution instrument, the "Agreement"), a standard form of agreement amended and restated as of September 27, 1996, as amended, is hereby entered into by and between

Tesoro Corporation

[Name of COMPANY]

a Delaware Corporation

[Type of entity and place of organization]

with its principal offices located at 19100 Ridgewood Parkway, San Antonio, TX 78259
(the "COMPANY"), and MARINE SPILL RESPONSE CORPORATION, a nonprofit corporation organized under the laws of Tennessee ("MSRC"), and shall be identified as

SERVICE AGREEMENT No. LMPA 346 [This is to be provided by MSRC.]

IN WITNESS WHEREOF, the parties hereto each have caused this Agreement to be duly executed and effective as of Feb. 18, 2013

Tesoro Corporaiton _____ [COMPANY]

By: [Signature] [signature] *KC*

Daniel R. Romasko [print name]

Title: Executive Vice President, Operations

Address: 19100 Ridgewood Parkway

San Antonio, TX 78259

Telephone: 210/626-6881 Fax: 210/626-4051

MARINE SPILL RESPONSE CORPORATION:

By: [Signature]

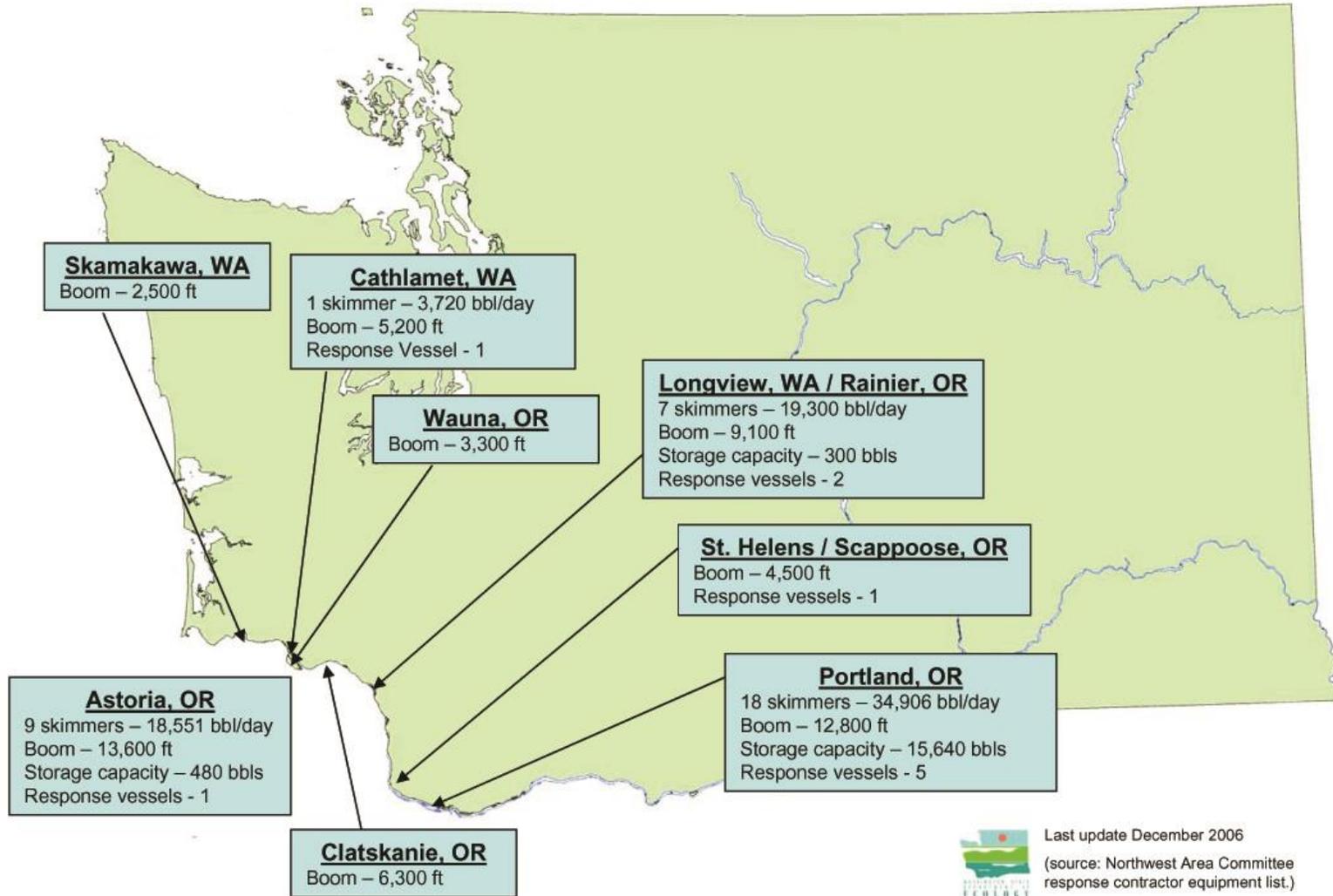
Judith A. Roos
Vice President
Marketing, Customer Services & Corporate Relations
220 Spring Street, Suite 500
Herndon, VA 20170
(703) 326-5617; Fax: (703) 326-5660

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Figure D.3 Equipment Maps

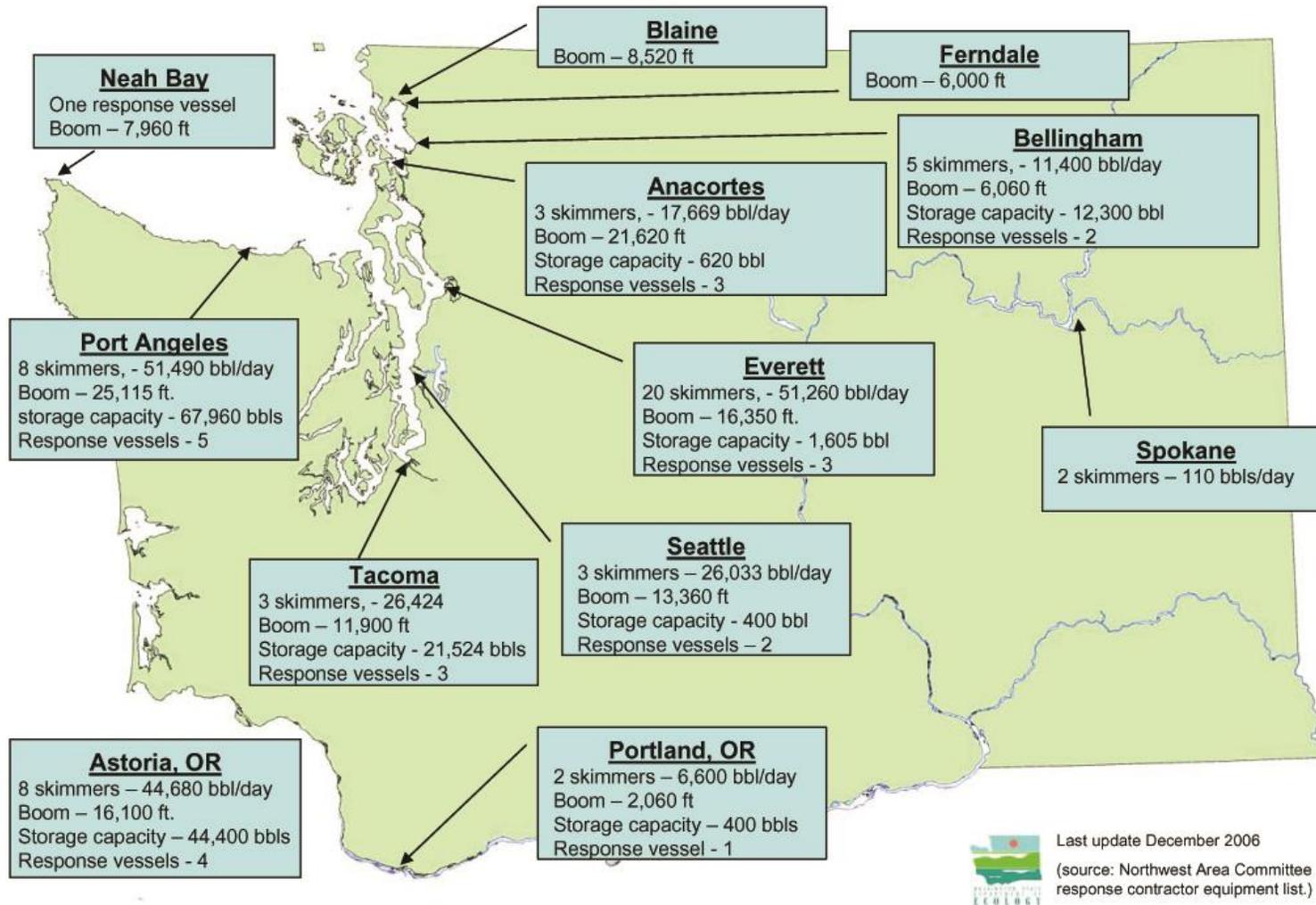
EQUIPMENT MAPS
CLEAN RIVERS COOPERATIVE INC.
MARINE SPILL RESPONSE CORPORATION
NATIONAL RESPONSE CORPORATION (Equipment available through Clean Rivers' Contract with NRC)

Clean Rivers Cooperative



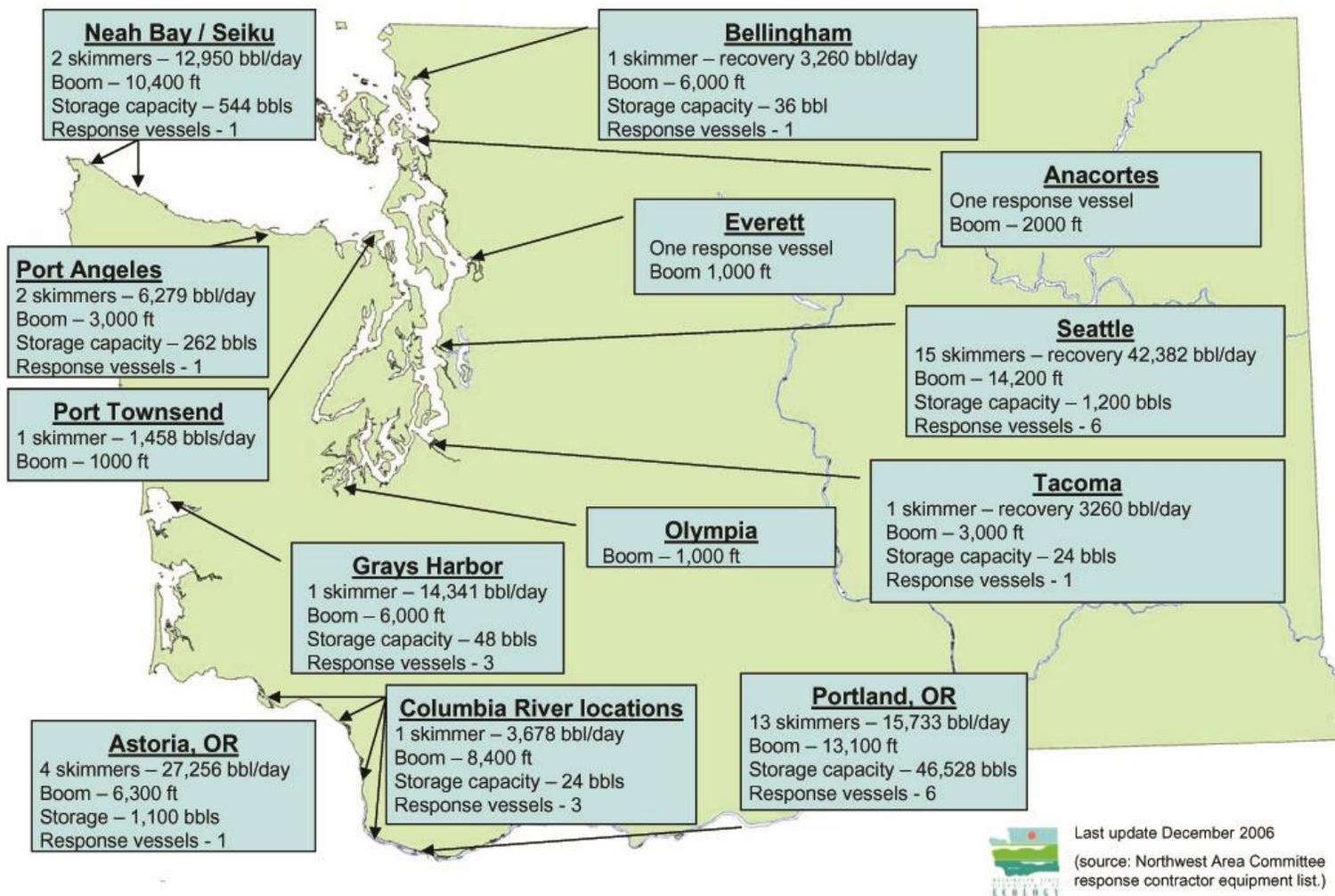
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Marine Spill Response Corporation



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National Response Corporation



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Appendix E
Response Equipment Instructions



Appendix E

Response Equipment Instructions

Instructions for Use of Response Boat

- Use boathouse key to unlock boathouse.
- Put on life jackets. Ensure all proper PPE is in good service and in use.
- Open garage door.
- Remove boat well stabilizers, from beneath response boat.
- Lower boat via electric winches.
- Check fuel level.
- Turn on batteries.
- Start engine.
- Back boat out of boathouse.
- Operate boat in accordance with safe boating practice.

Instructions for Use of Boom

- Attach bridal leader to boat cleat.
- Deploy boom slowly, in a straight line.
- When boom is fully deployed, response boat is to turn north and deploy boom according to the Facility's Contingency Plan.

Instructions for Use of Anchors

- Secure anchor line to boom.
- Stretch line until taut and deploy anchor.

Instructions for Use of Sorbents

- Place sorbents within boomed area to absorb oil.

Instructions for Use of Fire Extinguishers

- Position yourself 8 to 10 feet from the blaze.
- Hold unit upright, pull pin.
- Squeeze lever, aim at base of flame, and sweep the foam spray from side to side.
- Advance toward flames over area that has been extinguished, while maintaining 8- to 10-foot distance.

Instructions for Use of Radios

- Turn on.
- Key microphone to talk.
- Refer to Northwest Area Contingency Plan, Tab labeled "Radio Frequencies" for proper frequencies to utilize when using the Motorola MT 2000 radios.
- When using Motorola CT 250, Channel 2 is to be used to communicate between oil companies. Channel 1 is for Facility use only.

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Appendix F
Example Declaration of Inspection Form

DECLARATION OF INSPECTION

LOCATION & NAME OF FACILITY _____

NAME OF VESSEL _____

DATE TRANSFER OPERATIONS STARTS _____

An oil transfer operation may not commence to or from a vessel unless the following requirements are met and agreed upon by the respective transferring and receiving persons in charge.

Persons in charge indicate by a check (√), in the appropriate spaces, that the specific requirement has been met.

VESSEL	FACILITY
_____ A. The mooring lings are adequate for all anticipated conditions.	_____
_____ B. Cargo hoses and/or loading arms are long enough for intended use.	_____
_____ C. Cargo hoses are adequately supported to prevent undue strain on the couplings.	_____
_____ D. The transfer system is properly lined up for discharging or receiving oil. (Additional checks shall be performed each time a valve is repositioned.)	_____
_____ E. Each flange connection on the cargo system not being used during the transfer operation is blanked or shut off.	_____
_____ F. The cargo hoses and/or loading arms are connected to the manifolds using gaskets and a bolt in every other hole, (minimum of 4 bolts). Exception: Tanks without fixed loading systems per waiver from the Captain of the Port.	_____
_____ G. The overboard or sea suction valves are sealed or lashed in the closed position.	_____
_____ H. Adequate spill containments have been provided for couplings.	_____
_____ I. All scuppers or other overboard drains are closed or plugged.	_____
_____ J. A communications system is provided between the facility and the vessel.	_____
_____ K. Emergency shutdown system is available and operable.	_____
_____ L. Communication procedures are established and understood between persons in charge.	_____
_____ M. Qualified and designated personnel are in charge and on duty at the terminal and vessel control stations. .	_____
_____ N. One person at the vessel control station is present who fluently speaks the language of the terminal control station.	_____
_____ O. The owner of the cargo hoses will insure test requirements have been met and that the hose has no loose covers, kinks, bulges, soft spots or gouges, cuts and slashes which penetrate the hose reinforcement and that hoses are marked for identification and test data is maintained in a test log.	_____
_____ P. Adequate lighting of the vessel and terminal work areas and manifold areas is provided.	_____
_____ Q. Persons in charge have held a conference to assure the mutual understanding of the following transfer operations:	_____
_____ . . . 1. Product identity to be transferred.	_____
_____ . . . 2. Sequence of transfer operation.	_____
_____ . . . 3. Transfer rate of flow	_____
_____ . . . 4. Name or title and location of each person participating in the transfer operation	_____
_____ . . . 5. Particulars of the transferring and receiving systems	_____
_____ . . . 6. Starting, stripping, topping and shutdown have been discussed and understood . . .	_____
_____ . . . 7. Emergency procedures including notification, containment and cleanup of spills . . .	_____
_____ . . . 8. Watch and shift arrangements . . .	_____
_____ . . . 9. Notification before leaving stations . . .	_____

The following items are to be filled out by Vessel personnel only.

- _____ . . . 1. Warning signs and read warning signals (35.35-30).
- _____ . . . 2. Repair work authorization (35.35-30).
- _____ . . . 3. Boiler and galley fires safety (35.35-30).
- _____ . . . 4. Fires or open flames (35.35-30).
- _____ . . . 5. Safe smoking space (35.35-30).

I certify that I have read, understand and agree with the foregoing as marked and agree to begin/continue the transfer operation.

PERSON IN CHARGE OF VESSEL	Signature	PERSON IN CHARGE OF FACILITY	Signature
	Title		Title
	Time Date		Time Date

The operator of each facility and the operator of each vessel shall retain a signed copy for at least a month.

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Appendix G
Example Maintenance and Inspection Forms

**SPILL PREVENTION AND RESPONSE
TRAINING ACTIVITY REPORT**

DATE OF TRAINING: _____

LOCATION: _____

INSTRUCTOR/COMPANY: _____

COURSE/TOPICS/HOURS: _____

SOURCE/TYPER OF TRAINING MATERIALS

NAME OF PARTICIPANTS

LAST NAME	FIRST NAME	SIGNATURE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

This form shall be completed for all spill prevention and response related training except for monthly safety/prevention meetings, which are documented on a separate form.

OPA 90 "PREP" training shall be recorded on this form and on the documentation form provided by the Coast Guard.

To comply with State requirements, annual training will include a practice exercise on spill prevention during abnormal operations.

This form shall be maintained at the Terminal for a period of five years.

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MONTHLY, QUARTERLY, AND YEARLY INSPECTION FORM

Monthly Events Year:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Check Cathodic Protection System												
Check Spill Response Equipment												
Check Fire System & Extinguishers												
Check All Tank High Level Arms												
Hold Safety & Spill Prevention Meeting												

Quarterly Events	January	April	July	October
Grease Valves, Truck & Rail Rack				
Review Oil Spill Contingency Plan				
Inspect Vapor Recovery Unit				
Quarterly Safety Inspection				

Yearly Events	Year:
Pressure Test Pipelines and Hoses	
Inspect Cathodic Protection System	
Check Fire Extinguisher and Foam System	
Check Back-Flow Preventor Valve	

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Appendix H
General Inspection, Maintenance,
and Product Control Procedures



Appendix H

General Inspection, Maintenance, and Product Control Procedures

Daily Inspections and Product Inventory Control Documentation

1. Gauge tanks and record temperature and meter readings on all tanks. While performing gauging duties, visually inspect tanks, product lines, pumps, valves, and other equipment. Complete Daily Gauging and Terminal Inspection Sheet.
2. Input gauge, temperature, and meter data into the computer control system.
3. Input receipts or deliveries into the computer.
4. Distribute bills of lading to the appropriate offices.
5. Generate daily delivery and inventory report. Compare computer calculations with manual totals on delivery sheet.
6. Monitor schedule for pending receipts.
7. Input meter readings into the computer system, generate meter report. Distribute appropriate copies. Record copy to terminal file.
8. Compare movement and inventory data with daily delivery information to verify that inventories are accurate.
9. Send daily reports to appropriate offices and file one report locally.

Weekly Procedures

1. Back up computer system on disk and put into a secured storage.
2. Inspect any Dangerous (Hazardous) Waste accumulation drum(s), record inspection results on posted inspection form.

Monthly Procedures

1. Take physical inventory by hand gauging all tanks.
2. Inspect tank roofs and rooftop equipment while doing hand gauging.
3. Check all valve packing for leaks. Correct per Manufacturer's Service Manual. Stroke each valve five turns to assure operational readiness.
4. Check all flanges and fittings for leaks and repair/replace as necessary.
5. Complete wharfage report. Send copy to Port of Vancouver.
6. Complete terminal exchange reports and balance with movement and inventory report.
7. Monitor cathodic protection readings and record in log.
8. Hold safety meeting.
9. Conduct SPCC Monthly Inspection of area and record in log.

Quarterly Procedures and Preventative Maintenance

1. Conduct safety inspection and record in log.
2. Perform MVCU maintenance and adjustments (contract maintenance).
3. Pump and motor inspection and maintenance (see following guidelines).

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Annual Procedures

1. Test foam fire protection system(s) (contract maintenance and inspection).
2. Test back flow preventor valve (contract maintenance and inspection).
3. Test fire extinguishers (contract maintenance and inspection).
4. Pressure test dock hose, shoreline and all underground product lines for leaks per Coast Guard pressure requirements. Stencil latest hydrotest date on hose and pipes.
5. Coast Guard dock inspection (scheduled by Coast Guard).
6. Port of Vancouver facility environmental inspection (scheduled by Port of Vancouver).

Quarterly Pump and Motor Inspection and Maintenance Checks

1. Inspect Pumps and Motors for Leaks and Proper Lube Oil Level.
 - a. Mechanical Seals: If seal is leaking, replace per manufacturers recommendations.
 - b. Bolted Joints: Inspect case, seal flush lines, and suction and discharge connections for leakage. Tighten bolts or replace gaskets as required.
 - c. Lube Oil Leaks: Inspect motor and pump bearings for oil leaks and proper oil level.
2. Pump and Motor Noise and Vibration Checks
 - a. Roller Bearings: Damaged bearings may emit a high-pitched squealing or a lower pitched growling noise. Bearing housings may get warm or even hot to touch. Roller bearings with these indications are either worn or damaged and should be replaced.
 - b. Cavitation: Cavitation may sound like rocks in the pump and will produce erratic discharge pressure. Prolonged cavitation will result in damage to the impeller and possible bearing damage. Throttling the discharge of the pump or increasing pressure to the suction can reduce cavitation. A plugged suction screen will also cause cavitation.
 - c. High Overall Vibration: Excessive vibration may be caused by cavitation, bearing damage, misalignment, bent shafts, looseness, or out of balance. Pumps and motors must not be run with excessive vibrations. If vibration is occurring, check each of the above possible causes and correct.
3. High Temperature at Pumps and Motors
 - a. Pump Casing High Temperature: High temperature of the pump case may be caused by low flow through the pump. Check for blocked or throttled discharge and signs of cavitation. High temperatures may be evident by seal or gasket failure and/or a vapor lock.
 - b. Pump and Motor Bearing High Temperature: High temperature in pumps or motor bearings usually is caused by loss of cooling (no product in line) or damaged bearings. Check for both if pump or motors are running hot.
 - c. Motor Frame: High temperatures can be caused by overload on the motor. If this is suspected, contact electrician and check amperage draw against nameplate ratings.
4. Fittings and Mount Looseness at Pumps and Motors
 - a. Normal operating conditions can loosen fittings with time. Check all guards, motor and pump base plates, mounting bolts, and all appurtenances for bolt tightness. Replace bolts, washers, nuts, etc. as appropriate.
5. External Corrosion at Pumps and Motors
 - a. Exposed pumps and motors, valves and flanges, and pipe work can corrode. Check exposed metal in base plates as well as equipment for signs of corrosion. Paint, re-enforce or replace as needed.

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Appendix I
Example Oil Transfer Load Plan

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Appendix J
Example Advance Notice of Oil Transfer



Advance Notice of Oil Transfer

To: Prevention Section
 Dept. of Ecology, Spills Program

FAX: 1-800-664-9184 or **E-mail** to OilTransferNotifications@ecy.wa.gov

* - Indicates required fields by rule Questions about Advance Notice of Transfers can be answered by calling 360-407-7390	
*Delivering Company Name:	
*Company Address:	
*Company Contact Name:	*Contact Phone () Number:
*Start Date: (mm/dd/yy)	*Start Time: (hhmm)(24-hr clock)
*Duration (hh.mm): (decimal hours)	
Deliverer Type: (Check one)	Vessel <input type="checkbox"/> Fixed Facility <input type="checkbox"/> Mobile <input type="checkbox"/>
*Name of Deliverer:	
Receiver Type: (Check one)	Vessel <input type="checkbox"/> Fixed Facility <input type="checkbox"/>
*Name of Receiver:	
Berth Location:	Anchor Location:
*Address or Location of Transfer:	
*City of Transfer:	
*Product or Type of Oil(s): 1 2 3 / /	*Quantity: Gallons <input type="checkbox"/> or Barrels <input type="checkbox"/> 1 2 3 / /
Purpose of Transfer: <input type="checkbox"/> Cargo <input type="checkbox"/> Fueling <input type="checkbox"/> Lube/Hydraulic <input type="checkbox"/> Waste Oil <input type="checkbox"/> Bilges	
*Pre-boomed? Yes: <input type="checkbox"/> No <input type="checkbox"/>	
Comments:	

Ecology is an equal opportunity employer. To receive this form in an alternate format, please contact the Spills Prevention Program at (360) 407-7390 (voice) or 711 and 1-800-833-6388 (TTY)



Vancouver Energy

Appendix K, Safe and Effective Threshold Determination Report

Plan No. OP.05, Operations Facility Oil Handling Manual | Revision 00

Approved by:

Name, Title: Kelly Flint, Senior Vice President and Corporate Counsel, Savage Companies
Designated Agent for EFSEC Application No. 2013-01
Date: 26 June 2015

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Appendix K, Safe and Effective Threshold Determination Report

EFSEC Application for Site Certification No. 2013-01

Docket No. EF131590

26 June 2015



Prepared for

Tesoro Savage Petroleum Terminal LLC
5501 NW Old Lower River Road
Vancouver, Washington 98660

Prepared by

BergerABAM
210 East 13th Street, Suite 300
Vancouver, Washington 98660

Job No. A13.0267.02



Vancouver Energy

Appendix K, Safe and Effective Threshold Determination Report

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1. Summary

This safe and effective threshold determination report has been prepared for Tesoro Savage Petroleum Terminal LLC's (Company) Vancouver Energy (Facility). The report provides the Facility's Terminal Person-In-Charge (TPIC) of pre-booming for oil transfer operations at the dock for the Facility terminals with the threshold values for environmental conditions that allow the safe and effective deployment of oil boom around vessels prior to and during oil transfer operations.

As of 26 October 2006, Washington State rules were adopted for Facility Oil Handling Standards (Washington Administrative Code [WAC] 173-180) and Vessel Oil Transfer Advance Notice and Containment Requirements (WAC 173-184). These rules require that Class 1 facilities, such as the Facility's terminals, develop guidance on criteria and threshold values for the safe and effective deployment of oil boom for pre-booming operations.

Table 1. Pre-Boom Decision Tool

Note: This table is the key decision-making tool for deploying or not deploying boom. It is part of the form that is filled out by the Boom Boat Captain. Keep the Shift Supervisor (Shift SUP) informed of weather changes that may trigger the use of this form. Note that the Shift Sup = TPIC.

Environmental Conditions		GREEN		ORANGE		RED	
		If <u>ALL</u> conditions are GREEN		If <u>ONE</u> condition is ORANGE		If <u>ONE</u> condition is RED	
		BOOM?	YES	BOOM?	Shift SUP	BOOM?	NO
		REMOVE BOOM?	NO	REMOVE BOOM?	Shift SUP	REMOVE BOOM?	NO
				NO GO or EARLY TERMINATION: Shift SUP submits DOE Boom Reporting Form.		EARLY TERMINATION: Shift SUP determines if safe for boom removal.	
1.	WINDS	0 - 10 knots		10 - 20 knots		> 20 knots	
2.	WAVE HEIGHT	0 - 1 foot		1 - 3 feet		> 3 feet	
3.	WAVE TYPE	Low swells, ripples, or flat calm		Slight chop, steep swells, white caps		Steep choppy breaking waves	
4.	CURRENTS	0 - 0.5 knot		0.5 - 1.0 knot		>1.0 knot	
5.	VISIBILITY	Unlimited		< 2 miles		< 1,000 feet	

Shift Supervisor (Shift SUP) decision to boom or terminate booming early will be based on Operational Factors.

For any conditions within the ORANGE range, the Shift SUP, in consultation with the Boom Boat Captain, must make a case-by-case determination of whether conditions are safe and will promote effective booming. The Shift SUP and Boom Boat Captain will also consider whether conditions are forecast to degrade such that they decrease safety or boom effectiveness below acceptable thresholds based upon the following Operational Factors.

- Ability of boom boat to operate safely in present and forecast conditions; the new style is rated up to 5 knots whereas the older style is only rated to 2 to 3 knots and is part of the effective stance.
- If boom boat freeboard and present/forecasted wave conditions could put personnel at risk of pinch point or other injuries when making boom connection or operation over the side or stern.
- The ability of the boom to contain any potential oil.



1.1 Safety and Environmental Conditions

1.1.1 Personnel Safety

Safety of personnel is the first and overriding priority for the Facility's pre-booming and oil transfer operations at the Facility dock. The Facility TPIC at the dock has the ultimate responsibility and authority to determine if it is safe for personnel to deploy oil boom to meet the pre-booming requirement. That is, the TPIC may determine that, even though the environmental threshold values described later in this report are not exceeded, there are other factors that render the pre-booming operation unsafe for personnel and, therefore, the TPIC may terminate the pre-booming operation. In this situation and any other situation where the TPIC determines that pre-booming is not safe and/or effective, the TPIC will document the circumstances supporting the decision to not pre-boom.

Personnel safety during pre-booming may be compromised by one or more of the following conditions.

- High winds
- Waves, especially high, choppy (i.e., short period) waves
- Large floating/barely submerged debris carried by strong currents
- Icy conditions
- Heavy fog, rain, or other conditions that reduce visibility to unsafe levels
- Other conditions as determined and documented by the TPIC or contractor responsible for deploying the boom

1.1.2 Primary Environmental Conditions

1.1.2.1 Sea State (Wave Height and Period)

In the Port of Vancouver USA (Port) area, wave height and period (i.e., time between wave crests passing a fixed point) do not appear to have been continuously recorded. Under most wind and wave regimes, the location of the Facility dock is sheltered from significant wind-driven wave action. However, the Facility terminal manager reports that southeasterly and northwesterly winds exceeding 25 knots (~29 miles per hour [mph]) may occur and result in waves greater than 2 to 2.5 feet high that could affect pre-booming safety and effectiveness during the oil transfer operations.

Bow waves and wakes from large commercial and recreational vessels passing on the Columbia River occasionally may be large enough (e.g., >2 to 2.5 feet) to limit the effectiveness of the boom and affect the safety of the contractors deploying or maintaining it. This effect is temporary (e.g., on the order of a minute) but does require visual monitoring for safety reasons.

1.1.2.2 Water Currents

Continuous and long-term recorded current data for the surface currents in the Columbia River at the Port apparently are not available or do not exist. The Facility terminal manager and response contractor personnel note that, based on their experience, the estimated current speed in the vicinity of the Facility dock is usually on the order of 1 to 3 knots (~1.2 to 3.5 mph) and, in flood flows, may exceed 5 knots (~6 mph) at the dock face. Modeled current flow data for the project area from the National Oceanic and Atmosphere Administration (NOAA) Northwest River Forecast Center (Portland, Oregon) indicates that the monthly average current velocity ranged from 0.7 to 1.8 knots (~0.8 to 2 mph), with maximum currents occurring in May and June and ranging from 1.6 to 2.1 knots (~1.8 to 2.3 mph). In all months, maximum current speed exceeds 1 knot part of the time.

1.1.2.3 Weather (Wind and Precipitation)

Wind velocity and precipitation data were available from the National Weather Service (NWS) for Pearson Field Airport (about 2 miles east of Vancouver, Washington). The wind direction data were obtained from a long-term dataset (30-year monthly averages) maintained on the U.S. Department of Agriculture (USDA) National Water and Climate Center website for the Portland International Airport (PIA). The PIA is

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located across and about 5 miles upriver from the Port. Based on the PIA dataset, the wind in this area averages 8 to 11 mph (~7 to 10 knots) from the east-southeast during the months of October through March and approximately 8 mph from the northwest for April through September. The Vancouver NWS data, however, indicate that maximum sustained winds can occasionally exceed more than twice these averages and the Facility terminal manager’s observations support this assessment. Rainfall is greatest from about late September through April but rain does occur in all months of the year. Rainfall is seldom heavy enough to, by itself, pose a safety hazard to the personnel involved in pre-booming.

1.1.3 Other Conditions

- According to the Facility terminal manager and dock personnel, other conditions that might affect pre-booming are
 - Large floating/barely submerged debris carried by strong currents.
 - Low visibility due to heavy fog, rainfall, or snowfall.
 - Freezing conditions from a combination of high winds, cold weather, and rain/sleet/snow fall may cause ice buildup on the dock and/or vessel used for deploying boom.
 - Other commercial vessel traffic in the immediate vicinity of the dock typically will not restrict pre-booming.
 - Recreational activities are very limited in the vicinity of the terminal dock and should not affect pre-booming.

1.1.4 Efficacy of Oil Boom under Environmental Conditions

Ideal performance conditions for booms used by the Facility are

- Surface current speeds < 1.0 knot perpendicular to the long axis of the boom
- Surface current speeds < 3 to 5 knots at increasingly acute angles to the long axis of the boom
- Wave heights < 1.5 to 2 feet
- Wind speeds < 20 knots (~23 mph)

Generally accepted rules among the response industry are:

- Current speeds > 0.8 to 1.0 knot perpendicular to the long axis of the boom begin to result in product loss
- Current speed > 1.5 knots perpendicular to the long axis of the boom will result in significant or complete product loss; i.e., boom efficacy approaches zero
- Waves > 18 to 24 inches high will result in splash-over of product reducing boom effectiveness by 10 to 20 percent
- Waves 24 to 30 inches in height will dramatically decrease the effectiveness of the boom
- Waves > 30 inches will render the boom essentially useless for retaining oil, even if the water current speeds are essentially zero
- Large debris entangled in the boom or lines will render the boom largely to completely ineffective

1.2 Safe and Effective Threshold Values

1.2.1 Personnel Safety Threshold Values

Because safety of personnel is the first and overriding priority for the Company pre-booming and oil transfer operations at the Facility dock, the TPIC may determine that, even though the environmental threshold values described following are not exceeded, there are other factors that render the pre-booming operation unsafe for personnel and, therefore, the TPIC may terminate the pre-booming operation.

1.2.2 Environmental Conditions Threshold Values

The following are threshold values for environmental conditions above which the TPIC will consider it not safe and/or effective to pre-boom.

- Water current speed > 1.5 knots will be the effective threshold value
- Wave heights > 2 to 2.5 feet will be the safe and effective threshold value

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- Sustained wind speed greater than 30 knots (~35 mph) will be the safe and effective threshold value
- Low visibility resulting from fog, heavy precipitation, or snow at the dock and/or boom deployment vessel that, in the opinion of the TPIC, jeopardizes the safety of personnel involved in pre-booming
- Freezing and icy conditions that, in the opinion of the TPIC, jeopardize the safety of personnel involved in pre-booming
- Presence of large floating/barely submerged debris that, in the opinion of the TPIC, jeopardizes the safety of personnel involved in pre-booming

2. Introduction

2.1 Purpose

The purpose of this report is to provide the TPIC of oil transfer operations at the Facility terminal with the threshold values for environmental conditions that allow the safe and effective deployment of oil boom around vessels prior to and during oil transfer operations (also referred to as pre-booming).

2.2 Objectives

The objectives of the analysis and report are to

- Comply with the Safe and Effective Threshold Determination Report requirements of the Washington State Facility Oil Transfer Regulations (WAC 173-180-224)
- Identify personnel safety conditions and provide guidance on threshold criteria and values
- Identify oil boom oil-retention efficacy under a range of environmental conditions
- Provide guidance on criteria and threshold values for environmental conditions affecting personnel safety and oil-retention efficacy

2.3 Location of Terminal Dock

The Facility is located at the Port within the City of Vancouver in Clark County, Washington. The site is located on the Washington shore of the Columbia River. State Route 501 (Lower River Road) is located immediately to the north of the site and is available from the east. The site is located in the SE 1/4 of Section 18, NW 1/4 of Section 19, and the NW and NE 1/4 of Section 20, Township 2 North, Range 1 East W.M. Berths 13 and 14 are located at approximately Columbia River Mile 103.5.

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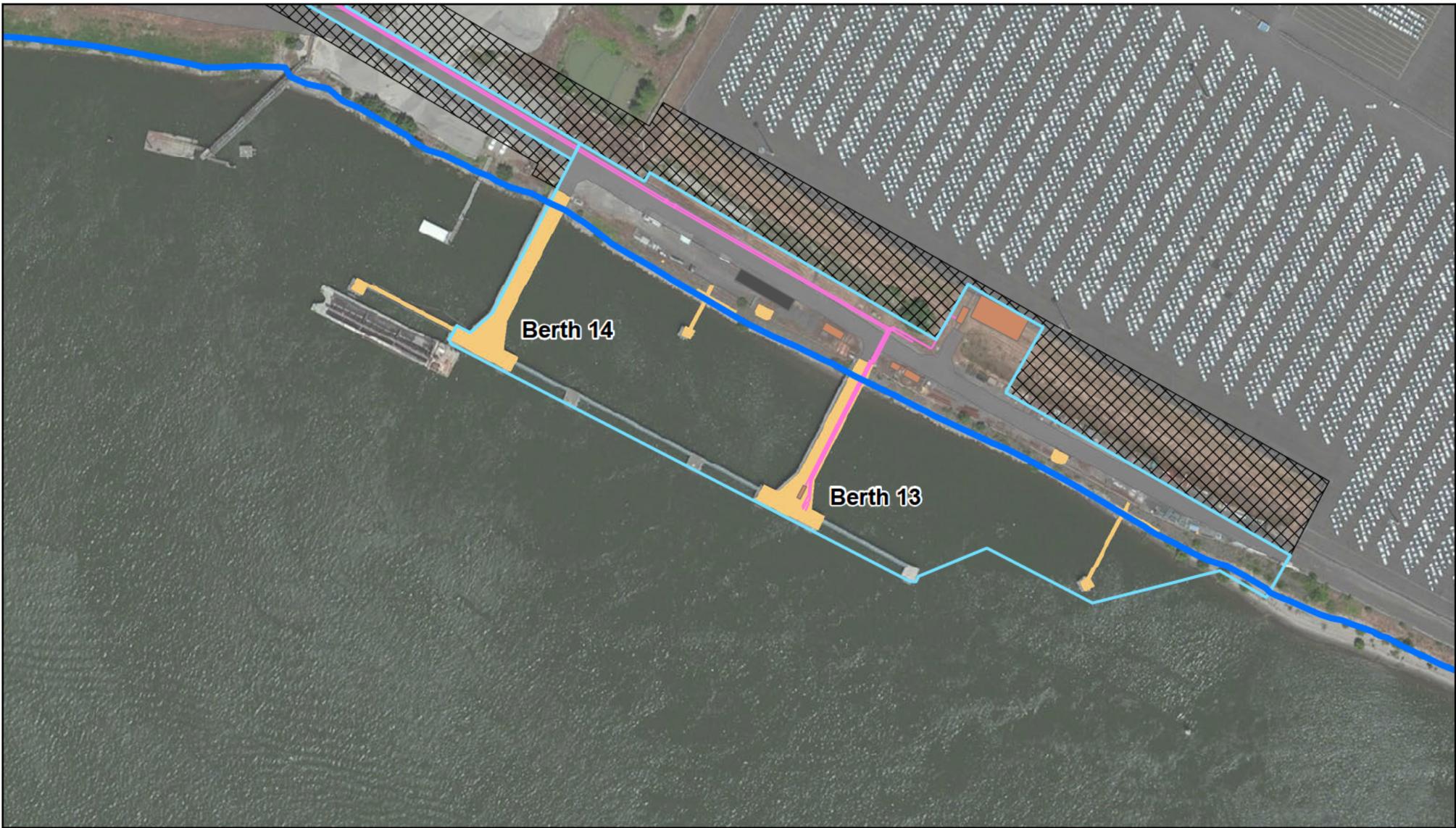


Figure 1 - Aerial View of Berths 13 and 14

LEGEND

Proposed Project Facilities

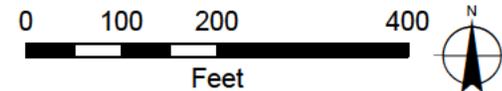
- | | | |
|---|---|---|
|  Lease Boundary |  Building |  Transfer Pipeline |
|  Construction Boundary |  Roads |  Ordinary High Water |
|  Parking |  Marine Terminal | |

Date: May 2015

Map Notes: Aerial photo dated July 2010, courtesy of ESRI World Imagery service



Tesoro Savage Petroleum Terminal LLC





2.4 Background

As of 26 October 2006, Washington State rules were adopted for Facility Oil Handling Standards (WAC 173-180) and Vessel Oil Transfer Advance Notice and Containment Requirements (WAC 173-184). These rules require that Class 1 facilities, such as the Facility, develop guidance on criteria and threshold values for the safe and effective deployment of oil boom around vessels during oil transfer operations.

The rule requires pre-booming of: (a) any bulk oil transfer operation greater than 500 gallons per minute from a vessel to a non-recreational vessel or facility, or (b) oil transfer from a Class 1 facility to a vessel, "... when it is safe and effective to do so..." The rule provides guidance on the determination of when it is, and is not, safe and effective to pre-boom the oil transfer vessel and facility.

This report provides the personnel safety and environmental criteria and threshold values for determination of when it is safe and effective to pre-boom at the Facility's dock. The analyses are based on data available from a variety of sources, including NOAA/NWS; weather stations at the terminal; boom manufacturers' technical specifications for their products; experience of the oil spill response contractors retained by the Facility for the terminal; other contractors retained by the Facility to handle normal docking and oil transfer operations at the dock; and on-site observations and experience of the dock operators and other Facility personnel.

3. Site-Specific Safety and Environmental Conditions

3.1 Personnel Safety

Facility TPIC at the terminal dock has the ultimate responsibility and authority to determine if it is safe for personnel to deploy oil boom to meet the pre-booming requirement. That is, the TPIC may determine that, even though the threshold values described later in this report are not exceeded, there are other factors that render the pre-booming operation unsafe for personnel and, therefore, the TPIC may terminate the pre-booming operation. In this situation and any other situation where the TPIC determines that pre-booming is not safe and/or effective, the TPIC will document the circumstances supporting the decision to not pre-boom and to proceed with alternative measures as required in WAC 173-180-221 and WAC 173-180-222.

Personnel safety may be compromised by one or more of the following conditions.

- High winds that affect the docking of the vessel or maintaining its position at the dock during transfer operations, even if these winds do not result in large waves (e.g., sustained wind speeds greater than 30 knots).
- Waves, especially high, choppy (i.e., short period) waves that affect the stability and maneuverability of the vessels deploying the boom.
- Icy conditions that make the dock and/or boom deployment vessel slippery.
- Heavy fog, rain, or other conditions that reduce visibility to unsafe levels for the boom deployment crew.
- High river flow (e.g., flood conditions) carrying large debris, flotsam, and jetsam that could make small vessel operations unsafe (and likely render the boom ineffective if not completely inoperative).
- Other conditions as determined and documented by the TPIC or designee, or Facility response or other contractor responsible for deploying the boom.

3.2 Primary Environmental Conditions

3.2.1 Sea State (Wave Height and Period)

Under most wind and wave regimes, the location of the Facility dock is sheltered from significant wind-driven wave action. Except from southeasterly and northwesterly wind directions, the fetch (i.e., straight

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line distance in a specified direction over water from the dock to land or large structure. such as the Interstate 5 bridge) is short and waves usually are not an environmental factor for oil transfer operations. Even from the southeasterly and northwesterly directions (which is approximately parallel to the Columbia River channel in this area), the dock location is partially sheltered from wind-generated waves. The upstream and downstream structures, such as bridges and shoreline structures, partially break up the wind-driven waves.

In the Port area, wave height and period (i.e., time between wave crests passing a fixed point) do not appear to have been continuously recorded or are not publicly available if they were. However, the Facility terminal manager reports that southeasterly and northwesterly winds exceeding 25 knots (~29 mph) ¹ may occur and result in waves greater than 2 to 2.5 feet high that could affect pre-booming safety and effectiveness during the oil transfer operations.

Bow waves and wakes from large commercial and recreational vessels passing on the Columbia River occasionally may be large enough (e.g., > 2 to 2.5 feet) to limit the effectiveness of the boom and affect the safety of the contractors deploying or maintaining it. This effect is temporary (e.g., on the order of a minute) but does require visual monitoring for safety reasons.

3.2.2 Water Currents

Continuous and long-term recorded current data for the surface currents in the Columbia River at the Port were not identified despite Internet and literature searches, and contacts with the United States Geological Survey (USGS), NOAA, NWS, U.S. Army Corps of Engineers (USACE), Port, and cleanup contractors. Based on these efforts, it appears unlikely that long-term, continuous recorded data of current velocity data for the Port exist.

Based on experience at the nearby Tesoro Dock, the estimated current speed in the vicinity of the Facility dock is usually on the order of 1 to 3 knots (~1.2 to 3.5 mph) and, in flood flows, may exceed 5 knots (~6 mph) at the dock face. They reported that the current generally flows downriver (e.g., east to west) indicating that the tidal influence that reaches the Port has little effect on currents and does not impact booming operations or effectiveness.

Modeled current flow data (channel average) for the project area was obtained from the NOAA Northwest River Forecast Center (Portland, Oregon). The NOAA model uses certain “real-time” inputs (i.e., tide state and dam releases) to forecast flooding events. Given the apparent lack of recorded data, the modeled data represent a reasonable estimate of river channel current conditions at the Port over the period of 2003 to 2006 although it did not include the entire 2003 to 2006 time period. The results are summarized in Table 2 and Figure 2. Only the average, maximum, and minimum values for each month are included in Table 2 and Figure 2. Over the four-year period, the monthly average current velocity ranged from 0.7 to 1.8 knots (~0.8 to 2 mph), with maximum currents occurring in May and June and ranging from 1.6 to 2.1 knots (~1.8 to 2.3 mph). In all months, maximum current speed exceeds 1 knot part of the time. However, because of the structure of the dataset obtained, it was not practical to estimate the percentage of time over the four-year period that the current exceeded any specified value (e.g., 1 knot).

¹ Wind speed is typically reported in miles per hour by the weather service databases accessed for this report and the Facility. Weather station wind speed readout is in statute miles per hour. Marine operations typically report wind speed and water current speed in nautical miles per hour (knots). For this report, wind speed is presented in knots with speed in miles per hour provided in parentheses where appropriate. Also, for comparison, a statute mile is 5,280 feet and a nautical mile is 6,076 feet long.



Table 2. Summary of Environmental Data for Vancouver Energy Terminal Region

YEAR	MONTH	Precipitation (in) ¹				Wind (mph) ¹			Current (kts) ²		
		Avg	Max	Min	Total	Avg	Max	Min	Avg	Max	Min
2003	Jan	0.26	2.15	0	8.16	4	26	0	na ³	na	na
	Feb	0.11	0.81	0	2.24	3	23	0	na	na	na
	March	0.17	0.88	0	5.44	5	16	0	na	na	na
	April	0.16	0.73	0	4.89	4	17	0	na	na	na
	May	0.09	0.34	0	1.28	2	17	0	na	na	na
	June	0	0.1	0	0.25	3	18	0	na	na	na
	July	0	0	0	0	3	15	0	na	na	na
	Aug	0	0.03	0	0.04	3	15	0	na	na	na
	Sept	0.06	0.5	0	0.95	3	16	0	na	na	na
	Oct	0.11	0.88	0	2.88	4	18	0	na	na	na
	Nov	0.15	1.48	0	4.02	5	20	0	na	na	na
	Dec	0.25	1.59	0	8.02	5	31	0	0.9	1.4	0.1
2004	Jan	0.2	0.78	0	5.89	4	21	0	0.9	1.3	0.3
	Feb	0.13	0.61	0	4.16	4	22	0	0.9	1.3	0.4
	March	0.08	0.34	0	1.83	4	21	0	1.0	1.4	0.4
	April	0.05	0.31	0	0.83	4	23	0	1.1	1.6	0.5
	May	0.08	0.36	0	1.67	4	20	0	1.4	2.0	0.9
	June	0.07	0.36	0	0.93	5	24	0	1.4	1.9	0.7
	July	0	0.01	0	0.02	5	17	0	1.2	1.5	0.7
	Aug	0.13	0.84	0	2.68	5	18	0	1.0	1.2	0.7
	Sept	0.09	0.63	0	1.68	4	18	0	0.9	1.1	0.4
	Oct	0.13	0.69	0	3.54	4	23	0	na	na	na
	Nov	0.11	0.85	0	2.48	3	18	0	na	na	na
	Dec	0.14	0.59	0	4.3	5	30	0	na	na	na
2005	Jan	0.1	0.71	0	2.09	5	29	0	na	na	na
	Feb	0.07	0.66	0	1.24	4	23	0	na	na	na
	March	0.18	1.38	0	4.19	4	23	0	1.0	1.3	0.5
	April	0.13	0.58	0	3.59	5	29	0	0.9	1.5	0.4
	May	0.14	0.79	0	4.39	5	23	0	1.2	1.7	0.7
	June	0.09	0.45	0	2.12	5	17	0	1.2	1.6	0.6
	July	0.04	0.23	0	0.36	6	18	0	1.2	1.6	0.6
	Aug	0.03	0.8	0	0.81	6	17	0	0.9	1.2	0.4
	Sept	0.06	1.67	0	1.73	5	18	0	0.7	1.1	-0.1
	Oct	0.12	1.08	0	3.37	4	21	0	0.7	1.2	0.0
	Nov	0.18	1.23	0	5.23	4	24	0	0.8	1.2	0.2
	Dec	0.25	1.35	0	7.9	6	30	0	0.8	1.3	0.2



YEAR	MONTH	Precipitation (in) ¹				Wind (mph) ¹			Current (kts) ²		
		Avg	Max	Min	Total	Avg	Max	Min	Avg	Max	Min
2006	Jan	0.37	1.35	0	11.42	7	26	0	1.0	1.4	0.5
	Feb	0.1	0.63	0	2.33	6	31	0	1.1	1.5	0.6
	March	0.15	0.39	0	3.06	6	25	0	1.0	1.4	0.4
	April	0.1	0.48	0	2.38	5	22	0	1.6	2.0	0.5
	May	0.1	0.54	0	2.67	4	22	0	1.8	2.1	1.1
	June	0.08	0.45	0	1.18	5	18	0	1.8	2.1	1.1
	July	0.02	0.23	0	0.25	5	17	0	1.2	1.8	0.7
	Aug	0	0.11	0	0.12	5	17	0	1.0	1.4	0.4
	Sept	0.03	0.25	0	0.69	4	23	0	0.7	1.2	0.0
	Oct	0.08	0.42	0	1.41	3	22	0	0.7	1.1	-0.1
	Nov	0.55	2.9	0	13.31	6	29	0	0.8	1.3	-0.1
	Dec	0.1	0.64	0	7.16	5	23	0	0.9	1.5	0.2

¹ Precipitation and Wind Data: taken from the Weather Underground website (www.wunderground.com), which archives NWS data.

² Velocity Data: Calculated for Vancouver, WA by NOAA NW River Forecast Center

³ na = not available, usually because one or more of the input data were not available to NOAA

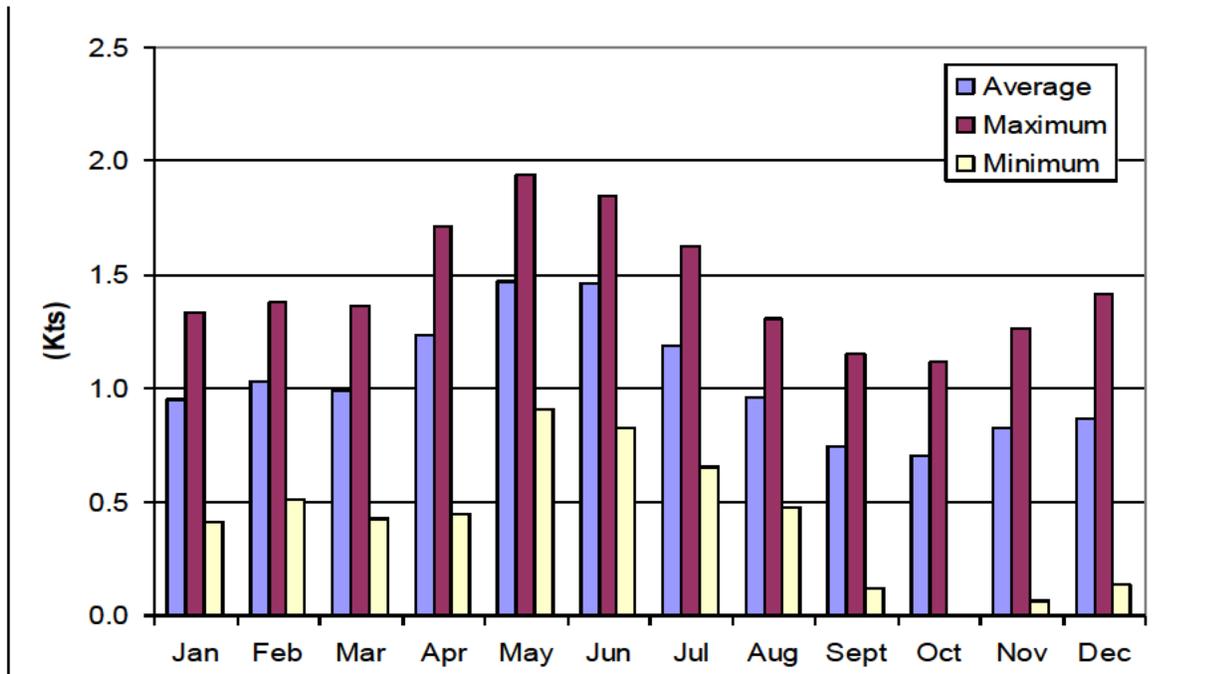


Figure 2. Columbia River Current Velocity near Vancouver, Washington (based on the 4 years of data provided in Table 2)



3.2.3 Weather (Wind and Precipitation)

The wind velocity and precipitation data presented in the summary Table 2 were collected at Pearson Field Airport (about 1.5 miles upriver of the dock and in southeast Vancouver, Washington) by NWS.

Because the wind direction information required was not available as a part of this dataset, these direction data were obtained from a long-term dataset (30-year monthly averages) maintained on the USDA National Water and Climate Center website for the PIA. The PIA is located across and about 5 miles upriver from the Port. The wind roses created by the USDA for this site are provided in Figures 3 to 8 and the information is summarized in Table 3. Based on the Portland USDA data, it appears that the wind in this area averages 8 to 11 mph (~7 to 10 knots) from the east-southeast during the months of October through March and approximately 8 mph from the northwest for April through September. The Vancouver NWS data (Table 2), however, indicate that maximum sustained winds can occasionally exceed more than twice these averages.

Most precipitation in the area is rainfall though occasional snowfall and rare hail or sleet storms occur in winter. Rain does occur in all months of the year and is greatest from about late September through April. Rainfall can be heavy but is usually not heavy enough for long enough duration to affect safety of the pre-booming operations.

Table 3. Thirty-year Average (1961-1990) Wind Speed and Predominant Direction Recorded at the Portland International Airport (Portland, Oregon)*

	Average Speed (MPH)	Primary Direction	Time From Primary Direction (%)
Jan	11	ESE	23
Feb	10.5	ESE	22
March	9.5	ESE	14
April	8.6	NW	11
May	8.1	NW	14
June	8.2	NW	17
July	8.3	NNW	23
Aug	7.9	NW	21
Sept	7.7	NW	14
Oct	7.9	ESE	11
Nov	10.1	ESE	19
Dec	10.6	ESE	24

* Long-term wind data obtained from the USDA National Water and Climate Center website <http://www.wcc.nrcs.usda.gov/climate/windrose.html>. Data are also presented in Figures 3 to 8 of this report.

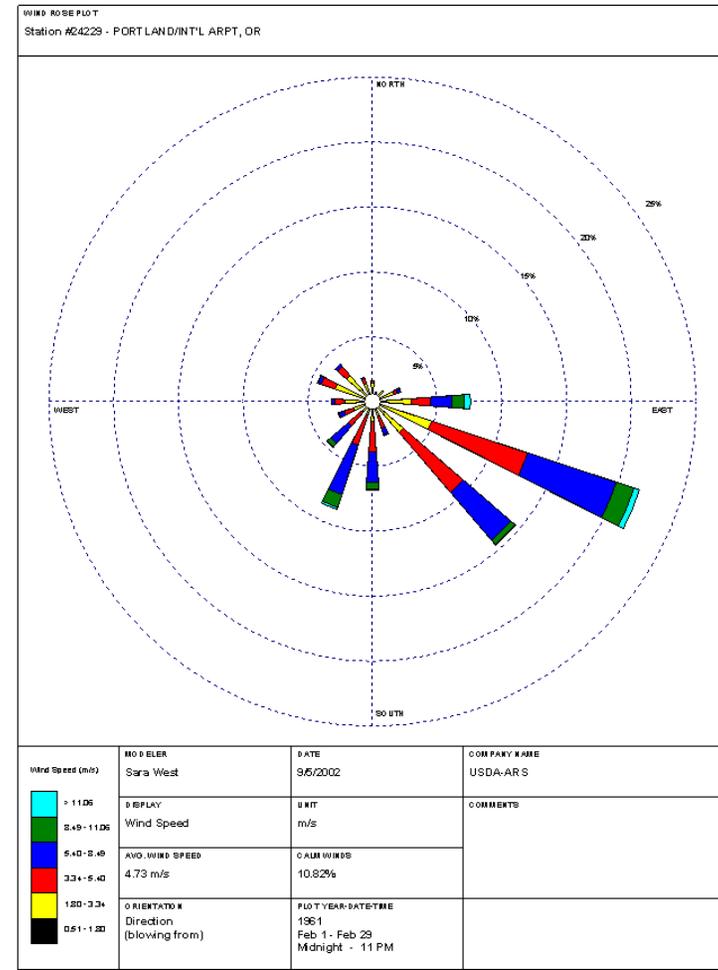
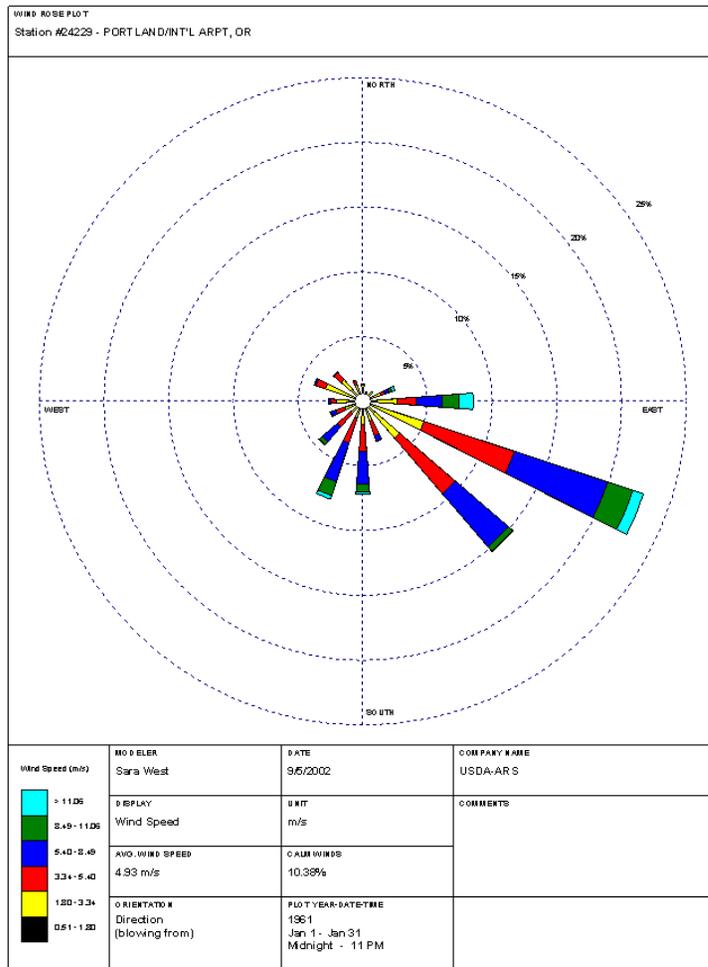


Figure 3. PIA, Portland, Oregon: Historical monthly average winds (Jan and Feb 1961-1990)

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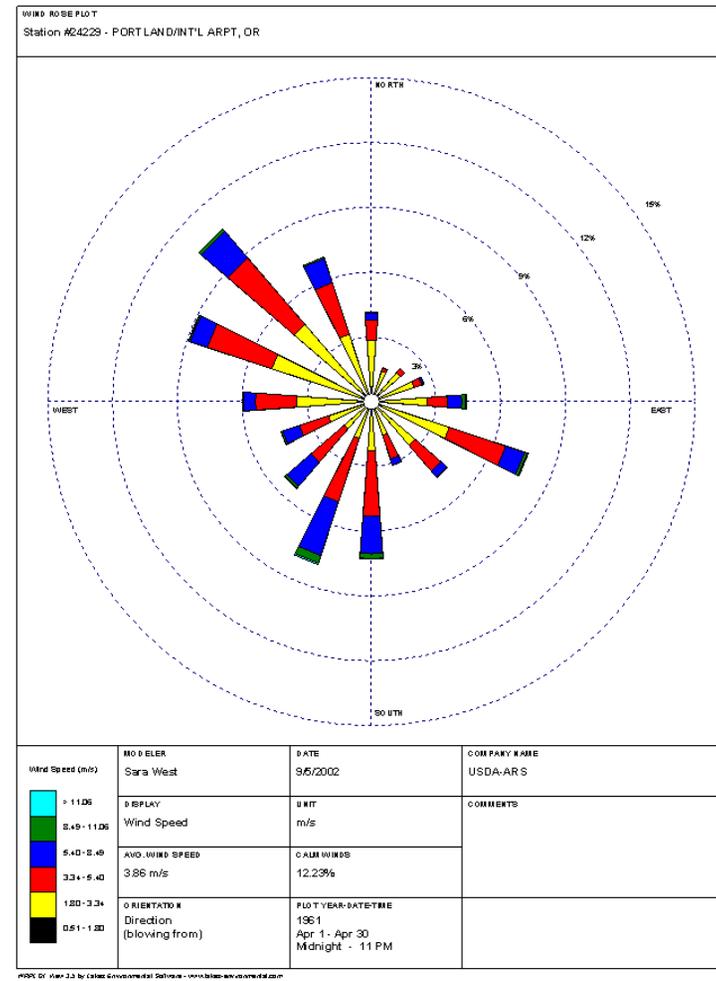
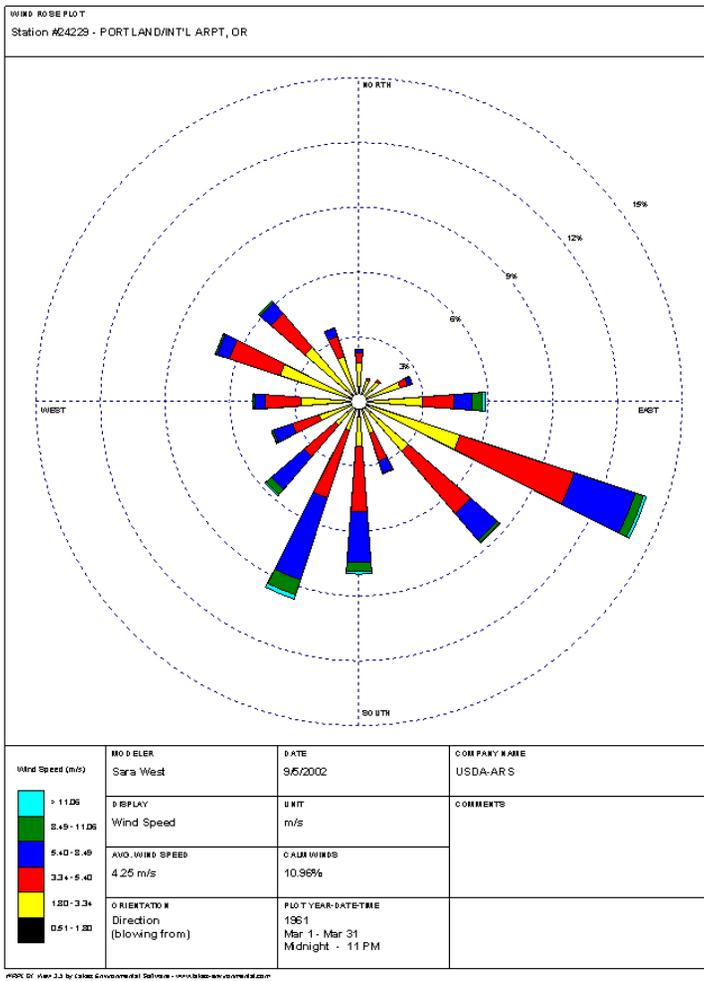


Figure 4. PIA, Portland, Oregon: Historical monthly average winds (March and April 1961-1990)

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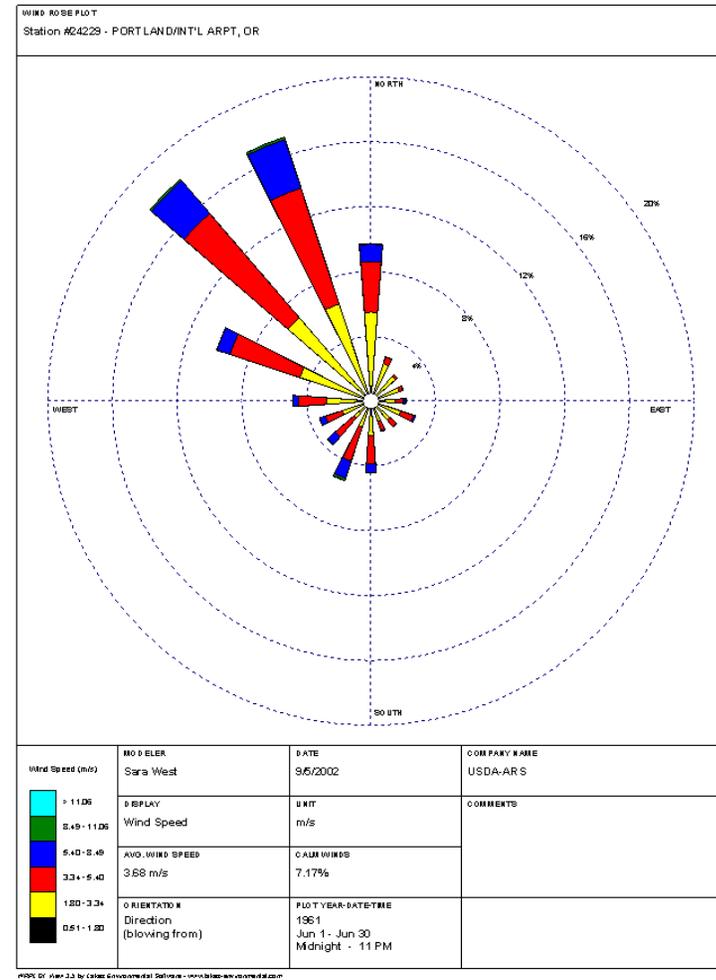
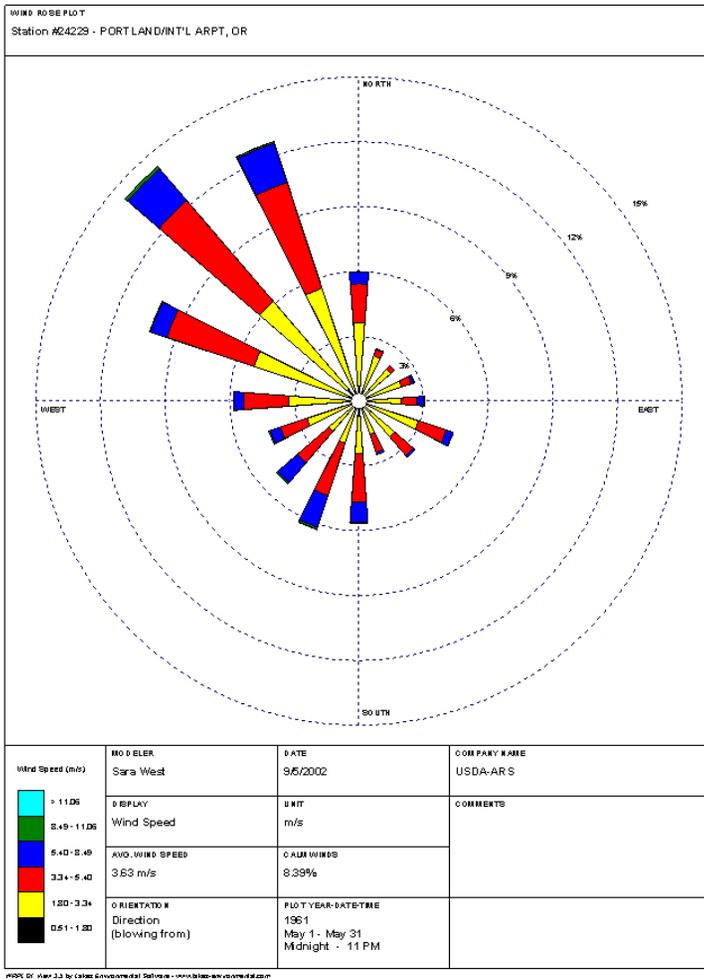


Figure 5. PIA, Portland, Oregon: Historical monthly average winds (May and June 1961-1990)

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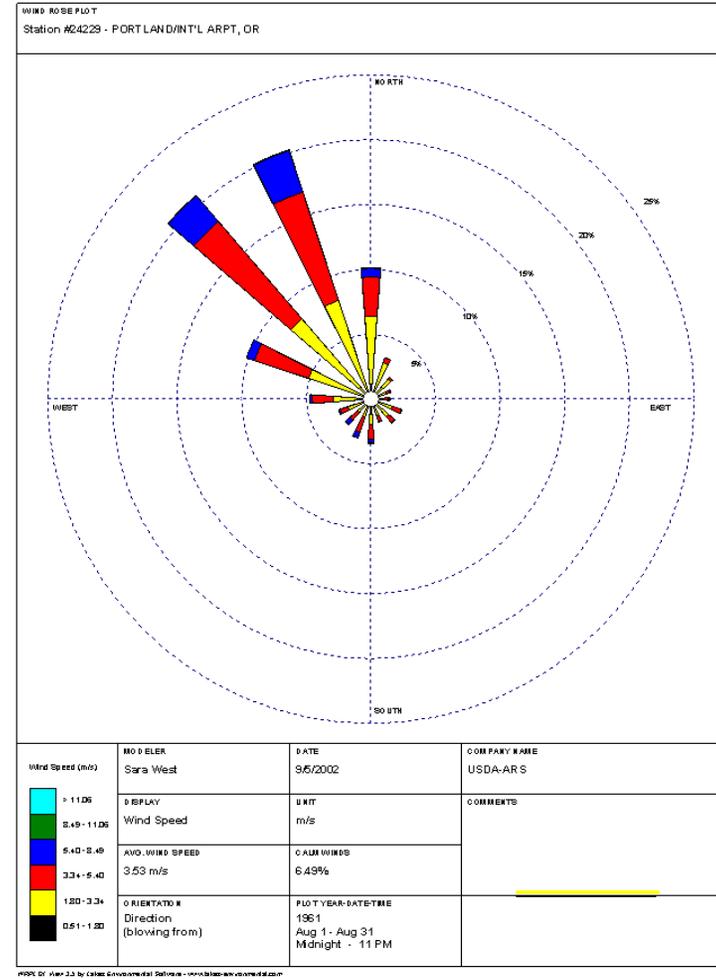
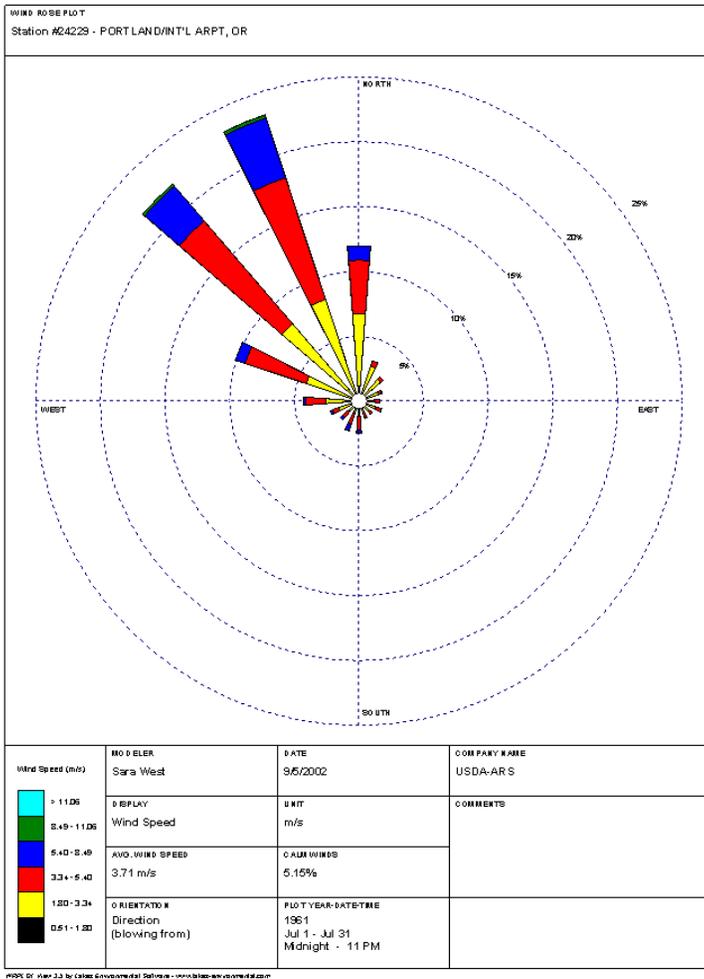


Figure 6. PIA, Portland, Oregon: Historical monthly average winds (July and August 1961-1990)

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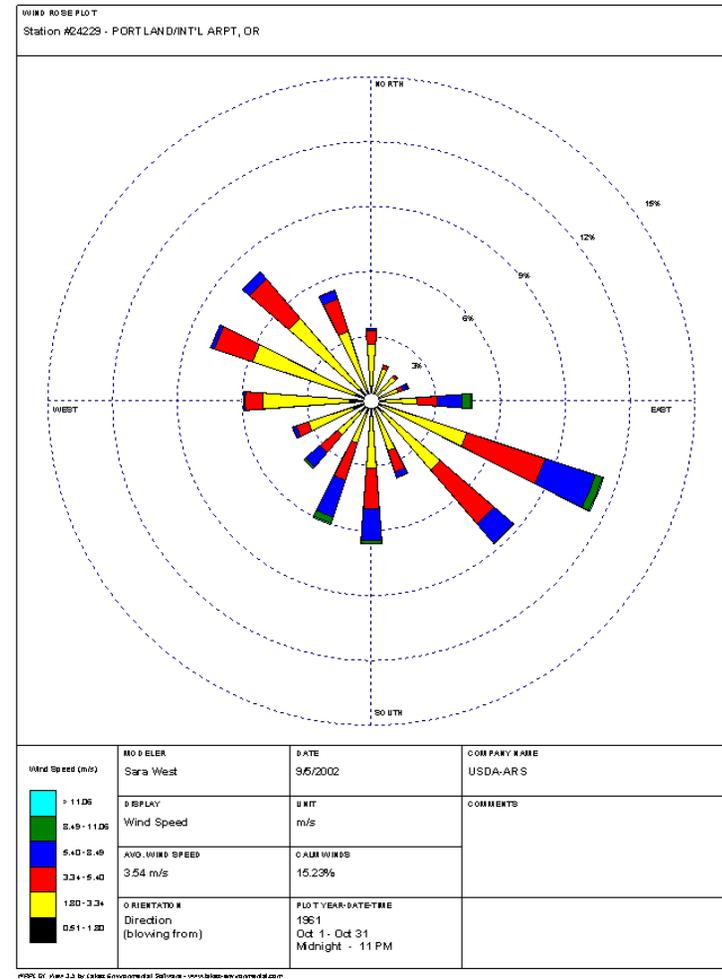
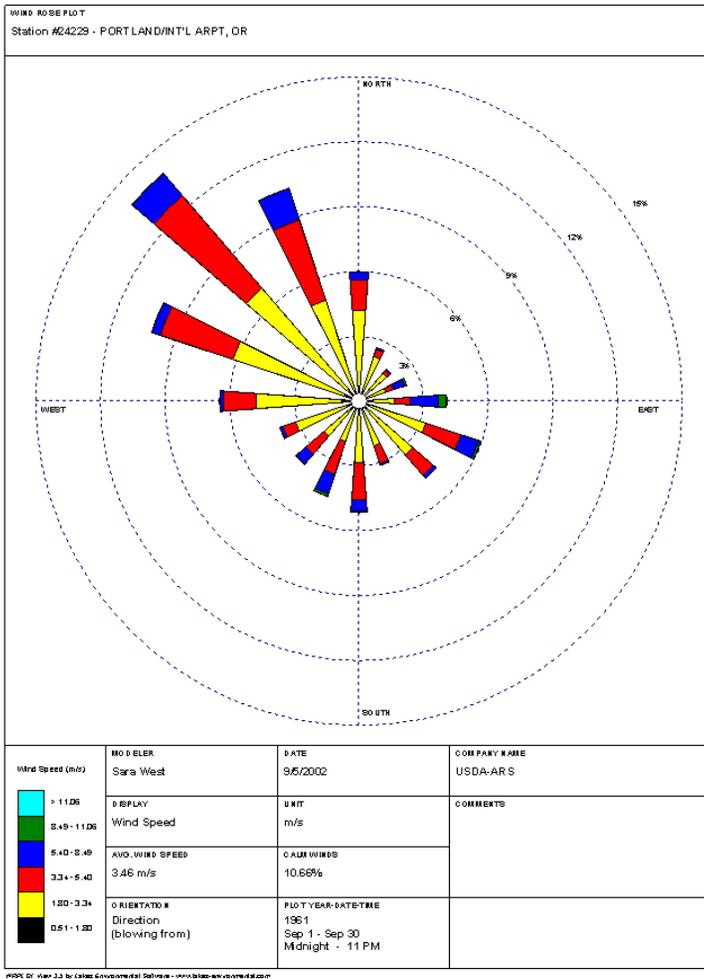


Figure 7. PIA, Portland, Oregon: Historical monthly average winds (Sept and Oct 1961-1990)

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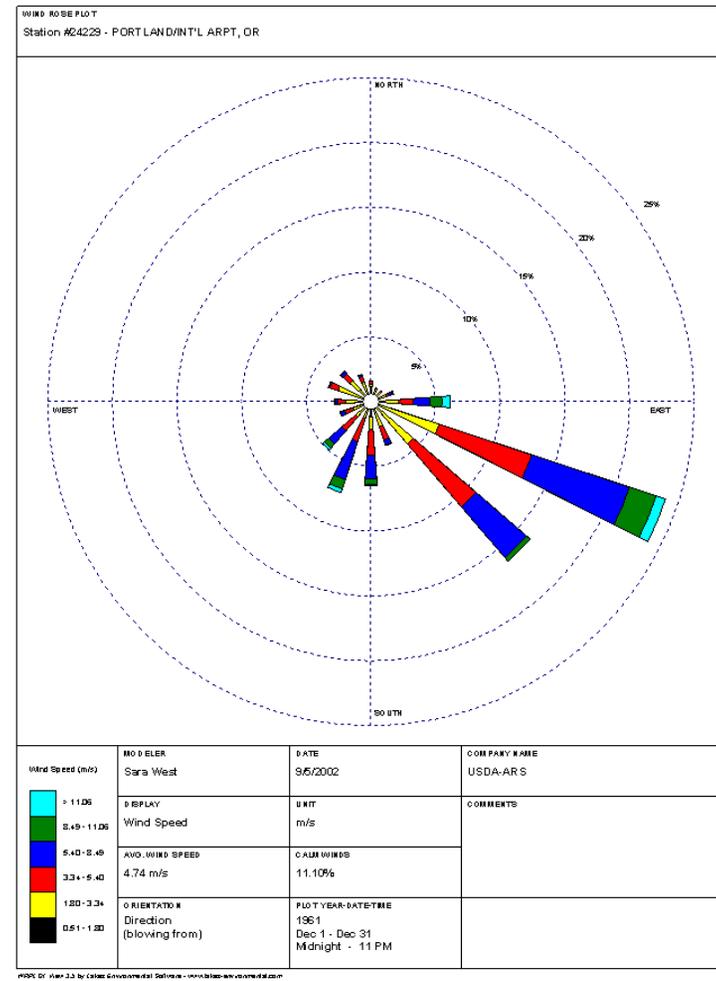
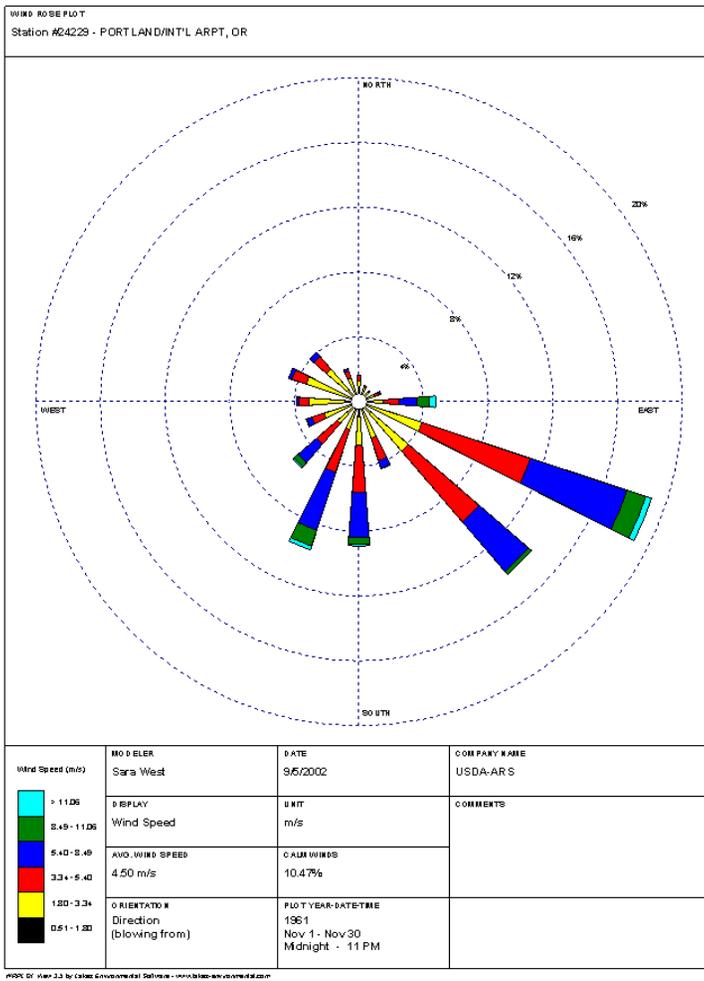


Figure 8. PIA, Portland, Oregon: Historical monthly average winds (Nov and Dec 1961-1990)

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3.2.4 Other Conditions that Influence Oil Transfer Operations

Large floating or barely submerged debris (e.g., logs, tree stumps, pieces of buildings, lumber, etc.) carried by high river flow (e.g., spring flood conditions) is a relatively common occurrence according to personnel at the Port. The debris could make small boat operations unsafe and likely render the boom ineffective if not completely inoperative.

Low visibility due to fog or, rarely, heavy rainfall or snowfall may occur at the dock.

Freezing conditions from some combination of high winds, cold weather, and rain/sleet/snow fall may cause ice buildup on the dock and/or vessel used for deploying boom (as well as on the vessel being loaded or unloaded). This could result in unsafe operating conditions for the personnel.

Other commercial vessel traffic in the immediate vicinity of the dock during an oil transfer operation will typically not restrict the ability of the Facility contractor to deploy boom around the vessel. However, passing large vessels (e.g., freighters, tugs, and tug/barge combinations) may create a wake that briefly impacts the safety of pre-booming operations.

Recreational activities are limited in the immediate vicinity of the dock and should not present a limitation to oil transfer operations. Passing large recreational vessels may create wakes that briefly impacts the safety of pre-booming operations.

4. Safe and Effective Threshold Values

4.1 Priority of Safe and Effective Threshold Values

Safety of the personnel assigned to the pre-booming of barges or ships prior to oil transfer operations is the first and highest priority for the Facility TPIC. This priority, whatever the reason, will supersede all environmental threshold values (though it may be influenced by one or more of these environmental conditions).

Once the safety of the personnel is assured to the TPIC's satisfaction, the TPIC will then evaluate the environmental factors that affect the efficacy of oil-retention by the deployed boom. If these conditions, primarily surface water currents or sea state (e.g., wave height and period), exceed the threshold values provided here as guidance, the TPIC will make and document the decision to pre-boom or not.

Though other factors may affect the TPIC's determination to pre-boom or not, the environmental conditions that have the greatest potential to affect personnel safety are described in the following sections.

4.2 Personnel Safety

The primary environmental conditions that generally influence personnel safety at the Facility dock during oil transfer operations are high winds, sea state, and presence of large debris. Low visibility or ice formation is infrequent but possible limitations from a safety perspective.

High winds may be detrimental to the pre-booming and other oil transfer operations at the dock. For the safety of dock personnel and the contractor deploying the boom, the Facility PIC may use Small Craft Advisory (SCA) conditions as an initial guide in the PIC's determination to authorize the launch or use of company-owned and operated oil spill response equipment for pre-boom deployment. These SCA conditions may either be present or forecasted. By definition, the NWS SCA conditions reference sustained winds under 33 knots (~38 mph) that may pose a hazard for small vessel operators. The Facility recognizes that, even if the SCA is issued or SCA conditions are applicable for the region, certain local conditions or combinations thereof may occur that could allow the TPIC to proceed with pre-

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booming. Pre-booming may occur only after conditions are documented and agreed to between TPIC and the contractor.

The following wind guidelines will be applied to all vessels at the Facility dock. The wind speeds are sustained as opposed to winds gusting up to these speeds. Sustained winds are determined when the speed is constant for more than 5 minutes. The following chart provides guidance as to the appropriate action to consider when wind speeds are high and sustained.

Table 4. Advisory for Oil Transfer Operation Actions Related to Wind Speed

Wind Speed (mph)	Wind Speed (knots)	Action Required
0-35	0-30	Monitor vessel tie-up lines and hose connections as normal.
35-40	30-35	Shutdown oil transfer operations and drain hoses.
Over 40	Over 35	Disconnect and stow hoses, if safe to do so.
Over 45	Over 39	Request vessel to prepare and sail if the vessel or dock is in jeopardy of sustaining damage. If safe to do so, sail the vessel.

Sea state (e.g., wave height and period) at the Facility dock are almost entirely a function of wind speed and direction, with southeasterly or northwesterly winds resulting in the highest waves. The vessel used to deploy the boom in the pre-booming operation is to be determined, but is likely to be a stable platform in most wave conditions expected at the dock. In the case when wave heights exceed about 2 to 2.5 feet in a “choppy” sea (i.e., short-period wind chop on top of the larger, longer-period swells), the PIC may consider it unsafe for personnel to deploy the boom, regardless of the potential efficacy of the boom to retain oil.

Low visibility resulting from fog, heavy precipitation, or snow at the dock and/or boom deployment vessel may jeopardize the safety of personnel involved in transfer operations. Close consultation between the TPIC and Vessel Person-In-Charge (VPIC) will be undertaken to determine if conditions are unsafe for personnel to pre-boom the vessel.

Freezing conditions that result in ice buildup on the dock and/or boom deployment vessel may jeopardize the safety of personnel involved in pre booming operations. Close consultation between the Facility TPIC and VICP will be undertaken to determine if conditions are unsafe for personnel to pre-boom the vessel.

Large floating/barely submerged debris is generally associated with high water flows and strong currents. The combination may pose a safety hazard to the pre-booming vessel, as well as to the boom and lines used to secure the boom. Close consultation between the TPIC and personnel on the contractor’s pre-booming boat will be undertaken to determine if conditions are unsafe for personnel to pre-boom the vessel.

4.3 Efficacy of Oil Boom under Range of Environmental Conditions

The Facility will deploy up to 1,600 feet of 18-inch fence boom, and 3,000 feet of 12- by 6-inch containment boom (1,000 feet with 36-inch floats and 2,000 feet with 72-inch floats). The fence boom is best suited for use in semi-protected environments. Having a high freeboard and a flat flotation device, fence booms are less effective in rough water, where wave and wind action can cause the boom to twist. Ideal performance conditions for the fence boom are

- Surface current speeds < 1.0 knot perpendicular to the boom and up to 5 knots depending upon the angle of the boom relative to the current direction
- Wave heights < 1.5 to 2 feet
- Wind speeds < 20 knots (~23 mph)



The containment booms have a more circular flotation device and a continuous skirt. They perform well in rough water, but are more difficult to clean and store than fence booms.

As currents pushing against the boom increase beyond ideal operating conditions, the boom becomes subject to hydraulic failure, commonly referred to as entrainment, and the oil product may begin to slip under the boom skirt. Entrainment is common to all types of booms regardless of size or design. Entrainment does not indicate a complete failure of the boom but does impact the efficacy of the boom.

It is difficult to establish exact limits of current speed to boom efficacy. A generally accepted rule among the response industry is that current speeds > 0.8 to 1.0 knot perpendicular to the long axis of the boom will begin to result in product loss, and current speed > 1.5 knots will result in significant or complete product loss. As the boom angle is adjusted toward parallel with the current direction, the entrainment is reduced for a given current speed. However, as current speed approaches 5 knots, boom effectiveness approaches zero regardless of boom configuration.

Modifying the boom configuration under different current regimes can have a dramatic impact on efficacy and in many cases can improve the capability to control product into a collection point. However, for oil transfer pre-booming where the boom needs to surround a vessel, the opportunity to develop alternative configurations is limited. In the pre-booming configuration, some portion of the downstream end of the boom will be at or near perpendicular to the current thereby reducing overall effectiveness of oil retention at high current velocity at that location.

Another generally accepted rule among the response industry is that waves > 18 to 24 inches high will result in splash over of water or product causing the boom effectiveness to be reduced by 10 to 20 percent. Waves > 24 inches in height will dramatically decrease the effectiveness of the boom through wash over, and waves > 30 inches high will render the boom essentially useless for retaining oil, even if the water current speeds are essentially zero.

Large debris that gets entangled in the boom or in the lines attaching boom to shore, other fixed points or vessels generally presents a large surface to the water currents. The resulting force drags the boom underwater or otherwise compromises the boom configuration to the extent the boom no longer retains oil. Large debris is typically present when current velocity is high, and the combination will almost always result in the boom efficacy being essentially zero.

4.4 Effective Threshold Conditions for Oil Boom

4.4.1 Surface Water Currents

Based on Tesoro's years of experience at their nearby dock and data presented in previous sections of this document, the Facility expects surface current speed to exceed 1.0 knot on a frequent basis all months of the year and occasionally to exceed 3 to 5 knots during spring flood flows of the Columbia River. The Facility anticipates that current speed will be a deterrent to effective pre-booming at this terminal for a substantial portion of the year. Therefore, the effective threshold value for current speed will be 1.5 knots at this terminal.

4.4.2 Sea State (Wave Height and Period)

Sea state will occasionally be a factor limiting pre-booming during oil transfer operations at this terminal, based on the long-term experience and observations of the terminal manager, dock operations personnel, and contractors supporting the Facility in oil transfer operations.

Wave action may be a factor on those occasions when sustained southeasterly or northwesterly winds exceed about 15 knots (~17 mph) and may cause waves from 1.5 to 2 feet high. Under these conditions, sea state will begin to exceed the capabilities of the boom to retain oil. At sustained easterly wind speeds

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greater than about 20 to 25 knots (~23 to 29 mph), wave height may exceed 3 feet, which will render the oil boom almost completely ineffective in retaining oil. Therefore, wave heights greater than 2 to 2.5 feet will be the effective threshold value for waves at this terminal.

4.4.3 Wind

As noted in Section 3.2, if SCA conditions (i.e., sustained winds up to 33 knots [~38 mph]) that may pose a hazard for small vessel operators are posted or similar winds are measured at the Facility, the TPIC will evaluate potential for impacts to personnel safety and to effectiveness of boom deployment. The TPIC may make a real-time determination that, because of the wind direction and shelter at the dock, it is safe to pre-boom the vessel and continue with oil transfer operations.

Also, as noted in Section 3.2, wind speed > 30 knots (~35 mph) for longer than 5 minutes will exceed the personnel safe operating limit and booming, as well as oil transfer operations, will be terminated. Therefore, sustained wind speed greater than 30 knots (~35 mph) will be the effective wind at this terminal.

5. Acronyms and Abbreviations

Company: Tesoro Savage Petroleum Terminal LLC

Facility: Vancouver Energy

mph: miles per hour

NOAA: National Oceanic and Atmosphere Administration

NWS: National Weather Service

PIA: Portland International Airport

PIC: Person-in-Charge

Port: Port of Vancouver USA

SCA: Small Craft Advisory

Shift SUP: Shift Supervisor

USDA: U.S. Department of Agriculture

WAC: Washington Administrative Code

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Appendix L
Unsafe Operating Conditions



Appendix L

Unsafe Operating Conditions

High Winds

Arrangements to be made and precautions to be taken will depend upon the direction and intensity of the storm. In any case, time permitting, close consultation between the Terminal Representative, Master of the vessel and the Coast Guard should lead to informed and balanced decision-making. If weather conditions exist that may create unsafe docking conditions, the vessel may be instructed to stand off until conditions moderate.

High winds are detrimental to the Wharf operations. The following wind guidelines will be applied to all vessels at the Facility dock. The wind speeds are sustained opposed to winds gusting up to these speeds. Sustained winds are determined when the speed is constant for more than 5 minutes. Use the following chart to determine what action is required when wind speeds are very high and sustained.

Wind Speed	Action Required
0-35 MPH	Monitor Vessel tie-up lines and hose connections as normal.
35-40 MPH	Shutdown cargo operations and drain hoses.
Over 40 MPH	Disconnect and stow hoses, if safe to do so.
Over 45 MPH	Request Vessel to prepare and sail if the vessel or wharf is in jeopardy of sustaining damage. If safe to do so, sail the vessel.

Wind Guidelines

Safe to sail is determined by assist vessels attached to the vessel, and assist vessels having the ability to handle the vessel weight in the weather.

In emergencies where vessel and wharf are in jeopardy of heavy damage, the vessel may request to sail without an assist vessel.

Electrical Storms

In the event of an electrical storm in the immediate vicinity of the dock, transfer operations will be shut down until such time it is deemed safe to resume operations.

Freezing Conditions

When freezing conditions exist (high winds and ice build-up on the wharf and/or vessel), the safety of personnel involved in transfer operations is the first priority. Close consultation between the Dock PIC and Vessel PIC should lead to informed and balanced decision making.



Small Craft Advisory

For the safety of dock personnel, the Vancouver Dock PIC will consider a Small Craft Advisory issued by the National Weather Service (NWS) for the area of operation to be the upper limit for personnel safety and shall not authorize the launch or use of company owned and operated oil spill response equipment. These conditions may either be present or immediately forecasted.

By definition the NWS Small Craft Advisory conditions reference sustained winds of over 21 mph (less in certain dangerous waters) and under 38 mph that may pose a hazard for small vessel operators.

Other

When it is determined that pre-booming is not safe or effective according to conditions listed within the safe and effective threshold limits, the Dock PIC will complete and return Ecology's boom reporting form via e-mail or fax and proceed under Alternative Measures requirements detailed in WAC-173-180-221 and WAC 173-180-222. Currently, requirements for Rate A transfers under the Alternative Measures requirement are being met for Vancouver Energy Dock through MSRC owned and operated equipment. Vancouver Energy operators have been trained to retrieve and deploy initial response equipment owned by MSRC.

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Appendix M
Pre-booming Oil Transfer



Appendix M

Pre-booming Transfer Plan

Pre-booming System

At such time that a vessel becomes finally moored at the Vancouver Energy dock, and prior to line connections being made, deployment of boom sufficient to maximize recovery of spilled product from the vessel or the dock shall occur in such manner as to allow a minimum of 5 feet standoff along the vessel waterline.

The standard pre-booming system used at the dock consists of

- Approximately 500 feet of 18-inch fence boom, which will remain stowed at the dock.
- Anchor points located port, starboard mid-ship, and/or aft sufficient to allow a spill during transfer to be fully contained at the downriver location.
- An 18-foot aluminum workboat equipped with a 130 hp outboard and functional communications equipment.
- A contracted 2-person crew to operate the boat and deploy and retract the boom upon request. This crew will also provide standby during transfer.

Pre-booming Process

Decision-making prior to pre booming a vessel at this facility will be dependent upon the following factors.

- Current wind and wave actions in and around the docking area as observed by the Terminal Person-in-Charge (TPIC).
- Forecasted weather information from local weather stations, as well as Yahoo Weather online are radioed hourly to the dock. This information includes local temperature, barometric pressure, wind speed and direction.
- When necessary to check river current information terminal operators will refer to the following web page: http://www.flypdx.com/Nvgt_Rvr_Frcst.aspx

With the safety of personnel remaining an unconditional priority, it is Vancouver Energy’s position that prior to pre-booming a vessel at the Facility, there must be agreement between the TPIC and boom boat captain that existing and predicted weather and sea conditions are such that pre booming can occur in a safe and effective manner. Should weather or forecasted weather deteriorate during a transfer, a joint decision between Vancouver Energy and the booming contractor will be made as to the safety of continuing with or removing the pre-booming system from the vessel. During decision making it is expected that Vancouver Energy personnel will refer to both the “Safe and Effective Threshold Evaluation” and the “Unsafe Operating Conditions” located within the Oil Handling Operations Manual as part of the final decision process.

Any time it is determined that pre-booming is neither safe nor effective for any reason, the “Rate A Deliverer’s Boom Reporting Form” will be filled out in detail and forwarded immediately to Ecology.

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Pre-booming Procedure

The standard pre-booming procedure used at Vancouver Energy is as follows.

- After a tanker or ATB (vessel) is moored in position at the dock, the booming contractor will be notified to begin preparing for deployment of the oil spill prevention boom.
- When the TPIC has communicated with the booming contractor that the mooring lines are in place and the vessel is finished mooring (all fast), the boom anchors and anchor buoys will be positioned and set in three locations on the offshore side of the ship in order to secure the boom; one on the starboard quarter, one midship on the starboard side, and one on the starboard bow. The boom will then be towed into position and secured to the anchors with the necessary standoffs to keep the boom off the side of the vessel. The trailing or downriver side of the boom on the starboard quarter of the ship will then be connected to the permanent fence boom that runs on the inboard (port side) of the vessel and the section of boom anchored on the starboard bow will be connected to the upriver side of the fence boom permanently installed on the inboard (port side of the vessel). This process will ensure that the vessel is fully encircled by boom.
- With both ends of the boom connected, the booming contractor will contact the TPIC by radio to verify boom placement and the TPIC will then initiate hose connection and transfer operations.
- During transfer, the boom boat will remain in the water and on site to tend to and provide standby inspection of the boom.

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Appendix N
Regulatory Cross Reference



Appendix N

Regulatory Cross Reference

Ecology Regulation	U.S. Coast Guard Regulation	Description	Location Where Addressed in Manual
WAC 173-180-415(1)		Table of contents	Table of contents
173-180-415(3)		Log sheet for changes	Inside front cover
WAC 173-180-420(1)		Overall requirements for manual	Entire document
173-420(2)(a)-(d)		Submittal agreement	Section 1.2
173-420(3)(a)(i) and (ii)	33 CFR 154.310(a)(1) and (2)	General facility information	Sections 2.1 through 2.3, Figures 1 and 2, Attachment A
173-420(3)(a)(iii)	33 CFR 154.310(a)(3)	Hours of operation	Section 3
173-420(3)(a)(iv)	33 CFR 154.310(a)(19)	Summary of applicable federal and state oil pollution laws and regulations	Section 19
173-420(3)(a)(v)		Recordkeeping	Section 25, Appendices F, G, and J
173-420(3)(a)(vi)		Overfill protection	Section 17
173-420(3)(a)(vii)		Maintenance schedules	Section 24, Appendix H
173-420(3)(a)(viii) through (x)	33 CFR 154.310(a)(5)	Oil transferred, physical properties, and safe handling	Section 5, Appendix C
173-420(3)(a)(xi)	33 CFR 154.310(a)(9)	Communications systems	Section 9, Appendix E
173-420(3)(a)(xii)(A)	33 CFR 154.310(a)(17)(i)	Hose and loading arm procedures	Section 17.1
173-420(3)(a)(xii)(B)	33 CFR 154.310(a)(17)(ii)	Oil transfer procedures	Section 17.2
173-420(3)(a)(xii)(C)	33 CFR 154.310(a)(17)(iii)	Completion of pumping	Section 17.3
173-420(3)(a)(xii)(D)	33 CFR 154.310(a)(13)	Monitoring devices	Section 13
173-420(3)(a)(xiii)		Leak detection	Sections 2.2.2 and 2.2.4
173-420(3)(a)(xiv)	33 CFR 154.310 (a)(10)	Shelters	Section 10
173-420(3)(a)(xv)	33 CFR 154.310(a)(16)	Working pressure	Section 16
173-420(3)(b)(i)	33 CFR 154.310(a)(4)	Size and type of vessels	Section 4
173-420(3)(b)(ii) and (iii)		Vessel equipment and procedures, and verification	Section 17.1

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173-420(3)(b)(iv)	33 CFR 154.310(a)(6)	Transfer staff and duties	Section 6
173-420(3)(b)(v)	33 CFR 154.310(a)(11)	Drip and discharge collection	Section 11
173-420(3)(b)(vi)	33 CFR 154.310(a)(20)	Shielding portable lighting	Section 20
173-420(3)(b)(vii)		Actions taken regarding unexpected weather	Appendix L
173-420(3)(c)		Safe and effective threshold	Appendix K
173-420(3)(d)(i) and (ii)	33 CFR 154.310(a)(7), (17)(iv), and (18)	Reporting spills, contacts, and initial actions	Sections 7 and 18
173-420(3)(d)(iii)	33 CFR 154.310(a)(12),	Emergency response and shutdown systems	Section 12, Appendix A
173-420(3)(d)(iv)	33 CFR 154.310(a)(14)	Oil containment equipment and access	Section 14, Appendix E
173-420(3)(d)(v)	33 CFR 154.310(a)(15)	Fire extinguishers	Section 15, Appendix A
	33 CFR 154.310 (a)(8)	Duties of watchman	Section 8
WAC 173-180-510	33 CFR 154.310(a)(21)	Training and qualifications	Section 21
	33 CFR 154.310(a)(22)	Hose marking	Section 22
	33 CFR 154.310(a)(23)	Tank cleaning	Section 23
WAC 173-180-040		Recordkeeping	Section 25, Appendices F, G, and J
WAC 173-180-055		Work hours	Section 26
WAC 173-180-430		Manual review and approval	Section 27

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