Appendix E.3

Air Permit Application, February 2013

ESA

Crude by Rail
Air Permit Application

Valero Benicia Refinery
Benicia, California

Public Document

February 2013

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Valero Refining Co. - California

Crude by Rail

Air Permit Application

Valero Benicia Refinery
Benicia, California
BAAQMD Plant No. B2626

February 2013

Project No. 0186851

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LIST OF ACRONYMS

ATC	Authority to Construct
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
bbl	barrel
BWON	Benzene Waste Operations NESHAP
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO2e	carbon dioxide equivalent
District	Bay Area Air Quality Management District
EFR	external floating roof
GHG	greenhouse gas
HAP	hazardous air pollutant
HRSA	Health Risk Screening Assessment
LDAR	Leak Detection and Repair
MACT	Maximum Achievable Control Technology
MMbbl	million barrels
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOx	oxides of nitrogen
NPOC	non-precursor organic compound
PM	particulate matter
POC	precursor organic compound
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psia	pounds per square inch absolute
PTE	Potential to Emit
RVP	Reid Vapor Pressure
SO_2	sulfur dioxide
TAC	toxic air contaminant
TBACT	Best Available Control Technology for Toxics
UP	Union Pacific Railroad Company
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

Valero Refining Co. - California (Valero) owns and operates a petroleum refinery located in Benicia, California. Valero is proposing the Crude by Rail project ("CBR" or "project"), which would allow the refinery to receive crude oil by train. The project would require a Bay Area Air Quality Management District (BAAQMD or "District") Authority to Construct (ATC) permit. The purpose of this document and its appendices is to provide information to the District in support of the project and issuance of an ATC.

The project would also require a land-use permit from the City of Benicia. Approval of the land-use permit would require compliance with the California Environmental Quality Act (CEQA), including preparation of an Initial Study. An application for a land-use permit was submitted to the City of Benicia in December 2012. The City is acting as lead agency.

1.1 Facility Contact Information

Name/Address:	Valero Refining Co. - California 3400 East Second Street Benicia, CA 94510-1097
District Facility No.:	B2626
Facility Contact:	Susan Gustofson, P.E. Staff Environmental Engineer (707) 745-7011 susan.gustofson@valero.com

1.2 Overview

Valero currently receives crude oil by pipeline and by ship. The project would install two rail car unloading racks, re-purpose an existing tank to include crude oil service, and construct associated infrastructure, including rail lines, to allow Valero to receive crude oil by train. The project would permit Valero to receive crude oil in quantities up to 70,000 barrels (bbl) per day (100 rail cars per day), but it would not increase the volume of crude oil delivered to the refinery because crude oil quantities delivered by train would replace crude oil quantities received by ship. The refinery's crude oil processing rate, which is limited by District permit to an annual average of 165,000 bbl per day (daily maximum of 180,000 bbl per day), would remain unchanged. No modifications would be made to refinery process equipment.

1.3 Schedule

Valero plans to begin construction in 2013 and to commence operating the crude by rail unloading facility in late 2013 or early 2014. Construction is expected to take approximately 6 months.

1.4 Application Summary

This application package, including the attached appendices, provides necessary information for the District to evaluate the project. The remainder of this document is organized as follows:

- Section 2.0 (Facility and Project Description) provides an overview of the facility and presents the various elements of the project, including descriptions of project components;
- Section 3.0 (Emissions Estimates) provides a summary of project emissions for storage tank, fugitive components associated with the rail car unloading facilities, and cargo carrier emissions;
- Section 4.0 (Applicable Regulations) addresses compliance with applicable District and federal regulatory requirements;
- Section 5.0 (Estimated Permit Fees) provides an estimate of District New Source Review fees;
- Section 6.0 (References);
- Appendix A – Project Drawings and Specifications;
- Appendix B – Emission Calculations;
- Appendix C – District Permit Application Forms.

2.0 FACILITY AND PROJECT DESCRIPTION

2.1 Facility Description

The refinery occupies approximately 330 acres of the 880-acre Valero property, which is located at 3400 East Second Street in the eastern portion of the city of Benicia, along the northern edge of Suisun Bay. Figure 2-1 shows an aerial photograph of the refinery, property boundaries, and surrounding area.

The refinery converts crude oil into many finished products, including California Air Resources Board (CARB) cleaner-burning gasoline and diesel fuels, liquefied petroleum gas, jet fuel, fuel oil, and asphalt. Major equipment used for processing crude oil into finished products includes distillation columns, storage tanks, reactors, vessels, heaters, boilers, and other ancillary equipment. Valero also operates its own wastewater treatment plant and a marine terminal, which services crude oil, refinery product, and feedstock deliveries and exports via ships and barges. The marine terminal is located approximately 1 mile south of the refinery, near the northern landing of the Benicia Bridge. The refinery also uses rail to transport refinery feedstocks and products. All rail traffic enters and exits along the southeastern boundary of the refinery near the intersection of Park Road and Bayshore Road.

The refinery site and project location are zoned General Industrial. Present land use at the project location is petroleum refining and storage. The elements of the project will be compatible with the existing land use, and will not result in substantial alterations of the planned land use in the area. Construction and operation of facilities associated with this project will be within the Valero property boundaries.

Figure 2-1 Valero Benicia Refinery Location Map

Imagery date: 9/1/2012, Google Earth Pro 6.2.2.6613.

2.2 Project Description

Valero currently receives crude oil by pipeline and by ship. The proposed project would allow Valero to receive crude oil by train and consist of the following primary components:

- Unloading racks. Two unloading racks would be installed to allow crude oil to be transferred from rail cars (up to 100 rail cars per day, 70,000 bbl per day) to existing external floating roof tank 1776 (District Source S-97). The racks would be installed in the northeastern portion of the main refinery property, between the eastern side of the lower tank farm and the fence adjacent to Sulphur Springs Creek.
- Tank 1776 (District Source S-97). Existing external floating roof tank 1776 would be used to store all crude oil transferred from the rail car unloading racks. Tank 1776 is currently permitted to store jet fuel and other refinery products. It would be changed to crude oil service as part of this project, but it would retain the capability to store jet fuel and other refinery products in the future if required. There would be no physical modifications to tank 1776 that would impact emissions. The bottom interior surface of the tank would be coated as required for crude water draw service.
- Pipeline and associated components. Approximately 4,000 feet of primarily 16-inch-diameter piping and associated components (pumps, valves, flanges, and connectors) would be installed between the rail car unloading racks and tank 1776 and from tank 1776 to the existing crude supply piping.
- Rail tracks. Two rail spurs and a parallel rail car storage track would be constructed on refinery property to allow receipt of rail cars at the unloading racks. The rail spurs and parallel rail car storage track would be located between the eastern side of the lower tank farm and the western side of the fence along Sulphur Springs Creek.
- Other infrastructure modifications. Approximately 1,800 feet of tank farm dike walls and an existing firewater pipeline and compressor station would be relocated to accommodate the new rail tracks.

Figure 2-2 shows the location of the rail car unloading racks and tank 1776. Detailed project drawings showing rail track locations, pipeline routes, and other project details, are provided in Appendix A.

Figure 2-2 Location Map

Imagery date: 9/1/2012, Google Earth Pro 6.2.2.6613.

2.2.1 Unloading Racks

The project would install two parallel rail car unloading racks. Each rail car unloading rack would accommodate up to 25 rail cars at a time (two, 50-rail car "switches" per day would be transported to the racks by train). Each rack would have 25 unloading stations, which would bottom-unload "closed dome" rail cars using a 4-inch-diameter hose, with dry disconnect couplings, connected to a common header routed between the two racks (a check valve, connected to the top of each rail car via 2-inch-diameter hose, would open to allow ambient air to enter during unloading and immediately close when unloading was finished). Two new pumps, operating in parallel, would pump the crude oil from the unloading rack header via a new 16-inch-pipeline to tank 1776 (see Section 2.2.2 for tank details). Once emptied, the 50 rail cars would be disconnected from the racks, moved off site (or to an interim storage location on site), and then replaced by another 50-rail car switch (see Section 2.2.3 for a description of train and rail car movements, including duration).

The unloading racks would be used only for unloading crude oil, up to 70,000 bbl per day (25.55 million barrels [MMbbl] per year); there would be no loading of crude oil or other materials at the racks. As a result, the only emissions associated with the unloading racks would be fugitive emissions from flanges, connectors, valves, and pumps (at the unloading rack, between the unloading rack and tank 1776, and from tank 1776 to the existing crude supply piping). The estimated number of new fugitive components associated with the project is presented in Table 2-1.

Table 2-1 Fugitive Component Counts

Component Type	Estimated Count*
Pumps	3
Valves	518
Flanges	1036
Connectors	259
Atmospheric Pressure Relief Devices	0

All components in light liquid service.
Estimated counts include contingency factor of 15% for valves. Flanges estimated using 2.0:1 flange/valve ratio. Connectors estimated using 0.5:1 connector/valve ratio. A third pump is a proposed installed spare for the two primary pumps.

Final component counts would be determined upon completion of construction.
A process flow diagram and project drawings are provided in Appendix A.

2.2.2 Tank 1776 (District Source S-97)

Tank 1776 is an existing external floating roof (EFR) tank that would be used to store all crude oil transferred from the rail car unloading racks, up to 70,000 bbl per day (25.55 MMbbl per year). Tank 1776 is a grandfathered source currently permitted to store various refinery products such as jet fuel, diesel, and gasoline. It shares a 62.8 MMbbl per year combined throughput limit with seven other storage tanks (S-63, S-73, S-74, S-75, S-76, S-78, and S-163). As part of this project, no physical modification would be made to tank 1776 that would increase breathing emissions, but the tank would be re-purposed for crude oil storage. To that end, the tank will be outfitted with additional nozzles for crude service and for potential future connections as found on typical crude storage tanks. Table 2-2 provides the dimensions and capacity of tank 1776.

Table 2-2 Tank 1776 Capacity and Dimensions

Valero Tank ID (District ID)	Type	Diameter (feet)	Height (feet)	Capacity [1] (bbl)
TK-1776 (S-97)	External Floating Roof	128	48	110,000

[1] Working (useable) capacity is 101,400 bbl.

Tank 1776 has a welded steel shell and its EFR is equipped with primary and tight-fitting secondary seals to minimize emissions. The roof fittings comply with the current District Rule 8-5 requirements for floating roof tanks.

Crude oil stored in tank 1776 would be transferred to an existing header where it would be blended with crude oil from other storage tanks before being piped to refinery process units.

2.2.3 Train Activity

Up to 100 rail cars per day would be unloaded at the refinery. Typically, two 50-rail-car switches per day would occur between the unloading racks and the Union Pacific Railroad Company (UP) tracks southeast of the refinery and highway 680. A UP locomotive would transport up to 50 rail cars at a time to the unloading rack. All locomotives would enter and exit along the southern refinery boundary, near the intersection of Park Road and Bayshore Road (see Figure 2-2 for location of the locomotive entrance/exit).

After the 50 rail cars are emptied at the unloading rack, they would be moved to the adjacent storage track. A UP locomotive would then retrieve the empty rail cars parked on the storage track and transport them off site. This unloading cycle would then be repeated for the remaining 50 loaded rail cars.

The duration of this unloading process, from entry of 50 loaded rail cars to refinery property, unloading of the 50 rail cars, to exit of 50 empty rail cars from refinery property, would take approximately 8 to 10 hours (16 to 20 hours for 100 rail cars).

Track layouts are provided in Appendix A.

3.0 EMISSION ESTIMATES

Estimated annual emissions have been calculated for the project to determine District permitting and emission offset requirements. Annual mass emissions are calculated based on 24-hour-per-day and 365-day-per-year operation. Net emissions are presented as the increase associated with the project based on post-project emissions minus baseline emissions. Consistent with District Rule 2-2-605, a baseline of the last 3 years (December 2009 through November 2012) best represents recent emissions at the refinery.

A summary of project net emissions is presented in Table 3-1. Emissions estimates for tank 1776 represent the net increase in potential emissions at maximum annual crude throughput (25.55 MMbbl per year). Fugitive emissions from components reflect the increased number of components associated with the unloading rack and related components, including pumps, valves, flanges, and connectors. Train emissions reflect the potential emissions increase at maximum annual crude throughput of 25.55 MMbbl per year, while marine vessel emissions reflect the potential emissions decrease associated with a 25.55 MMbbl reduction in crude oil delivered by marine vessels.

Net emissions of precursor organic compounds (POCs) from tank 1776 and fugitive component emissions (unloading rack, pumps, etc.) are the only pollutant increases associated with the project subject to District permitting requirements.

Table 3-1 Emissions Summary

Source	Project Emissions, Net Change from Baseline (ton/yr)						
	POC	NOx	CO	PM_{10}	$PM_{2.5}$	SO_2	GHG
Tank 1776 (S-97)	4.33	-	-	-	-	-	-
Unloading Rack and Pipeline Fugitive Components	1.71	-	-	-	-	-	-
Trains	1.70	33.04	5.60	0.83	0.81	0.02	5,593
Marine Vessels	(5.18)	(91.84)	(10.69)	(3.58)	(3.40)	(26.79)	(9,498)
Total	2.56	(58.80)	(5.09)	(2.75)	(2.59)	(26.77)	(3,905)

Project emissions estimates @ 25.55 MMbbl per year crude oil by rail. "()" indicates decrease.

POC = precursor organic compounds
NOx = oxides of nitrogen
CO = carbon monoxide
PM_{10} = particulate matter (10 microns or less)
$PM_{2.5}$ = particulate matter (2.5 microns or less)
SO_2 = sulfur dioxide
GHG = greenhouse gases, calculated as CO2 equivalent (CO2e)

3.1 Tank Emissions

The change in tank 1776 service to include crude oil storage would result in a net increase in POC and toxic air contaminant (TAC) emissions at the source. To minimize emissions, tank 1776's external floating roof is equipped double seals with zero-gap secondary seals, consistent with District Rule 8-5, Best Available Control Technology (BACT) performance requirements, and Title 40 of the Code of Federal Regulations (CFR) 60 Subpart Kb.

3.1.1 POC Emissions

POC emissions are calculated using the United States Environmental Protection Agency (USEPA) TANKS 4.09d software. Crude oil storage tank emissions for the project are presented in Table 3-2, including baseline, post-project, and net emissions. Pre-project (baseline) emissions are based on actual emissions from product storage at tank 1776 for the 3-year baseline period from December 2009 through November 2012.

Table 3-2 Tank 1776 POC Emissions

Valero Tank ID (District ID)	POC Emissions (lb/day)			POC Emissions (ton/yr)		
	Baseline	Post-Project	Net	Baseline	Post-Project	Net
TK-1776 (S-97)	15.6	39.3	23.7	2.85	7.18	4.33

Post-project emissions assume annual crude oil throughput of 25.55 MMbbl/yr (70,000 bbl/day x 365 day/yr) and the following crude oil properties: Reid Vapor Pressure (RVP) = 9.4 pounds per square inch absolute (psia), density = 6.74 lb/gal (43.5 API).

Appendix B provides documentation of the emission estimation methodology including tank characteristics, material properties, USEPA TANKS 4.09d software input assumptions and output results, and actual tank throughput data for the 3-year baseline period.

Tank 1776 is currently permitted for jet fuel (JP4) as a grandfathered source under Valero's Title V permit, and shares a combined throughput limit of 62.8 MMbbl per year with the following tanks: S-63, S-73, S-74, S-75, S-76, S-78, and S-163 (S-74 is operated under NuStar Logistics' Title V permit, Facility B5574, while the other tanks are operated under the refinery's Title V permit. NuStar is a contiguous facility that is operated pursuant to a service agreement between NuStar Logistics and Valero Refining Company--California). Valero requests that S-97 receive a new throughput limit of 25.55 MMbbl per year applicable to storage of crude oil only, but that S-97 should also remain subject to the shared 62.8 MMbbl per year throughput limit for S-63, S-73, S-74, S-75, S-76, S-78, S-97, and S-163 to the extent S-97 is used for storage of products other than crude.

While the post-project PTE calculated for S-97 would be greater than baseline emissions, crude oil throughput at S-97 would be offset by a corresponding decrease in crude oil throughput at the facility's other crude oil storage tanks that are currently served by ship and by pipeline (S-57 through S-62, S-1047, and S-1048 [S-57 through S-62 are operated under NuStar Logistics' Title V permit]). As a result, post-project combined crude oil throughput at tanks S-57 through S-62, S-97, S-1047, and S-1048 would not exceed 62.6 MMbbl per year, which is the current combined throughput limit specified by Condition 20820 for tanks S-57 through S-62, S-1047, and S-1048.

3.1.2 TAC Emissions

POC emissions from crude oil storage include compounds classified as TACs. For the TAC emissions estimates, post-project POC emissions were speciated into TAC constituents based on the default speciation data obtained from USEPA TANKS 4.09d software for crude oil at the conditions assumed for each tank. Pre-project (baseline) emissions are based on actual emissions from product storage at tank 1776 for the 3-year baseline period from December 2009 through November 2012. TAC emissions are summarized in Table 3-3.

Table 3-3 Tank 1776 TAC Emissions

TAC	Hourly Emissions (lb/hr)			Annual Emissions (lb/yr)		
	Baseline	Post-Project	Net	Baseline	Post-Project	Net
Benzene	5.3E-03	8.6E-03	3.2E-03	46.6	74.9	28.3
Ethylbenzene	6.1E-04	3.7E-03	3.1E-03	5.4	32.3	26.9
Hexane (n-)	4.7E-03	7.1E-03	2.4E-03	41.3	62.3	21.0
Toluene	6.8E-03	1.0E-02	3.5E-03	59.5	90.0	30.5
Xylenes (m-)	2.8E-03	1.3E-02	1.0E-02	24.7	111.9	87.2

Hourly TAC emissions are average hourly emissions based on annual emissions estimates. TAC emissions estimates based on TANKS4.09d default speciation profiles (except for benzene in crude oil: 0.6%wt benzene assumed for crude oil, which is higher than default benzene content in TANKS4.09d).

See Appendix B for detailed assumptions and TANKS 4.09d input parameters.

3.2 Fugitive Component Emissions

3.2.1 POC Emissions

Project fugitive POC emissions are based on the total count of new components associated with the Crude by Rail project. POC emission increases are based on emission factors developed using the Correlation Equation Method (California Air Pollution Control Officers Association [CAPCOA]/CARB, 1999), with the District Rule 8-18 component emission definitions as the screening values. Total fugitive emissions are estimated by multiplying the emission factor for each component type by the estimated count of each component type. For the proposed project, total POC emissions from fugitive components are estimated to be 1.71 tons per year as presented in Table 3-4.

Table 3-4 Fugitive Component POC Emissions

Component Type	POC Emissions (ton/yr)
Pumps	0.07
Valves	0.35
Flanges	1.17
Connectors	0.11
Atmospheric Pressure Relief Devices	0.00
Total	**1.71**

All components in light liquid (crude oil) service.
POC emissions estimates represent net post-project potential emissions.

Detailed fugitive emission calculations including the correlation equations, screening values, and resulting emission factors are presented in Appendix B.

3.2.2 TAC Emissions

Fugitive POC emissions contain compounds that are classified as TACs. Using the same liquid fraction for the same crude oil speciation as for the storage tanks, TAC emissions were calculated from project component fugitive POC emissions and are presented in Table 3-5.

Table 3-5 Fugitive Component TAC Emissions

TAC	CAS #	Wt. Percent in Crude Oil	TAC Emissions (net)	
			lb/hr	lb/yr
Benzene	00071-43-2	0.06	2.3E-04	2.0
Ethylbenzene	00100-41-4	0.4	1.6E-03	13.7
Hexane (n-)	00110-54-3	0.4	1.6E-03	13.7
Toluene	00108-88-3	1.0	3.9E-03	34.2
Xylenes (m-)	01330-20-7	1.4	5.5E-03	47.8

Consistent with District Rule 2-5-601, fugitive components are considered new sources. Hourly and annual TAC emissions are based on the post-project emissions (i.e., the potential to emit). Detailed fugitive TAC emission calculations are documented in Appendix B.

3.3 Cargo Carrier Emissions

3.3.1 Criteria Pollutant Emissions

Cargo carrier emissions would decrease because emission rates per bbl of crude delivered would be lower for trains than for ships, and increases in crude volume delivered by train would result in decreases in crude volume delivered by ship. Emissions from cargo carriers include all emissions while operating in the District. A summary of cargo carrier emissions is presented in Table 3-6.

Table 3-6 Cargo Carrier Criteria Pollutant Emissions

Source	Post-Project Emissions, Net Change from Baseline (ton/yr)						
	POC	NOx	CO	PM_{10}	$PM_{2.5}$	SO_2	GHG
Trains	1.70	33.04	5.60	0.83	0.81	0.02	5,593
Marine Vessels	(5.18)	(91.84)	(10.69)	(3.58)	(3.40)	(26.79)	(9,498)
Total	(3.48)	(58.80)	(5.09)	(2.75)	(2.59)	(26.77)	(3,905)

Train emissions are post-project potential emissions @ 25.55 MMbbl per year; marine vessel emissions (negative) are post-project emissions @ -25.55 MMbbl per year (reduced crude oil deliveries).

Detailed calculations are presented in Appendix B. The baseline period is defined as the 3-year period ending November 30, 2012.

Cargo carrier emissions, specifically ship and barge emissions, associated with the import of crude and gas oil at Valero's marine terminal are currently subject to annual calendar year limits, as specified in Part 23 of Condition 20820. No changes are proposed to these limits; post-project cargo carrier emissions would remain within these limits.

4.0 APPLICABLE REGULATIONS

Prior to issuance of an ATC, the District must determine that the proposed project will comply with applicable air quality rules and regulations, including both District and federal requirements. This section presents a discussion of each applicable air quality requirement and documentation that the project complies with all requirements.

4.1 District Rules and Regulations

4.1.1 Regulation 1 – General Provisions and Definitions

Section 1-301 of Regulation 1 prohibits discharge from any source such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public; or that endangers the comfort, repose, health or safety of any such person or the public; or that causes or has a natural tendency to cause injury or damage to business or property.

The project will be operated in accordance with all federal and District rules and regulations, and is not expected to cause a public nuisance.

4.1.2 Regulation 2 – Permits

4.1.2.1 Rule 2-1 – General Requirements

Section 2-1-301 – Authority to Construct

Unless otherwise exempted, an ATC must be obtained from the District prior to building, modifying, or replacing any emissions unit or control device. The project would emit regulated air contaminants. Therefore, the project is subject to the requirements of Section 2-1-301 to obtain an ATC from the District prior to project implementation. District ATC permit application forms are presented in Appendix B, Attachment B-1, in accordance with Section 2-1-402.

Per Section 2-1-114.2.4, cargo carrier emissions must be included in the facility's emissions. As discussed in Section 3.3, post-project, facility-wide cargo carrier emissions would remain unchanged or decrease because emissions rates per barrel of crude delivered would be lower for trains than for ships, and increases in crude volume delivered by train would replace crude volume delivered by ships.

Criteria pollutant emissions from cargo carriers would not exceed the existing "Cargo Carrier and Dock" emission limits contained Parts 23 and 24 of Condition 20820. Cargo carrier TAC emissions would not be emitted in a quantity greater than that previously emitted (Section 2-1-234.4.). While cargo carrier emissions would remain unchanged or decrease, the distribution of cargo carrier emissions would shift from the marine terminal south of the refinery to the rail lines east and south of the refinery.

Section 2-1-302 – Permit to Operate

In accordance with Section 2-1-302, a Permit to Operate must be obtained from the District prior to using or operating any article, machine, equipment, or other contrivance, the use of which may cause, reduce or control emissions of air contaminants. After construction of any equipment associated with the proposed project is complete in accordance with the ATC, Valero would notify the District when ready to commence operation. Operation of the new project would only commence once Valero receives a Permit to Operate or a temporary authorization to operate in accordance with the ATC.

Section 2-1-412 – Public Notice, Schools

Section 2-1-412 requires public notice if the new or modified source is located within 1,000 feet of any K-12 school. The project will not be located within 1,000 feet of the boundary of any school.

4.1.2.2 Rule 2-2 – New Source Review

District Rule 2-2, New Source Review, applies to all new and modified sources that are subject to ATC requirements. The proposed project is potentially subject to several sections of Rule 2-2.

Section 2-2-301 – Best Available Control Technology

Section 2-2-301 requires BACT to control emissions from any new source with the potential to emit 10 pounds per day or more of non-precursor organic compounds (NPOCs), POCs, NOx, SO_2, PM_{10}, or CO. Tank 1776 would be subject to BACT because post-project POC emissions would exceed 10 pounds per day (see Table 3-2 for emissions estimates). Fugitive components (pumps, valves, flanges, connectors) would not be subject to BACT because post-project POC emissions would be below 10 pounds per day. Cargo carriers (trains) are not subject to BACT per Section 2-2-206.

District BACT guidelines for POC emissions from EFR tanks are summarized in Table 4-1.

Table 4-1 BACT for EFR Tanks

Pollutant	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	Typical Technology
POC	1. Vapor recovery system w/ an overall system efficiency >98% [a],[T] 2. BAAQMD Approved roof w/ liquid mounted primary seal and zero gap secondary seal, all meeting design criteria of Reg. 8, Rule 5. Also, no ungasketed roof penetrations, no slotted pipe guide pole unless equipped with float and wiper seals, and no adjustable roof legs unless fitted w/ vapor seal boots or equivalent. [a],[T] Additionally, a dome is required for tanks that meet all of the following: 1) capacity greater than or equal to 19,815 gallons 2) located at a facility with greater than 20 tons per year volatile organic compound (VOC) emissions since the year 2000 and 3) storing a material with a vapor pressure equal to or greater than 3 psia (except for crude oil tanks that are permitted to contain more than 97% by volume crude oil).[b]	1. Thermal Incinerator; or Carbon Adsorber; or Refrigerated Condenser; or BAAQMD approved equivalent. [a],[T] 2. BAAQMD Approved Roof and Seal Design. [a],[T]

References:

District BACT Guideline Document 167.1.2, Source: Storage tank – External Floating Roof, Organic Liquids, Class: All, Revision 2, Date: 9/19/2011. Only POC BACT information is shown because BACT is only triggered for POC emissions.
[a] BAAQMD
[T] TBACT (Best Available Control Technology for Toxics)
[b] BAAQMD Application 22722, SCAQMD Regulation 1178 (1/1/04)

BACT1 for EFR tanks specifies a vapor recovery system with an overall efficiency greater than 98 percent. While technologically feasible, a vapor recovery system is not typically used in practice on large EFR tanks because it would be cost-prohibitive, well above the District's cost-effectiveness threshold of $17,500 per ton of POC reduced.

BACT2 for EFR tanks is a liquid-mounted primary seal, zero-gap secondary seal, and gasketed fittings, all meeting the design criteria of Rule 8-5. Tank 1776 would satisfy these BACT2 requirements (it would not be subject to the BACT2 dome requirement because it would be permitted to store more than 97 percent by volume crude oil).

Section 2-2-302 and 2-2-303 – Project Emission Offsets

In accordance with Section 2-2-302, emission offsets must be provided for a new or modified source at a facility that emits or will be permitted to emit 35 tons per year or more of POC or NOx (minus any contemporaneous emission reduction credits) at a 1.15 to 1.0 ratio. The refinery is permitted to emit POC and NOx in excess of 35 tons per year. For new and modified sources, emission increases must be calculated in accordance with Sections 2-2-604 and 2-2-605. As presented in Table 4-2, the project results in an increase in POC emissions from tank 1776 and from fugitive component emissions. Valero plans to provide emission reduction credits at the prescribed ratio of 1.15 to 1.0 to offset the net project emission increase.

Table 4-2 *Emission Offsets*

Emission Source	POC Emissions (ton/yr)	NOx Emissions (ton/yr)	PM_{10} Emissions (ton/yr)	SO_2 Emissions (ton/yr)
Project Emissions				
Tank 1776	4.33	0	0	0
Fugitive Components	1.71	0	0	0
Cargo Carriers (Trains, Marine Vessels)	*	*	*	*
Subtotal	*6.04*	*0*	*0*	*0*
Contemporaneous Emission Reductions				
None	0	0	0	0
Subtotal	*0*	*0*	*0*	*0*
Net Project Emission Increase	**6.04**	**0**	**0**	**0**
Emission Offset Requirement	**6.95**	**-**	**-**	**-**

Emissions are post-project net emissions (post-project potential emissions minus baseline emissions).
Emission offset ratio is 1.15:1. Only POC, NOx, PM_{10}, and SO_2 are subject to emission offset requirements.
* There would be no increase in cargo carrier emissions (trains, marine vessels). See Table 3-6 for the estimated net change in emissions from cargo carriers. Cargo carrier emissions would continue to comply with the existing cargo carrier emission limits in Condition 20820, Parts 23-25.

See Appendix B for detailed calculations and assumptions.

Valero would surrender emission reduction credits for the required emission offsets upon confirmation by the District.

Section 2-2-304 through 2-2-306 – PSD Requirement

The tanks and fugitive components would only emit POC, which is not a regulated Prevention of Significant Deterioration (PSD) pollutant. Cargo carrier emissions are not considered as part of the facility emissions when determining PSD applicability per Section 2-2-215.2.

Section 2-2-317 – Maximum Achievable Control Technology Requirement

In accordance with Section 2-2-317, the District shall not issue an ATC for a new or modified source at a Major Facility of hazardous air pollutants (HAPs) unless the source will meet Best Available Control Technology for Toxics (TBACT), except as provided in Section 2-2-114. Section 2-2-114 allows an exemption from Section 2-2-317 when the combined increase in Potential to Emit (PTE) from all related sources in a proposed construction or modification is less than 10 tons per year of any HAP and less than 25 tons per year of any combination of HAPs. The increase in HAP emissions from tank 1776 and associated project fugitive components would be less than 10 tons per year of any HAP and less than 25 tons per year of all HAPs combined. Therefore, TBACT is not required for tank 1776 or the associated project fugitive components pursuant to Section 2-2-317.

4.1.2.3 Rule 2-5 – New Source Review of Toxic Air Contaminants

In accordance with District Regulation 2-5-100, if the project's emissions of any TAC, which are identified in Table 2-5-1 of Regulation 2, Rule 5, exceed the indicated trigger level, then a risk analysis is required. "Project emissions" include emissions from new sources and increased emissions from modified sources. The rule requires that emissions of all TACs associated with a project be included in the risk analysis if any single TAC exceeds its hourly or annual trigger level.

According to Section 2-5-216, project emissions must include all approved projects within the 2-year period preceding an application, unless the emissions are demonstrated to be unrelated to those in the application. There are no approved projects within the 2-year period prior to this application that are related to this application. Therefore, no adjustment to project emissions is necessary.

Project TAC emissions are summarized in Table 4-3. Hourly TAC emissions are below acute trigger levels. Annual TAC emissions are below the chronic trigger level for all pollutants except benzene. Because benzene exceeds the District's chronic trigger level, Valero has included a completed District Health Risk Screening Assessment (HRSA) form in Appendix C.

Table 4-3 TAC Emissions and District Trigger Levels

Pollutant	CAS Number	Emissions, Net Change from Baseline		Trigger Levels (District Table 2-5-1)		Exceed Acute Trigger Level?	Exceed Chronic Trigger Level?
		lb/hr	lb/yr	lb/hr (acute)	lb/yr (chronic)		
Tank 1776							
Benzene	71-43-2	3.2E-03	28.3	2.9	6.4	No	**Yes**
Ethylbenzene	100-41-4	3.1E-03	26.9	NA	77,000	No	No
Hexane (n-)	110-54-3	2.4E-03	21.0	NA	270,000	No	No
Toluene	108-88-3	3.5E-03	30.5	82.0	12,000	No	No
Xylenes (m-)	1330-20-7	1.0E-02	87.2	49.0	27,000	No	No
Fugitive Components							
Benzene	71-43-2	2.3E-04	2.0	2.9	6.4	No	No
Ethylbenzene	100-41-4	1.6E-03	13.7	NA	77,000	No	No
Hexane (n-)	110-54-3	1.6E-03	13.7	NA	270,000	No	No
Toluene	108-88-3	3.9E-03	34.2	82.0	12,000	No	No
Xylenes (m-)	1330-20-7	5.5E-03	47.8	49.0	27,000	No	No

Net TAC emissions from Tables 3-3 and 3-5.

4.1.2.4 Rule 2-6 – Major Facility Review

The refinery is a major facility and currently holds a Major Facility Review Permit, also referred to as a Title V operating permit. The project will require a Minor Permit Revision of the Title V permit in accordance with Regulation 2-6-215 because it is not an administrative or significant permit revision. The proposed revisions are not considered to be administrative or significant because there are no proposed revisions that meet the definition for administrative revisions under 2-6-201 or that meet the definition for significant revisions under Section 2-6-226.

Valero will submit a Title V permit modification application following receipt of the ATC for this project.

4.1.3 Regulation 3 – Fees

District Regulation 3 specifies the fee structure for projects subject to District permitting review. Estimated fees for the project are presented in Section 5.0.

4.1.4 Regulation 6 – Odorous Substances

Regulation 6, Rule 1 limits particulate matter and visible emissions. Tank 1776, the offloading racks, and fugitive components would not be sources of PM or visible emissions. The locomotives used to transport rail cars would emit PM, but Rule 6-1 does not apply to cargo carriers.

4.1.5 Regulation 7 – Odorous Substances

District Regulation 7 places general limitations on odorous substances and specific emission limitations on certain odorous compounds. This rule only becomes applicable if the District receives odor complaints from 10 or more complainants within a 90-day period. Because the District has not received 10 or more complaints with a 90-day period concerning refinery emissions, the Valero refinery is not subject to this rule.

4.1.6 Regulation 8 – Organic Compounds

4.1.6.1 Rule 8-5 – Storage of Organic Liquids

Rule 8-5 limits emissions of organic compounds from storage tanks. S-97 would continue to be subject to this rule. The tank would continue to comply with Rule 8-5; the project would not change the applicability of Rule 8-5 to tank 1776.

4.1.6.2 Rule 8-18 – Equipment Leaks

Rule 8-18, specific to equipment leaks, limits POC emissions from equipment components such as valves, flanges, connectors, and pumps. The limits on these fugitive POC emissions are specific to each component type. The new fugitive components installed as part of this project would be added to the Valero's existing Leak Detection and Repair (LDAR) program to ensure compliance with Rule 8-18.

4.1.6.3 Rule 8-28 – Episodic Releases from Pressure Relief Valves at Petroleum Refineries and Chemical Plants

Section 8-28-302 requires that any person installing a new refinery source or modifying an existing refinery source that is equipped with at least one pressure relief device in organic compound service must meet all applicable requirements of Rule 2-2, including BACT. Any pressure relief devices installed as part this project would meet BACT.

4.1.7 Regulation 10 – Standards of Performance for New Stationary Sources

Regulation 10 adopts the provisions of 40 CFR 60 by reference. The applicable subparts of 40 CFR 60 are identified in Section 4.3 of this application.

4.1.8 Rule 11-12 – National Emission Standard for Benzene Emissions

Rule 11-12 adopts the provisions of 40 CFR 61 Subpart BB and Subpart FF by reference. The applicability of and compliance with 40 CFR 61 is reviewed in Section 4.3 of this application.

4.2 California Environmental Quality Act

CEQA requires a review of potential significant environmental impacts from proposed projects. This project has been determined to be subject to CEQA review by the City of Benicia and will require a Land Use Permit. An application for a Land Use Permit was submitted to the City of Benicia in December 2012. The City of Benicia will serve as Lead Agency.

4.3 Federal Rules and Regulations

4.3.1 40 CFR 52.21 – Prevention of Significant Deterioration of Air Quality

District has been delegated authority by USEPA for implementation and enforcement of the federal PSD requirements as referenced in District Regulation 2-2-304. As previously discussed in Sections 1.5 and 4.1.2.2, the project is not subject to PSD review because project emissions increases are not considered to be a "modification" that would exceed "major modification" applicability thresholds for any pollutant listed in District Rules 2-2-304 through 2-2-306.

Cargo carriers are not subject to PSD applicability review per District Rule 2-2-215.

4.3.2 40 CFR 60 Subpart A – General Provisions

Any source subject to an applicable standard under 40 CFR 60 is also subject to the general provisions of Subpart A. Because the replacement, new, and refurbished storage tanks are subject to 40 CFR 60 Subpart Kb, the requirements of Subpart A apply. Subpart A contains requirements for notification of construction or modification and startup, monitoring, recordkeeping and reporting, and performance testing. Valero will provide notification to the USEPA administrator at least 60 days prior to construction of equipment subject to Subpart Kb and notification of startup, as required. Valero currently complies with the monitoring, recordkeeping, and reporting requirements of Subpart A and will continue to do so following implementation of the proposed project.

4.3.3 40 CFR 60 Subpart Kb – Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

This subpart applies to each storage vessel with a capacity greater than or equal to 75 cubic meters that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. Subpart Kb requires tanks storing organic liquids to be equipped with an appropriate vapor loss control device (internal floating roof with seals, EFR with seals, or fixed roof tank with vapor recovery and control device).

Tank 1776 would be subject to Subpart Kb because the proposed operational change is considered a modification under Section 60.14 (an operational change that would result in an increase in the emission rate of a pollutant to which a standard applies). Tank 1776 would comply with the requirements of Subpart Kb.

4.3.4 40 CFR 60 Subpart GGGa – Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

The project's group of equipment (valves, pumps, connectors, and flanges in POC service) is not within a process unit, as defined in §60.590a, and is therefore not an affected facility and not subject to 40 CFR 60 Subpart GGGa.

4.3.5 40 CFR 61 Subpart A – General Provisions

Any source subject to an applicable standard under 40 CFR 61 is also subject to the general provisions of Subpart A. Because the proposed project will be subject to Subpart FF, the requirements of Subpart A apply. Valero currently complies with the monitoring, recordkeeping, and reporting requirements of Subpart A and would continue to do so following implementation of the proposed project.

4.3.6 40 CFR 61 Subpart FF – Benzene Waste Operations NESHAP

Commonly referred to as BWON, or the Benzene Waste Operations national emission standards for hazardous air pollutants (NESHAP), 40 CFR 61 Subpart FF applies to chemical manufacturing plants, coke by-product recovery plants, and petroleum refineries. The proposed project would generate benzene-containing wastes. Valero has in place a BWON program that would ensure continued compliance with this rule.

4.3.7 40 CFR 63 Subpart A – General Provisions

Any source subject to an applicable standard under 40 CFR 63 is also subject to the general provisions of Subpart A. Because the proposed project will be subject to Subpart CC, the requirements of Subpart A apply. Valero currently complies with the monitoring, recordkeeping, and reporting requirements of Subpart A and would continue to do so following implementation of the proposed project.

4.3.8 40 CFR 63 Subpart CC – National Emission Standards for Petroleum Refineries

Commonly referred to as "Refinery MACT," Subpart CC applies to petroleum refining process units and related emission sources that emit or have equipment containing or contacting one or more HAPs listed in Subpart CC, and are located in a petroleum refinery that is a major source of HAPs. Subpart CC establishes standards for miscellaneous process vents, storage vessels, wastewater streams and treatment operations, equipment leaks, gasoline loading racks, and marine vessel loading operations. Tank 1776 and the project's fugitive component equipment leaks would be subject to this rule.

Storage tanks subject to Subpart CC are classified as either Group 1 or Group 2 storage vessels. "Group 1 storage vessel" means a storage vessel at an existing source that has a design capacity greater than or equal to 177 cubic meters (46,758 gallons) and stored-liquid maximum true vapor pressure greater than or equal to 10.4 kilopascals (1.5 pounds per square inch [psi]) and stored-liquid annual average true vapor pressure greater than or equal to 8.3 kilopascals (1.2 psi) and annual average HAP liquid concentration greater than 4 percent by weight total organic HAP. "Group 2 storage vessel" means a storage vessel that does not meet the definition of a Group 1 storage vessel.

Tank 1776 is a Group 1 storage vessel. A Group 1 storage vessel that is also subject to 40 CFR 60 Subpart Kb is subject to the overlap in Subpart CC at 63.640(n)(1) that specifies that such tanks are subject only to the requirements of 40 CFR 60 Subpart Kb with exceptions in Subpart CC at 63.640(n)(8). This will be the case for tank 1776.

5.0 ESTIMATED PERMIT FEES

Estimated permit fees for this ATC application are $16,818. Table 5-1 presents a breakdown of the estimated fees based on tank 1776's capacity. Valero requests District confirmation of these permit fee estimates.

Table 5-1 Estimated Permit Fees

Fee Type	Fee ($)
Filing Fee	$416
Initial Fee	$7,993
Risk Screening Fee	$8,409
Permit to Operate Fee [1]	-
Toxic Surcharge Fee [1]	-
Total	**$16,818**

Fee estimate based on District Regulation 3 (June 6, 2012) and Schedule C (Stationary Containers for the Storage of Organic Liquids).
Initial fee = 0.173 cents per gallon
Risk Screening Fee (RSF) = $416 plus 0.173 cent per gallon (first TAC source in application)
[1] This is a permit modification application for an existing source and there is no incremental increase in Permit to Operate or Toxic Surcharge fees because the tank's capacity will remain unchanged.
Fee estimate assumes a container volume of 4,620,000 gallons (110,000 bbl), as listed in Table II A of Valero's Title V permit. Note that the actual working (useable) volume of the tank is 4,258,000 gallons (101,400 bbl).

6.0 REFERENCES

Bay Area Air Quality Management District (District). 2013. *Best Available Control Technology (BACT) Guideline*. http://hank.baaqmd.gov/pmt/bactworkbook/default.htm.

Bay Area Air Quality Management District (District). 2010. Final Major Facility Review Permit, Valero Refining Co. – California, Facility #B2626. December 20, 2010.

Bay Area Air Quality Management District (District). 1994. Application 12467. S-97 External Floating Roof Tank: TK-1776, storing JP-4 and mogas, 110 thousand barrel capacity. January 21, 1994.

California Air Pollution Control Officers Association (CAPCOA)/California Air Resources Board (CARB). 1999. *California Implementation Guidelines for Estimating Mass Emissions from Fugitive Hydrocarbon Leaks at Petroleum Facilities*. http://www.arb.ca.gov/fugitive/fugitive.htm.

Appendix A
Drawings and Specifications

Attachment A-1 – Process Flow Diagram

Attachment A-2 – Plot Plan

Appendix A contains confidential business information

Appendix B
Emission Calculations

Attachment B-1 – Tank 1776 Baseline Throughput and Emissions

Attachment B-2 – Tank 1776 Post-Project Emissions

Attachment B-3 – Fugitive Component Emissions

Attachment B-4 – Cargo Carrier Emissions

Appendix B, Attachments B-1, B-2, and portions of B-4 contains confidential business information

Attachment B-3
Fugitive Component Emissions

Crude By Rail Project
Fugitive Component Emissions Estimates
2/27/2013

Emission Factors

Component Type	Screening Value (SV)	Correlation Equation	Hourly Emissions	Daily Emissions
	max ppm	kg/hr/comp	lb/hr/comp	lb/day/comp
Pumps	500	5.07E-05(SV)^0.622	5.33E-03	0.12803
Valves	100	2.27E-06(SV)^0.747	1.56E-04	0.00375
Flanges	100	4.53E-06(SV)^0.706	2.58E-04	0.00619
Connectors	100	1.53E-06(SV)^0.736	1.00E-04	0.00240
PSVs/Other	500	8.69E-06(SV)^0.642	1.04E-03	0.02485

Correlation Equation from Table IV-3a (CAPCOA-Revised 1995 EPA Correlation Equations and Factors for Refineries and Marketing Terminals), California Implementation Guidelines for Estimating Mass Emissions from Fugitive Hydrocarbon Leaks at Petroleum Facilities, February 1999.

Screening Value (SV) from BAAQMD Regulation 8, Rule 18 component emission limits

Component Count Estimates

Component Type	Component Count Estimate		
	Total	% Contin	Total (w/Contin)
Pumps	3	0	**3**
Valves	450	15%	**518**
Flanges	2 * valves	2 * valves	**1,036**
Connectors	0.5 * valves	0.5 * valves	**259**
PSVs	0	0%	**0**
Total			**1,816**

Equipment counts per Valero, Feb 2013. Flange count assumes 2.0:1 flange to valve ratio, and 0.5:1 connector to valve ratio. Total component counts for valves includes 15% contingency.

POC and TAC Emissions

Component Type	Total Count	POC Emission Factor (lb/day/comp)	POC Emissions		TAC Emissions				
					Benzene	Ethylbenzene	Hexane (-n)	Toluene	Xylenes (-m)
					0.06%	0.4%	0.4%	1.00%	1.4%
			Daily Emissions (lb/day)	Annual Emissions (lb/yr)	Annual Emissions (lb/yr)	Annual Emissions (lb/yr)	Annual Emissions (lb/yr)	Annual Emissions (lb/yr)	Annual Emissions (lb/yr)
Pumps	3	0.12803	0.38	140.2	0.08	0.56	0.56	1.40	1.96
Valves	518	0.00375	1.94	708.3	0.42	2.83	2.83	7.08	9.92
Flanges	1,036	0.00619	6.41	2340.4	1.40	9.36	9.36	23.40	32.77
Connectors	259	0.00240	0.62	226.9	0.14	0.91	0.91	2.27	3.18
PSVs	0	0.02485	0.00	0.0	0.00	0.00	0.00	0.00	0.00
Total	1,816	-	**9.36**	**3415.7**	**2.05**	**13.66**	**13.66**	**34.16**	**47.82**

TAC speciation percentages for crude oil based on EPA TANKS 4.09d default values (same as used for tank emissions).

Emissions Summary (ton/yr)

Component Type	POC	Benzene	Ethylbenzene	Hexane (-n)	Toluene	Xylenes (-m)
Pumps	0.07	0.00	0.00	0.00	0.00	0.00
Valves	0.35	0.00	0.00	0.00	0.00	0.00
Flanges	1.17	0.00	0.00	0.00	0.01	0.02
Connectors	0.11	0.00	0.00	0.00	0.00	0.00
PSVs	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.71	0.00	0.01	0.01	0.02	0.02

Attachment B-4
Cargo Carrier Emissions

Train Criteria Pollutant and GHG Emissions

Marine Vessel Criteria Pollutant and GHG Baseline Emissions

Train
Criteria Pollutant and GHG Emissions

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Summary

Incremental Locomotive Annual Emissions (100 Rail Cars per Day, 25.55 MMbbl Crude Oil per Year)

Type	Annual Emissions (tons/year)						
	CO	ROG	NOx	SOx	PM10	PM2.5	CO_2e
Small Line Haul	0.336	0.178	3.490	0.001	0.081	0.078	149
Large Line Haul	4.224	1.019	21.416	0.015	0.571	0.554	5,058
Switching	1.043	0.501	8.134	0.004	0.180	0.175	387
Total Emissions	**5.602**	**1.698**	**33.04**	**0.020**	**0.832**	**0.807**	**5,593**

Locomotive Emission Factors (100 Rail Cars per Day)

	Emission Factor (lb/kbbl)						
	CO	ROG	NOx	SOx	PM10	PM2.5	CO_2e
Locomotive Emission Factor	0.4385	0.1329	2.5863	0.0016	0.0651	0.0632	437.8

lb/kbbl = pounds per thousand barrels of crude oil delivered

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Input Data

Maximum Daily and Annual Tank Rail Cars and Crude Oil

Project Scenario	Maximum Daily Tank Rail Cars (cars/day)	Maximum Annual Tank Rail Cars (cars/yr)	Maximum Daily Crude (bbl/day)	Maximum Annual Crude (bbl/yr)	Reference
100 railcars per day	100	36,500	70,000	25,550,000	Project Description

Fuel Consumption Index* Calculation (for year 2011)

Railroads Operating in CA	Fuel Consumption (gallons)	Gross-Ton Miles w/ Locomotive (1000 ton-miles)	Gross-Ton Miles w/o Locomotive (1000 ton-miles)	Fuel Consumption Index (gross ton-miles/gal)
BNSF	1,291,164,605	1,200,654,478	101,512,077	851
UP	980,687,454	1,072,705,764	86,678,504	1005
Average	-	-	-	928
Data Source	Form R-1 schedule 750 Line 1	Form R-1 schedule 755 Line 104	Form R-1 schedule 755 Line 98	-

* Based on methodology described in *Procedures for Emission Inventory Preparation Volume IV: Mobile Sources* , EPA420-R-92-009, December 1992

Track Length/Trip Distance Calculation (Miles)

Track Segment	Haul Type	Total Distance (miles)	Distance within BAAQMD (miles)	Reference
Track Length from Roseville Yard to UPRR Mainline Track near Valero Refinery	Large Line Haul	68	22	Google Earth - Roseville Yard to Benecia Refinery
Track Length of Siding Track in Valero Refinery	Small Line Haul	2	2	Google Maps - Tracks 700, 732, 710
R-A-R/Industry Track	Switching	NA	NA	

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Daily Emissions

Year 2014 Daily Locomotive Criteria Pollutant Emissions - 100 Railcars per Day

Parameter	Value	Units	Reference
Maximum Additional Daily Tank Car due to Project	100	Cars/day	Based on Project Description
Maximum Freight Weight	106	short tons/car	TRN Spec Sheet-1
Daily Freight Transported due to Project	10,580	short tons/day	Based on Project Description
Weight of Empty Tank Car	37	short tons/car	TRN Spec Sheet-1
Maximum Total Daily Weight of Empty Tank Cars	3,720	short tons/day	
Maximum Daily Gross Weight Hauled	14,300	short tons/day	Freight Weight + Empty Railcar Weight
Assuming the Facility is Serviced Once daily	1	train/day	
Therefore Daily Number of Railcars per Train	100	Cars/train	
Total Siding Track Length within Valero Facility	2	miles	Google Earth and diagram provided by Valero
Total Mainline Track Length in California	68	miles	Google Earth - UPRR tack from Roseville Yard to Benecia Refinery
Total Mainline Track Length in BAAQMD	22	miles	Google Earth - Portion of UPRR tack from Roseville Yard to Benecia Refinery within BAAQMD
Conversion Factors			
UPRR Fuel Consumption Index (Gross Weight - Locomotive Weight)	1,005	Gross ton-miles/gal	Calculated based on methodology described in Procedures for Emission Inventory Preparation Volume IV: Mobile Sources, EPA420-R-92-009, December 1992
Sulfur Content of Fuel	15	ppmw	California Diesel Fuel Standard
Density of Diesel	3,200	g/gal	Emission Factors for Locomotives, EPA-420-F-09-025, April 2009
Number of Locomotives required for Switching	1	per train	Assumption
Switching Time	2	hr/train	Assumption
Average Train Size	25	cars/train	Project Description
Fuel Consumed during Yard Operation	9.4	gal/hr/locomotive	Revised Inventory Guidance for Locomotive Emissions, Sierra Research, pg 14, footnote 2, June 2004, http://www.metro4-sesarm.org/pubs/railroad/FinalGuidance.pdf
Average Locomotive Power over typical Switch Duty Cycle	177	bhp	Locomotive Emission Standards, Regulatory Support Document, Appendix B, EPA-420-R-98-101, April 1998
Power to Fuel Consumption Conversion Factor	15.2	bhp-hr/gal	Table 3, Emission Factors for Locomotives, EPA-420-F-09-025, April 2009

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Daily Emissions

Year 2014 Locomotive Emission Factors

	Emision Factor (g/gal fuel)[1]						
Operation Type	**CO**	**POC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO_2e[1,2]**
Large Line Haul	26.62	6.42	135	0.096	3.6	3.5	10,314
Switch	27.82	13.37	217	0.096	4.8	4.7	10,314
Small Line Haul	23.30	12.32	242	0.096	5.6	5.4	10,314

1. Emission Factors for Locomotives, EPA-420-F-09-025, April 2009
2. N_2O and CH_4 factors for locomotive from 2012 Climate Registry Default Emission Factors, Released: January 6, 2012. http://www.theclimateregistry.org/downloads/2012/01/2012-Climate-Registry-Default-Emissions-Factors.pdf

Year 2014 Daily Line Haul Emissions (Within BAAQMD)

		Emissions (lb/day)					
Segment	**Operation Type**	**CO**	**ROG**	**NOx**	**SOx**	**PM10**	**PM2.5**
Within Valero Refinery	Small Line Haul	1.84	0.97	19.12	0.01	0.44	0.43
BAAQMD Border to Valero Refinery	Large Line Haul	23.14	5.58	117.35	0.08	3.13	3.04
Total Line Haul Emissions		**24.98**	**6.56**	**136.47**	**0.09**	**3.57**	**3.46**

Year 2014 Daily Switching Emissions

		Emissions (lb/day)					
Segment	**Operation Type**	**CO**	**ROG**	**NOx**	**SOx**	**PM10**	**PM2.5**
From Unloading Rack to Empty Railcar Parking Location (Using Fuel Usage Method)	Switch	4.62	2.22	36.04	0.02	0.80	0.77
From Unloading Rack to Empty Railcar Parking Location (Using Average Power Method)	Switch	5.71	2.75	44.57	0.02	0.99	0.96
Total Switch Emissions		**5.71**	**2.75**	**44.57**	**0.02**	**0.99**	**0.96**

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Annual Emissions

Year 2014 Annual Locomotive Criteria Pollutant Emissions - 100 Railcars per Day

Parameter	Value	Unit	Reference
Additional Annual Tank Car due to Project	36,500	Cars/year	Based on Project Description
Maximum Freight Weight	106	short tons/car	TRN Spec Sheet-1
Annual Freight Transported due to Project	3,861,700	short tons/year	Based on Project Description
Weight of Empty Tank Car	37	short tons/car	TRN Spec Sheet-1
Total Annual Weight of Empty Tank Cars	1,357,800	short tons/year	
Annual Gross Weight Hauled	5,219,500	short tons/year	Freight Weight + Empty Railcar Weight
Assuming the Facility is Serviced Once daily	1	train/day	
Therefore daily Number of Railcars per Train	100	Cars/train	
Total Siding Track Length within Valero Facility	2	miles	Google Earth and diagram provided by Valero
Total Mainline Track Length in California	68	miles	Google Earth - UPRR tack from Roseville Yard to Benecia Refinery
Total Mainline Track Length in BAAQMD	22	miles	Google Earth - Portion of UPRR tack from Roseville Yard to Benecia Refinery within BAAQMD
Conversion Factors			
UPRR Fuel Consumption Index (Gross Weight - Locomotive Weight)	1,005	Gross ton-miles/gal	Calculated based on methodology described in Procedures for Emission Inventory Preparation Volume IV: Mobile Sources, EPA420-R-92-009, December 1992
Sulfur Content of Fuel	15	ppmw	California Diesel Fuel Standard
Density of Diesel	3,200	g/gal	Emission Factors for Locomotives, EPA-420-F-09-025, April 2009
Number of Locomotives required for Switching	1	per train	Assumption
Switching Time	2	hr/train	Assumption
Average Train Size	25	cars/train	Project Description
Fuel Consumed during Yard Operation	9.4	gal/hr/ locomotive	Revised Inventory Guidance for Locomotive Emissions, Sierra Research, pg 14, footnote 2, June 2004, http://www.metro4-sesarm.org/pubs/railroad/FinalGuidance.pdf
Average Locomotive Power over typical Switch Duty Cycle	177	bhp	Locomotive Emission Standards, Regulatory Support Document, Appendix B, EPA-420-R-98-101, April 1998
Power to Fuel Consumption Conversion Factor	15.2	bhp-hr/gal	Table 3, Emission Factors for Locomotives, EPA-420-F-09-025, April 2009

Crude by Rail Project
Locomotive Criteria Pollutant and GHG Emissions
2/22/2013
Annual Emissions

Year 2014 Locomotive Emission Factors

	Emision Factor (g/gal fuel)[1]						
Operation Type	**CO**	**POC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO_2e[1,2]**
Large Line Haul	26.624	6.4233	135	0.096	3.6	3.5	10314
Switch	27.816	13.3731	217	0.096	4.8	4.7	10314
Small Line Haul	23.296	12.3201	242	0.096	5.6	5.4	10314

1. Emission Factors for Locomotives, EPA-420-F-09-025, April 2009
2. N_2O and CH_4 factors for locomotive from 2012 Climate Registry Default Emission Factors, Released: January 6, 2012. http://www.theclimateregistry.org/downloads/2012/01/2012-Climate-Registry-Default-Emissions-Factors.pdf

Year 2014 Annual Line Haul Emissions (Within BAAQMD for Criteria Pollutants and Within California for CO2e)

	Emissions (tons/year)								Fuel Usage
Segment	**Operation Type**	**CO**	**ROG**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO_2e**	**(gal/day)**
Within Valero Refinery	Small Line Haul	0.34	0.18	3.49	0.001	0.081	0.078	149	13,083
BAAQMD Border to Valero Refinery	Large Line Haul	4.22	1.02	21.42	0.015	0.571	0.554	5058	444,834
Total Line Haul Emissions		**4.56**	**1.20**	**24.91**	**0.017**	**0.652**	**0.632**	**5,206**	**457,918**

Year 2014 Annual Switching Emissions

	Emissions (tons/year)								Fuel Usage
Segment	**Operation Type**	**CO**	**ROG**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO_2e**	**(gal/day)**
From Unloading Rack to Empty Railcar Parking Location (Using Fuel Usage Method)	Switch	0.843	0.405	6.577	0.003	0.145	0.141	313	75
From Unloading Rack to Empty Railcar Parking Location (Using Average Power Method)	Switch	1.043	0.501	8.134	0.004	0.180	0.175	387	93
Total Switch Emissions		**1.043**	**0.501**	**8.134**	**0.004**	**0.180**	**0.175**	**387**	**93**

Marine Vessel
Criteria Pollutant and GHG
Baseline Emissions

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
2/22/2013

Total Emissions Over 3-Year Baseline Period

Sources	Total Emissions Over Baseline Period (lb)									
	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
OGV - Main Engine	218,239	18,710	14,480	5,221	4,809	29,772	1,299	9,213,764	469	9,386,595
OGV - Auxiliary Engine	292,408	26,445	12,501	9,136	8,414	50,486	2,164	16,588,373	697	16,849,940
OGV - Auxiliary Boiler	74,692	7,568	4,162	7,568	7,378	115,501	1,135	36,702,931	2,845	37,608,850
Tugboats	85,823	25,437	6,739	4,248	4,248	62	112	5,485,412	247	5,564,409
Total	**671,162**	**78,161**	**37,882**	**26,172**	**24,849**	**195,822**	**4,710**	**67,990,480**	**4,259**	**69,409,794**
Emission Factor (lb/kbbl)	**7.19**	**0.84**	**0.41**	**0.28**	**0.27**	**2.10**	**0.05**	**728**	**0.05**	**743**

Total crude delivered by marine vessel during 3-year baseline period: 93,361,985 barrels

Annual Average Emissions Over Baseline Period

Sources	Annual Average Emissions Over Baseline Period (tons/year)									
	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
OGV - Main Engine	36	3	2	1	1	5	0	1,536	0	1,564
OGV - Auxiliary Engine	49	4	2	2	1	8	0	2,765	0	2,808
OGV - Auxiliary Boiler	12	1	1	1	1	19	0	6,117	0	6,268
Tugboats	14	4	1	1	1	0	0	914	0	927
Total	**112**	**13**	**6**	**4**	**4**	**33**	**1**	**11,332**	**1**	**11,568**

Average Emissions per Visit Over Baseline Period

Sources	Average Emissions Over Baseline Period (lb/visit)									
	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
OGV - Main Engine	827	71	55	20	18	113	5	34,901	2	35,555
OGV - Auxiliary Engine	1,108	100	47	35	32	191	8	62,835	3	63,826
OGV - Auxiliary Boiler	283	29	16	29	28	438	4	139,026	11	142,458
Tugboats	325	96	26	16	16	0.2	0	20,778	1	21,077
OGV - Total	2,217	200	118	83	78	742	17	236,762	15	241,839

Projected Emissions Offset by Proposed Crude By Rail Project

Emissions Offset by 25.55 MMbbls/year of Crude by Rail										
	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
Emissions (tpy)	91.8	10.7	5.2	3.6	3.4	26.8	0.6	9,303	0.6	9,498

Note: - Greenhouse gases (GHGs) are calculated as carbon dioxide equivalent (CO_2e) = CO_2 + 21*CH_4 + 310*N_2O
21 is the Global Warming Potential of CH_4
310 is the Global Warming Potential of N_2O

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
2/22/2013

Default or Average Tanker Ship Specifications

Ship/Tanker Type	Crude Capacity (barrels)	DWT	Average Aux Engine Rating of ships visiting the Valero Wharf (kW)	Average Max Speed of ships visiting the Valero Wharf (kW)
Handymax		0 to 49,999	2328	14.5
Panamax	500,000	50,000 to 79,999	2616	14.9
Aframax	750,000	80,000 to 119,999	2492	15.0
Suezmax	1,000,000	120,000 to 199,999	3277	15.6
VLCC	2,000,000	200,000 to 299,999	4,502	15.3
ULCC	4,000,000	300,000+	4,502	15.6

VLCC - VERY LARGE CRUDE CARRIER
ULCC - ULTRA LARGE CRUDE CARRIER

Crude Tanker Specific Cargo Capacity Estimate

Description	DWT[1]	Cargo tank capacity (m^3)[1]	Cargo capacity per DWT (m3/DWT)	Specific Cargo Capacity (bbl/DWT)
Suezmax Oil Tanker	166,300	185,447	1.1151	7.01
Oil Tanker	108,000	126,211	1.1686	7.35
Oil Tanker	114,000	126,210	1.1071	6.96
Oil Tanker	70,700	80,400	1.1372	7.15
Oil Tanker	52,600	58,691	1.1158	7.02
Oil Tanker	45,999	53,100	1.1544	7.26
Chemicals and Oil Products Tanker	46,764	52,969	1.1327	7.12
Oil and Chemical Tanker	47,400	53,100	1.1203	7.05
Alaskan class tankers	193,048	210,902	1.0925	6.87
Average				**7.09**

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
2/22/2013

conversion factor:	264.172	gal/m3
conversion factor:	42	gal/bbl

Notes:
1. DWT and cargo tank capacity for oil tankers were obtained from the following websites~
http://www.hb.hr/LinkClick.aspx?fileticket=RetQFnntemc%3D&tabid=74
http://www.nassco.com/products-and-services/comm-dc/bp-tanker-fa
http://www.marinetraffic.com/ais/shipdetails.aspx?MMSI=303656000
2. Emissions from slow cruise and maneuvering mode are apportioned by the ratio of crude delivered for Valero to the total cargo capacity of the oil tanker. It was assumed that the oil
3. Maximum cargo capacity = Average specific cargo capacity x DWT

Default Discharge Rate

DWT	Average Discharge Rate (bbl/hr)
0 -109,999	22707
110,000 - 169,999	22707
170,000 -	22707

POLB Air Emissions Inventory for 2011 -Tanker Specifications

Size	Average Model Year	Avg Age (2011 - Model year)	AVG DWT	Max Speed (knots)	Main Eng Rating (kW)	Aux Eng Rating (kW)
Handysize	2004	7	46,314	14.6	8,257	2,328
Panamax	2004	7	70,912	14.8	11,060	2,627
Aframax	2005	6	109,227	15.1	13,319	2,432
Suezmax	2005	6	178,271	15.3	18,587	5,056
VLCC	2003	8	298,571	15.3	25,288	4,502
ULCC	2004	7	311,294	15.6	28,625	4,502

Main Engine Emission Factors

Fuel Switching Regulation

Phase	Effective Date	% Sulfur Content for OGV		Comment
		MGO	MDO	
1	7/1/2009	1.5%	0.5%	No HFO to be used
	8/1/2012	1.0%	0.5%	
2	1/1/2014	0.1%	0.1%	

All main engines on oil tankers are slow speed, category 3 engines with displacement > 30 dm3 and power rating b/w 2,500 kw and 70,000 kW

Main Engine Emission Standards

Tier	For US Flagged Vessels (USEPA Standard for Category 3 Engines)			
	Effective Date	Speed (rpm)		
		Slow (n < 130)	Medium (130 ≤ n < 2000)	High (n ≥ 2000)
0				
1	2004	17	$45 \cdot n^{-0.2}$	9.8
2	2011	14.4	$44 \cdot n^{-0.23}$	7.7
3	2016	3.4	$9 \cdot n^{-0.2}$	1.96

Tier	For Foreign Flagged Vessels (MARPOL Annex VI - not based on category)			
	Effective Date	Speed (rpm)		
		Slow (n < 130)	Medium (130 ≤ n < 2000)	High (n ≥ 2000)
0				
I	2000	17	$45 \cdot n^{-0.2}$	9.8
II	2011	14.4	$44 \cdot n^{-0.23}$	7.7
III	2016	3.4	$9 \cdot n^{-0.2}$	1.96

Tier	For All Flagged Vessels (Combination of USEPA and MARPOL)			
	Effective Date	Speed (rpm)		
		Slow (n < 130)	Medium (130 ≤ n < 2000)	High (n ≥ 2000)
0	≤1999			
1	2000 - 2010	17	$45 \cdot n^{-0.2}$	9.8
2	2011 - 2015	14.4	$44 \cdot n^{-0.23}$	7.7
3	2016 -	3.4	$9 \cdot n^{-0.2}$	1.96

Main Engine Emission Factors

						Main Engine Emission Factor (g/kW-hr)									
Engine Speed	RPM	Tier	Ship Built Year From	Ship Built Year To	Fuel	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
Slow	<130	0	0	1999	0.5%S MDO	18.1	1.1	0.78	0.38	0.35	1.9	0.07	588	0.029	598
Slow	<130	I	2000	2010	0.5%S MDO	17	1.1	0.78	0.38	0.35	1.9	0.07	588	0.029	598
Slow	<130	II	2011	2015	0.5%S MDO	14.4	1.1	0.78	0.38	0.35	1.9	0.07	588	0.029	598
Slow	<130	0	0	1999	0.1%S MDO	18.1	1.1	0.78	0.25	0.23	0.36	0.07	588	0.029	598
Slow	<130	I	2000	2010	0.1%S MDO	17	1.1	0.78	0.25	0.23	0.36	0.07	588	0.029	598
Slow	<130	II	2011	2015	0.1%S MDO	14.4	1.1	0.78	0.25	0.23	0.36	0.07	588	0.029	598
Slow	<130	III	2016	9999	0.1%S MDO	3.4	1.1	0.78	0.25	0.23	0.36	0.07	588	0.029	598

All emission factors, except Tier-based NOx and N2O from California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Tables II-6 and II-7
Tier-based Nox emission factors are from on MARPOL Annex IV regulations
N2O emission factor at 0.5% S or 0.1 % S = N2O emission factor at 2.7% S in HFO (from POLB 2011 Emisisons Inventory, Section 2, Table 2.6) x Fuel Correction Factor
(POLB 2011 Emisisons Inventory, Section 2, Tables 2.17)

Low Load Adjustment Multipliers (Used when Load factor < 20%)

Load Factor (%)	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O
2	4.63	9.7	21.18	7.29	7.29	1	21.18	1	4.63
3	2.92	6.49	11.68	4.33	4.33	1	11.68	1	2.92
4	2.21	4.86	7.71	3.09	3.09	1	7.71	1	2.21
5	1.83	3.9	5.61	2.44	2.44	1	5.61	1	1.83
6	1.6	3.26	4.35	2.04	2.04	1	4.35	1	1.6
7	1.45	2.8	3.52	1.79	1.79	1	3.52	1	1.45
8	1.35	2.45	2.95	1.61	1.61	1	2.95	1	1.35
9	1.27	2.18	2.52	1.48	1.48	1	2.52	1	1.27
10	1.22	1.97	2.18	1.38	1.38	1	2.18	1	1.22
11	1.17	1.79	1.96	1.3	1.3	1	1.96	1	1.17
12	1.14	1.64	1.76	1.24	1.24	1	1.76	1	1.14
13	1.11	1.52	1.6	1.19	1.19	1	1.6	1	1.11
14	1.08	1.41	1.47	1.15	1.15	1	1.47	1	1.08
15	1.06	1.32	1.36	1.11	1.11	1	1.36	1	1.06
16	1.05	1.24	1.26	1.08	1.08	1	1.26	1	1.05
17	1.03	1.17	1.18	1.06	1.06	1	1.18	1	1.03
18	1.02	1.11	1.11	1.04	1.04	1	1.11	1	1.02
19	1.01	1.05	1.05	1.02	1.02	1	1.05	1	1.01
20	1	1	1	1	1	1	1	1	1

POLB 2011 Emisisons Inventory, Section 2, Table 2.9

Auxiliary Engine Emission Factors

Fuel Switching Regulation

Phase	Effective Date	% Sulfur Content for OGV		Comment
		MGO	MDO	
1	7/1/2009	1.5%	0.5%	No HFO to be used
	8/1/2012	1.0%	0.5%	
2	1/1/2014	0.1%	0.1%	

All auxiliary engines are assumed to be medium speed engines
According to USEPA's "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009", Table 2-2 - Auxiliary engines in OGVs are Category 2 engines

Auxiliary Engine Emission Standards

Tier	For Foreign Flagged Vessels (MARPOL Annex VI - not based on category)			
	Effective Date	Speed (rpm)		
		Slow (n < 130)	Medium (130 ≤ n < 2000)	High (n ≥ 2000)
0				
I	2000	17	$45 \cdot n^{-0.2}$	9.8
II	2011	14.4	$44 \cdot n^{-0.23}$	7.7
III	2016	3.4	$9 \cdot n^{-0.2}$	1.96

Auxiliary Engine Emission Factors
USEPA Category 2 engine Standards

Tier	Effective Date	Displacement (L/cylinder)	Power (kW)	Speed (rpm)	Nox (g/kW-hr)	HC + Nox (g/kW-hr)	PM (g/kW-hr)
1	2004	≥ 2.5	≥ 37	rpm < 130	17	-	-
				130 ≤ rpm < 2,000	$45 \cdot n^{-0.2}$	-	-
				rpm ≥ 2,000	9.8	-	-
2	2007	5.0 ≤ Disp < 15	all	-	-	7.8	0.27
		15.0 ≤ Disp < 20	< 3,300	-	-	8.7	0.50
		15.0 ≤ Disp < 20	≥ 3,300	-	-	9.8	0.50
		20.0 ≤ Disp < 25	all	-	-	9.8	0.50
		25.0 ≤ Disp < 30	all	-	-	11.0	0.50
3	2013+	7.0 ≤ Disp < 15	< 2,000	-	-	6.2	0.14
			2,000 ≤ kW < 3,700	-	-	7.8	0.14
	2014+	15.0 ≤ Disp < 20	< 2,000	-	-	7	0.34
		20.0 ≤ Disp < 25	< 2,000	-	-	9.8	0.27
		25.0 ≤ Disp < 30	< 2,000	-	-	11.0	0.27
4	2017+	All	600 ≤ kW < 1,400	-	1.8	0.19 HC only	0.04
	2016+	All	1400 ≤ kW < 2,000	-	1.8	0.19 HC only	0.04
	2014+	All	2,000 ≤ kW < 3,700	-	1.8	0.19 HC only	0.04
	2014-2015	< 15.0	≥ 3,700	-	1.8	0.19 HC only	0.12
	2014-2015	15.0 ≤ Disp < 30		-	1.8	0.19 HC only	0.25
	2016+	All		-	1.8	0.19 HC only	0.06

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
2/22/2013

Auxiliary Engine Emission Factors

Auxiliary Engine Emission Factors for Foreign Flagged Ships (g/kW-hr)															
Engine Speed	**RPM**	**Tier**	**Ship Built Year From**	**Ship Built Year To**	**Fuel**	**NO_x**	**CO**	**ROG**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CH_4**	**CO_2**	**N_2O**	**CO_2e**
Medium	130 - 2000	0	0	1999	0.5%S MDO	13.9	1.1	0.52	0.38	0.35	2.1	0.09	690	0.029	701
Medium	130 - 2000	I	2000	2010	0.5%S MDO	12.2	1.1	0.52	0.38	0.35	2.1	0.09	690	0.029	701
Medium	130 - 2000	II	2011	2015	0.5%S MDO	9.9	1.1	0.52	0.38	0.35	2.1	0.09	690	0.029	701
Medium	130 - 2000	0	0	1999	0.1%S MDO	13.9	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701
Medium	130 - 2000	I	2000	2010	0.1%S MDO	12.2	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701
Medium	130 - 2000	II	2011	2015	0.1%S MDO	9.9	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701
Medium	130 - 2000	III	2016	9999	0.1%S MDO	2.6	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701

Engine Category	2
speed (rpm)	500

All emission factors, except Tier-based NOx and N2O from California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-8
Tier-based Nox emission factors are from MARPOL Annex IV regulations. Tier 0, I, and II factors are multiplied by fuel correction factor. Tier III emission factors were not multiplied by fuel correction factors as HFO will not be availale and used in 2016 and thre after.
N2O emission factor at 0.5% S or 0.1 % S = N2O emission factor at 2.7% S in HFO (from POLB 2011 Emisisons Inventory, Section 2, Table 2.11) x Fuel Correction Factor (POLB 2011 Emisisons Inventory, Section 2, Tables 2.17)

Auxiliary Engine Emission Factors for US Flagged Ships (g/kW-hr)															
Engine Speed	**RPM**	**Tier**	**Ship Built Year From**	**Ship Built Year To**	**Fuel**	**NO_x**	**CO**	**ROG**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CH_4**	**CO_2**	**N_2O**	**CO_2e**
Medium	130 - 2000	0	0	1999	0.5%S MDO	13.9	1.1	0.52	0.38	0.35	2.1	0.09	690	0.029	701
Medium	130 - 2000	I	2000	2006	0.5%S MDO	12.2	1.1	0.52	0.38	0.35	2.1	0.09	690	0.029	701
Medium	130 - 2000	II	2007	2013	0.5%S MDO	8.4	1.1	0.47	0.11	0.11	2.1	0.09	690	0.029	701
Medium	130 - 2000	0	0	1999	0.1%S MDO	13.9	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701
Medium	130 - 2000	I	2000	2006	0.1%S MDO	12.2	1.1	0.52	0.25	0.23	0.4	0.09	690	0.029	701
Medium	130 - 2000	II	2007	2013	0.1%S MDO	8.4	1.1	0.47	0.08	0.08	0.4	0.09	690	0.029	701

Engine Category	2
Displacement (dm3/cyl)	5 ≤ Disp < 30
speed (rpm)	500

All emission factors, except Tier-based NOx and N2O and Tier II ROG and PM, are from California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-8
Tier-based NOx and Tier II ROG and PM emission factors are from USEPA commercial marine engine regulations for Category 2 engines. The USEPA Tier II emission standards are based on engine displacement and as the engine displacement is not available, the emission factors are assumed to be an average of emission standards for all displacement categories under Category 2 engines. Tier II NOx and ROG emission factors assumed a 95% to 5% split for the combined NOx+HC standard. Tier 0, I and II NOx factors and Tier II ROG and PM factors are multiplied by fuel correction factor.
Tier II PM 2.5 emissions factors assumed equal to Tier II PM10 factors
N2O emission factor at 0.5% S or 0.1 % S = N2O emission factor at 2.7% S in HFO (from POLB 2011 Emisisons Inventory, Section 2, Tables 2.5 and 2.6) x Fuel Correction Factor (POLB 2011 Emisisons Inventory, Section 2, Tables 2.17)

Fuel Correction factor

Actual fuel	**S Content**	**PM**	**NOx**	**SOx**	**CO**	**HC**	**CO2**	**N2O**	**CH4**
HFO	1.50%	0.82	1	0.555	1	1	1	1	1
MDO	1.50%	0.47	0.94	0.555	1	1	1	0.94	1
MGO	0.50%	0.25	0.94	0.185	1	1	1	0.94	1
MGO	0.30%	0.21	0.94	0.111	1	1	1	0.94	1
MGO	0.20%	0.19	0.94	0.074	1	1	1	0.94	1
MGO	0.10%	0.17	0.94	0.037	1	1	1	0.94	1

POLB 2011 Emisisons Inventory, Section 2, Tables 2.17

Auxiliary Boiler Emissions Factors

Auxiliary Boiler Emission Factors (g/kW-hr)										
Fuel	**NO_x**	**CO**	**ROG**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CH_4**	**CO_2**	**N_2O**	**CO_2e**
2.7% S HFO	2.1	0.2	0.11	0.8	0.78	16.5	0.03	970	0.08	995
0.5%S MDO	1.97	0.20	0.11	0.20	0.195	3.05	0.03	970.00	0.08	993.9
0.1%S MDO	1.97	0.20	0.11	0.136	0.1326	0.61	0.03	970.00	0.08	993.9

All emission factors, except N2O from California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-9

N2O emission factor at 0.5% S or 0.1 % S = N2O emission factor at 2.7% S in HFO (from POLB 2011 Emisisons Inventory, Section 2, Table 2.15) x Fuel Correction Factor (POLB 2011 Emisisons Inventory, Section 2, Tables 2.17)

Auxiliary Boiler Emission Factors (kg/tonne)										
Fuel	**NO_x**	**CO**	**ROG**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**CH_4**	**CO_2**	**N_2O**	**CO_2e**
2.7% S HFO	6.89	0.66	0.36	2.62	2.56	54.10	0.10	3180	0.26	3264
0.5%S MDO	6.47	0.66	0.36	0.66	0.64	10.0	0.10	3180	0.25	3259
0.1%S MDO	6.47	0.66	0.36	0.45	0.43	2.00	0.10	3180	0.25	3259

Fuel Correction factor

Actual fuel	S Content	NOx	CO	HC	PM10	PM2.5	SOx	CH4	CO2	N2O
HFO	1.50%	1	1	1	0.82	0.82	0.555	1	1	1
MDO	1.50%	0.94	1	1	0.47	0.47	0.555	1	1	0.94
MGO	0.50%	0.94	1	1	0.25	0.25	0.185	1	1	0.94
MGO	0.30%	0.94	1	1	0.21	0.21	0.111	1	1	0.94
MGO	0.20%	0.94	1	1	0.19	0.19	0.074	1	1	0.94
MGO	0.10%	0.94	1	1	0.17	0.17	0.037	1	1	0.94

POLB 2011 Emisisons Inventory, Section 2, Tables 2.17

Auxiliary Boiler Emissions Factors

Fuel Consumption Rates (ARB OGV 2011 Appendix D, Table II-10)

Engine	Engine Speed	Mode	Fuel	Fuel Use Rate (g of fuel/kW-hr)
Auxiliary Engine	All	All	Marine Distillate	217
	All	All	HFO	227
Boiler	NA	All	HFO	305
Main	Slow	Transit	Marine Distillate	185
	Slow	Transit	HFO	195
	Medium	Transit	Marine Distillate	203
	Medium	Transit	HFO	213
	High	Transit	HFO	213
	Slow	Maneuvering	Marine Distillate	185
	Slow	Maneuvering	HFO	195
	Medium	Maneuvering	Marine Distillate	203
	Medium	Maneuvering	HFO	213
	High	Maneuvering	HFO	213

Crude by Rail Project
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OGV and Tugboat Operation in SF Bay Area and Port of Benicia

Speed Requirements per SF Bar Pilot - Steve Teague

Segment	Speed	Distance	Time	Tug assist	
	knots	nm	hrs	Loaded (incoming)	Ballasted (outgoing)
Sea buoy - Mile rock (1 mi west of GG Bridge)	12	10	0.83		
Mile rock (1 mi west of GG Bridge) - SPB Light #5	10	19	1.90	Tug 1	
SPB light #5 - SPB light #15	10	7	0.70		
SPB light #15 - Buoy 25	8	4.5	0.56		
Buoy 25 - Berth	5	2.5	0.50	Additional Tugs	Tugs
Berth - Sea Buoy (out)	12	43	3.58		
Total Round Trip		86	8.08		

Tug Operations and Typical Specs per Capt. Shawn Bennett at Bay Delta Maritime

Segment	Tug Requirement	Incoming - Loaded	Outgoing - Ballasted
Mile rock (1 mi west of GG Bridge) - Near Berth (assumed Buoy 25)	1 Tug	3.2	0.5
Near Berth (assumed Buoy 25) - Berth	Tug 1 and Additional Tugs as required per ship DWT	0.5	0.5

Tug Fleet Main Engine Operating in Bay Area	5000 HP
Tug Fleet Aux Engine Operating in Bay Area	150 HP
Tug Fleet Avg Age	10 years

Conclusion - typical tugboats are Class A

Bay Delta Maritime tugs are docked at SF Pier 17 and Valero dock in Port of Benicia

Crude by Rail Project
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Ocean Going Vessels Activity Data

	Mode of Operation					
	Slow Cruise -1	**Slow Cruise - 2**	**Slow Cruise/ Maneuvering**	**Maneuvering/Mooring/Unmooring**	**Hotelling w/o Discharge**	**Hotelling /w Discharge**
Segment Name	Pilot Sea Buoy[1] - GG Bridge and Berth - Pilot Sea Buoy	GG Bridge - San Pablo Bay Light #15	San Pablo Bay Light #15 - Sea Buoy 25	Sea Buoy 25 - Berth	At Berth	At Berth
Speed (knots)	12	10	8	5	---	---
Round-trip distance (nm)	53.0	26.0	4.5	2.5	---	---
Round-Trip Time (hrs)	4.42	2.60	0.56	0.50	6	Crude delivered/ Discharge Rate
Main Engine Load Factor	(12/Max Speed)^3	(10/Max Speed)^3	(8/Max Speed)^3	2%	0%	0%
Auxiliary Engine Load Factor	24%	24%	33%	33%	26%	26%
Auxiliary Boiler Load Factor	0%	0%	12%	12%	100%	100%
Reference	Port of Richmond, 2005 Seaport Air Emissions Inventory, Table, 2-6		Distance measured using Google Earth from Valero Wharf	POLB, CARB, Port of Richmond Emissions Inventory	Assumed 3 hours before and after unloading the crude	

1. Per Alison Kirk of BAAQMD, emissions must be estimated from the point the pilot boards the ship at Sea Buoy

Ocean Going Vessels Activity Data

Operating Modes of Emission Sources			
Source	**Operating Mode**		
	Transit	**Maneuvering**	**Hotelling**
Main Engine	x	x	Not Used
Auxiliary Engine	x	x	x
Auxiliary Boiler	Operate if main Engine LF < 20%	x	x

Emission reduction technology control efficiency (Only for main engine)
2004 and newer main engines assumed to be equipped with fuel slide valves

	NO_x	CO	ROG	PM_{10}	$PM_{2.5}$	SO_2	CH_4	CO_2	N_2O	CO_2e
Control Efficiency	30%	0%	0%	25%	25%	0%	0%	0%	0%	0%

POLB 2011 Emissions Inventory

Baseline Ocean Going Vessels Emissions

1. IMO # obtained by searching ship name on www.marinetraffic.com
2. DWT obtained by searching IMO # in POLB Air Emissions Inventory OGV Appendices or in www.marinetraffic.com
3. MY obtained by searching IMO # in POLB Air Emissions Inventorys' OGV Appendices or in www.marinetraffic.com
4. Ship Category based on IMO classification by DWT
5. Assumed number of main engines by ship category

Ship Category	Number of Main Engines
Handymax	1
Panamax	1
Aframax	1
Suezmax	2
VLCCS	2
ULCCS	2

6. Main engines power obtained by searching IMO # in POLB Air Emissions Inventorys' OGV Appendices for various years and if not available then estimated using the regression analysis equation provided in EPA "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data" (EPA420-R-00-002, February 2000), Table 4-5.

Horsepower = 9070 + 0.101*DWT

kW = 0.746*(9070 + 0.101 * DWT)

7. Average number of Auxiliary engines on tankers = 2.7, per California ARB 2005 Oceangoing Ship Survey Summary Of Results, Appendix C, Table 9
8. Auxiliary engine rating for ships for which data was not available is equal to the average of auxiliary engine rating for similar category (DWT) of ships that visited the valero Wharf during the baseline period or the average auxiliary engine rating for similar category of ships provided in POLB 2011 Emissions Inventory, Appendix A, Table A.3
9. Auxiliary Boiler rating for ships for which data was not available was assumed equal to the average of auxiliary boiler rating for similar category (DWT) of ships provided in POLB 2011 Emissions Inventory, Section 2, Table 2.16

Tugboat Specifications and Assumptions

Tug requirements - Sec C.3, Benicia Port Information and Terminal Regulations Manual

Vessel Size	SIZE	MOORING*	MOORING*	UNMOORING*	UNMOORING*
DWT		Class A	Class B	Class A	Class B
0	30,000	0	2	0	2
30,000	65,000	1	1	1	1
65,000	130,000	2	1	2	0
130,000	195,000	4	0	3	0
195,000	999,999	4	0	3	1

http://portal.harleymarine.com/vessels/sms/Shared%20Documents/SF%20Bay%20Area%20Terminal%20Guidlines/Valero%20Benicia,%20Ca/Valero%20Benicia%20Terminal%20Manual%20(Final%20July%2027%202012)%2

Main Engine Assumptions

Tug Class	Average Power per Engine[1]	Number of Main Engines	Assumed Model Year	Useful Life[2]	Emission Factor x FCF (g/HP-hr)									Assumed Date of MY
	HP				NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O	
A	2172	2	2001	21	6.93	1.97	0.49	0.29	0.29	0.01	0.01	486.39	0.02	7/1/2001
B	1563	2	2001	21	6.93	1.97	0.49	0.29	0.29	0.01	0.01	486.39	0.02	7/1/2001
C	1388	2	2001	21	6.93	1.97	0.49	0.29	0.29	0.01	0.01	486.39	0.02	7/1/2001
D	754	2	2001	21	6.93	1.97	0.49	0.29	0.29	0.01	0.01	486.39	0.02	7/1/2001

1 - Revised PORT OF OAKLAND 2005 SEAPORT AIR EMISSIONS INVENTORY, Table 3-6
2 - Port of Richmond 2005 Emissions Inventory, Appendix A, Table 4

Aux Engine Assumptions

Tug Class	Average Power per Engine[1]	Number of Aux Engines	Assumed Model Year	Useful Life[2]	Emission Factor x FCF (g/HP-hr)									Assumed Date of MY
	HP				NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O	
A	128	2	2001	23	6.93	2.78	0.58	0.26	0.26	0.01	0.01	486.39	0.02	7/1/2001
B	110	2	2001	23	6.93	3.59	0.85	0.46	0.46	0.01	0.02	486.39	0.02	7/1/2001
C	92	2	2001	23	6.93	3.59	0.85	0.46	0.46	0.01	0.02	486.39	0.02	7/1/2001
D	110	2	2001	23	6.93	3.59	0.85	0.46	0.46	0.01	0.02	486.39	0.02	7/1/2001

1 - Revised PORT OF OAKLAND 2005 SEAPORT AIR EMISSIONS INVENTORY, Table 3-6
2 - Port of Richmond 2005 Emissions Inventory, Appendix A, Table 4

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Fuel Correction factor for ULSD

Engine Power (HP)		MY		NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
0	24	0	1994	0.93	1	0.72	0.72	0.72	1	0.72	1	0.93
25	50	0	1998	0.93	1	0.72	0.72	0.72	1	0.72	1	0.93
51	100	0	1997	0.93	1	0.72	0.72	0.72	1	0.72	1	0.93
101	175	0	1996	0.93	1	0.72	0.72	0.72	1	0.72	1	0.93
176	5000	0	1995	0.93	1	0.72	0.72	0.72	1	0.72	1	0.93
0	24	1995	2010	0.948	1	0.72	0.8	0.8	1	0.72	1	0.948
25	50	1999	2010	0.948	1	0.72	0.8	0.8	1	0.72	1	0.948
51	100	1998	2010	0.948	1	0.72	0.8	0.8	1	0.72	1	0.948
101	175	1997	2010	0.948	1	0.72	0.8	0.8	1	0.72	1	0.948
176	5000	1996	2010	0.948	1	0.72	0.8	0.8	1	0.72	1	0.948
0	5000	2011	9999	0.948	1	0.72	0.852	0.852	1	0.72	1	0.948

Ref - CARB 2007, Appendix B Emissions Estimation Methodology for Commercial Harbor Craft Operating in California and POLB 2011 Air Emissions Inventory

Deterioration Factor

HP Range		NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
25	50	0.06	0.41	0.51	0.31	0.31	0	0	0	0
51	250	0.14	0.16	0.28	0.44	0.44	0	0	0	0
251	5000	0.21	0.25	0.44	0.67	0.67	0	0	0	0

Ref - CARB 2007, Appendix B Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Operation Mode	Tug in-Transit	Tug Assist/Mooring/ Unmooring
Load Factor	**Tug Base - Vessel**	**Vessel - Vessel Berth**
Main	0.5	0.31
Auxiliary	0.43	0.43

Ref - Port of Richmond 2005 Emissions Inventory, Appendix A, Table 2

Tug Mooring/Unmooring Activity rate	Tug in-Transit[1]	Tug Mooring/ Unmooring[2]
(hrs/one-way trip)	**Tug Base - Vessel (in/out)**	**Vessel - Vessel Berth**
Main	0.5	0.5
Auxiliary	0.5	0.5

1. Assumption
2. Assumed equal to time for maneuvering mode

Tug Assisting Activity rate	Tug in-Transit[1]	Tug Assist[2]
(hrs/one-way trip)	**Tug Base - Vessel**	**Vessel - Vessel Berth**
Main	2	3.2
Auxiliary	2	3.2

1. Assumption
2. Based on conversation with SF Bar Pilot

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
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Tugboat Zero Hour Emissions Factors

Engine Type	Year		Engine Power (HP)		Zero Hour Emission Factor (g/HP-hr)								
	Min	Max	Min	Max	NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
Main	0	1997	25	50	8.14	3.65	1.84	0.72	0.72	0.006	0.0368	486	0.023
Main	1998	1999	25	50	8.14	3.65	1.8	0.72	0.72	0.006	0.036	486	0.023
Main	2000	2004	25	50	7.31	3.65	1.8	0.72	0.72	0.006	0.036	486	0.023
Main	2005	2008	25	50	5.32	3.73	1.8	0.3	0.3	0.006	0.036	486	0.023
Main	2009	2020	25	50	5.32	3.73	1.8	0.22	0.22	0.006	0.036	486	0.023
Main	0	1996	51	120	15.34	3.5	1.44	0.8	0.8	0.006	0.0288	486	0.023
Main	1997	1999	51	120	10.33	2.55	0.99	0.66	0.66	0.006	0.0198	486	0.023
Main	2000	2004	51	120	7.31	2.55	0.99	0.66	0.66	0.006	0.0198	486	0.023
Main	2005	2008	51	120	5.32	3.73	0.99	0.3	0.3	0.006	0.0198	486	0.023
Main	2009	2020	51	120	5.32	3.73	0.99	0.22	0.22	0.006	0.0198	486	0.023
Main	0	1970	121	175	16.52	3.21	1.32	0.73	0.73	0.006	0.0264	486	0.023
Main	1971	1978	121	175	15.34	3.21	1.1	0.63	0.63	0.006	0.022	486	0.023
Main	1979	1983	121	175	14.16	3.21	1	0.52	0.52	0.006	0.02	486	0.023
Main	1984	1986	121	175	12.98	3.14	0.94	0.52	0.52	0.006	0.0188	486	0.023
Main	1987	1995	121	175	12.98	3.07	0.88	0.52	0.52	0.006	0.0176	486	0.023
Main	1996	1999	121	175	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2003	121	175	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2004	2012	121	175	5.1	3.73	0.68	0.22	0.22	0.006	0.0136	486	0.023
Main	2013	2020	121	175	3.8	3.73	0.68	0.09	0.09	0.006	0.0136	486	0.023
Main	0	1970	176	250	16.52	3.21	1.32	0.73	0.73	0.006	0.0264	486	0.023
Main	1971	1978	176	250	15.34	3.21	1.1	0.63	0.63	0.006	0.022	486	0.023
Main	1979	1983	176	250	14.16	3.21	1	0.52	0.52	0.006	0.02	486	0.023
Main	1984	1986	176	250	12.98	3.14	0.94	0.52	0.52	0.006	0.0188	486	0.023
Main	1987	1994	176	250	12.98	3.07	0.88	0.52	0.52	0.006	0.0176	486	0.023
Main	1995	1999	176	250	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2003	176	250	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2004	2013	176	250	5.1	3.73	0.68	0.15	0.15	0.006	0.0136	486	0.023
Main	2014	2020	176	250	3.99	3.73	0.68	0.08	0.08	0.006	0.0136	486	0.023
Main	0	1970	251	500	16.52	3.07	1.26	0.7	0.7	0.006	0.0252	486	0.023
Main	1971	1978	251	500	15.34	3.07	1.05	0.6	0.6	0.006	0.021	486	0.023
Main	1979	1983	251	500	14.16	3.07	0.95	0.5	0.5	0.006	0.019	486	0.023
Main	1984	1986	251	500	12.98	3.07	0.9	0.5	0.5	0.006	0.018	486	0.023
Main	1987	1994	251	500	12.98	2.99	0.84	0.5	0.5	0.006	0.0168	486	0.023
Main	1995	1999	251	500	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2003	251	500	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2004	2013	251	500	5.1	3.73	0.68	0.15	0.15	0.006	0.0136	486	0.023
Main	2014	2020	251	500	3.99	3.73	0.68	0.08	0.08	0.006	0.0136	486	0.023
Main	0	1970	501	750	16.52	3.07	1.26	0.7	0.7	0.006	0.0252	486	0.023
Main	1971	1978	501	750	15.34	3.07	1.05	0.6	0.6	0.006	0.021	486	0.023
Main	1979	1983	501	750	14.16	3.07	0.95	0.5	0.5	0.006	0.019	486	0.023
Main	1984	1986	501	750	12.98	3.07	0.9	0.5	0.5	0.006	0.018	486	0.023
Main	1987	1994	501	750	12.98	2.99	0.84	0.5	0.5	0.006	0.0168	486	0.023
Main	1995	1999	501	750	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2006	501	750	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2007	2012	501	750	5.1	3.73	0.68	0.15	0.15	0.006	0.0136	486	0.023
Main	2013	2020	501	750	3.99	3.73	0.68	0.08	0.08	0.006	0.0136	486	0.023
Main	0	1970	751	1900	16.52	3.07	1.26	0.7	0.7	0.006	0.0252	486	0.023

Crude by Rail Project
Marine Vessel Criteria Pollutant and GHG Baseline Emissions
2/22/2013

Tugboat Zero Hour Emissions Factors

Engine Type	Year		Engine Power (HP)		Zero Hour Emission Factor (g/HP-hr)								
	Min	Max	Min	Max	NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
Main	1971	1978	751	1900	15.34	3.07	1.05	0.6	0.6	0.006	0.021	486	0.023
Main	1979	1983	751	1900	14.16	3.07	0.95	0.5	0.5	0.006	0.019	486	0.023
Main	1984	1986	751	1900	12.98	3.07	0.9	0.5	0.5	0.006	0.018	486	0.023
Main	1987	1998	751	1900	12.98	2.99	0.84	0.5	0.5	0.006	0.0168	486	0.023
Main	1999	1999	751	1900	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2006	751	1900	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2007	2011	751	1900	5.53	3.73	0.68	0.2	0.2	0.006	0.0136	486	0.023
Main	2012	2016	751	1900	4.09	3.73	0.68	0.08	0.08	0.006	0.0136	486	0.023
Main	2017	2020	751	1900	1.3	3.73	0.18	0.03	0.03	0.006	0.0036	486	0.023
Main	0	1970	1901	3300	16.52	3.07	1.26	0.7	0.7	0.006	0.0252	486	0.023
Main	1971	1978	1901	3300	15.34	3.07	1.05	0.6	0.6	0.006	0.021	486	0.023
Main	1979	1983	1901	3300	14.16	3.07	0.95	0.5	0.5	0.006	0.019	486	0.023
Main	1984	1986	1901	3300	12.98	3.07	0.9	0.5	0.5	0.006	0.018	486	0.023
Main	1987	1998	1901	3300	12.98	2.99	0.84	0.5	0.5	0.006	0.0168	486	0.023
Main	1999	1999	1901	3300	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2006	1901	3300	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2007	2012	1901	3300	5.53	3.73	0.68	0.2	0.2	0.006	0.0136	486	0.023
Main	2013	2015	1901	3300	4.37	3.73	0.68	0.1	0.1	0.006	0.0136	486	0.023
Main	2016	2020	1901	3300	1.3	3.73	0.18	0.03	0.03	0.006	0.0036	486	0.023
Main	0	1970	3301	5000	16.52	3.07	1.26	0.7	0.7	0.006	0.0252	486	0.023
Main	1971	1978	3301	5000	15.34	3.07	1.05	0.6	0.6	0.006	0.021	486	0.023
Main	1979	1983	3301	5000	14.16	3.07	0.95	0.5	0.5	0.006	0.019	486	0.023
Main	1984	1986	3301	5000	12.98	3.07	0.9	0.5	0.5	0.006	0.018	486	0.023
Main	1987	1998	3301	5000	12.98	2.99	0.84	0.5	0.5	0.006	0.0168	486	0.023
Main	1999	1999	3301	5000	9.64	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2000	2006	3301	5000	7.31	1.97	0.68	0.36	0.36	0.006	0.0136	486	0.023
Main	2007	2013	3301	5000	5.53	3.73	0.68	0.2	0.2	0.006	0.0136	486	0.023
Main	2014	2015	3301	5000	4.94	3.73	0.68	0.25	0.25	0.006	0.0136	486	0.023
Main	2016	2020	3301	5000	1.3	3.73	0.18	0.03	0.03	0.006	0.0036	486	0.023

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Marine Vessel Criteria Pollutant and GHG Baseline Emissions
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Tugboat Zero Hour Emissions Factors

Engine Type	Year		Engine Power (HP)		Zero Hour Emission Factor (g/HP-hr)								
	Min	Max	Min	Max	NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
Auxiliary	0	1997	25	50	6.9	5.15	2.19	0.64	0.64	0.006	0.0438	486	0.023
Auxiliary	1998	1999	25	50	6.9	5.15	2.14	0.64	0.64	0.006	0.0428	486	0.023
Auxiliary	2000	2004	25	50	6.9	5.15	2.14	0.64	0.64	0.006	0.0428	486	0.023
Auxiliary	2005	2008	25	50	5.32	3.73	2.14	0.3	0.3	0.006	0.0428	486	0.023
Auxiliary	2009	2020	25	50	5.32	3.73	2.14	0.22	0.22	0.006	0.0428	486	0.023
Auxiliary	0	1996	51	120	13	4.94	1.71	0.71	0.71	0.006	0.0342	486	0.023
Auxiliary	1997	1999	51	120	8.75	3.59	1.18	0.58	0.58	0.006	0.0236	486	0.023
Auxiliary	2000	2004	51	120	7.31	3.59	1.18	0.58	0.58	0.006	0.0236	486	0.023
Auxiliary	2005	2008	51	120	5.32	3.73	1.18	0.3	0.3	0.006	0.0236	486	0.023
Auxiliary	2009	2020	51	120	5.32	3.73	1.18	0.22	0.22	0.006	0.0236	486	0.023
Auxiliary	0	1970	121	175	14	4.53	1.57	0.65	0.65	0.006	0.0314	486	0.023
Auxiliary	1971	1978	121	175	13	4.53	1.31	0.55	0.55	0.006	0.0262	486	0.023
Auxiliary	1979	1983	121	175	12	4.53	1.19	0.46	0.46	0.006	0.0238	486	0.023
Auxiliary	1984	1986	121	175	11	4.43	1.12	0.46	0.46	0.006	0.0224	486	0.023
Auxiliary	1987	1995	121	175	11	4.33	1.05	0.46	0.46	0.006	0.021	486	0.023
Auxiliary	1996	1999	121	175	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2003	121	175	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2004	2012	121	175	5.1	3.73	0.81	0.22	0.22	0.006	0.0162	486	0.023
Auxiliary	2013	2020	121	175	3.8	3.73	0.81	0.09	0.09	0.006	0.0162	486	0.023
Auxiliary	0	1970	176	250	14	4.53	1.57	0.65	0.65	0.006	0.0314	486	0.023
Auxiliary	1971	1978	176	250	13	4.53	1.31	0.55	0.55	0.006	0.0262	486	0.023
Auxiliary	1979	1983	176	250	12	4.53	1.19	0.46	0.46	0.006	0.0238	486	0.023
Auxiliary	1984	1986	176	250	11	4.43	1.12	0.46	0.46	0.006	0.0224	486	0.023
Auxiliary	1987	1994	176	250	11	4.33	1.05	0.46	0.46	0.006	0.021	486	0.023
Auxiliary	1995	1999	176	250	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2003	176	250	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2004	2013	176	250	5.1	3.73	0.81	0.15	0.15	0.006	0.0162	486	0.023
Auxiliary	2014	2020	176	250	3.99	3.73	0.81	0.08	0.08	0.006	0.0162	486	0.023
Auxiliary	0	1970	251	500	14	4.33	1.5	0.62	0.62	0.006	0.03	486	0.023
Auxiliary	1971	1978	251	500	13	4.33	1.25	0.53	0.53	0.006	0.025	486	0.023
Auxiliary	1979	1983	251	500	12	4.33	1.13	0.45	0.45	0.006	0.0226	486	0.023
Auxiliary	1984	1986	251	500	11	4.33	1.07	0.45	0.45	0.006	0.0214	486	0.023
Auxiliary	1987	1994	251	500	11	4.22	1	0.45	0.45	0.006	0.02	486	0.023
Auxiliary	1995	1999	251	500	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2003	251	500	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2004	2013	251	500	5.1	3.73	0.81	0.15	0.15	0.006	0.0162	486	0.023
Auxiliary	2014	2020	251	500	3.99	3.73	0.81	0.08	0.08	0.006	0.0162	486	0.023
Auxiliary	0	1970	501	750	14	4.33	1.5	0.62	0.62	0.006	0.03	486	0.023
Auxiliary	1971	1978	501	750	13	4.33	1.25	0.53	0.53	0.006	0.025	486	0.023
Auxiliary	1979	1983	501	750	12	4.33	1.13	0.45	0.45	0.006	0.0226	486	0.023
Auxiliary	1984	1986	501	750	11	4.33	1.07	0.45	0.45	0.006	0.0214	486	0.023
Auxiliary	1987	1994	501	750	11	4.22	1	0.45	0.45	0.006	0.02	486	0.023
Auxiliary	1995	1999	501	750	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2006	501	750	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2007	2012	501	750	5.1	3.73	0.81	0.15	0.15	0.006	0.0162	486	0.023
Auxiliary	2013	2020	501	750	3.99	3.73	0.81	0.08	0.08	0.006	0.0162	486	0.023

Tugboat Zero Hour Emissions Factors

Engine Type	Year		Engine Power (HP)		Zero Hour Emission Factor (g/HP-hr)								
	Min	Max	Min	Max	NOx	CO	HC	PM10	PM2.5	SO2 at 15 ppm	CH4	CO2	N2O
Auxiliary	0	1970	751	1900	14	4.33	1.5	0.62	0.62	0.006	0.03	486	0.023
Auxiliary	1971	1978	751	1900	13	4.33	1.25	0.53	0.53	0.006	0.025	486	0.023
Auxiliary	1979	1983	751	1900	12	4.33	1.13	0.45	0.45	0.006	0.0226	486	0.023
Auxiliary	1984	1986	751	1900	11	4.33	1.07	0.45	0.45	0.006	0.0214	486	0.023
Auxiliary	1987	1998	751	1900	11	4.22	1	0.45	0.45	0.006	0.02	486	0.023
Auxiliary	1999	1999	751	1900	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2006	751	1900	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2007	2011	751	1900	5.53	3.73	0.81	0.2	0.2	0.006	0.0162	486	0.023
Auxiliary	2012	2016	751	1900	4.09	3.73	0.81	0.08	0.08	0.006	0.0162	486	0.023
Auxiliary	2017	2020	751	1900	1.3	3.73	0.18	0.03	0.03	0.006	0.0036	486	0.023
Auxiliary	0	1970	1901	3300	14	4.33	1.5	0.62	0.62	0.006	0.03	486	0.023
Auxiliary	1971	1978	1901	3300	13	4.33	1.25	0.53	0.53	0.006	0.025	486	0.023
Auxiliary	1979	1983	1901	3300	12	4.33	1.13	0.45	0.45	0.006	0.0226	486	0.023
Auxiliary	1984	1986	1901	3300	11	4.33	1.07	0.45	0.45	0.006	0.0214	486	0.023
Auxiliary	1987	1998	1901	3300	11	4.22	1	0.45	0.45	0.006	0.02	486	0.023
Auxiliary	1999	1999	1901	3300	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2006	1901	3300	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2007	2012	1901	3300	5.53	3.73	0.81	0.2	0.2	0.006	0.0162	486	0.023
Auxiliary	2013	2015	1901	3300	4.37	3.73	0.81	0.1	0.1	0.006	0.0162	486	0.023
Auxiliary	2016	2020	1901	3300	1.3	3.73	0.18	0.03	0.03	0.006	0.0036	486	0.023
Auxiliary	0	1970	3301	5000	14	4.33	1.5	0.62	0.62	0.006	0.03	486	0.023
Auxiliary	1971	1978	3301	5000	13	4.33	1.25	0.53	0.53	0.006	0.025	486	0.023
Auxiliary	1979	1983	3301	5000	12	4.33	1.13	0.45	0.45	0.006	0.0226	486	0.023
Auxiliary	1984	1986	3301	5000	11	4.33	1.07	0.45	0.45	0.006	0.0214	486	0.023
Auxiliary	1987	1998	3301	5000	11	4.22	1	0.45	0.45	0.006	0.02	486	0.023
Auxiliary	1999	1999	3301	5000	8.17	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2000	2006	3301	5000	7.31	2.78	0.81	0.32	0.32	0.006	0.0162	486	0.023
Auxiliary	2007	2013	3301	5000	5.53	3.73	0.81	0.2	0.2	0.006	0.0162	486	0.023
Auxiliary	2014	2015	3301	5000	4.94	3.75	0.81	0.25	0.25	0.006	0.0162	486	0.023
Auxiliary	2016	2020	3301	5000	1.3	3.75	0.18	0.03	0.03	0.006	0.0036	486	0.023

Ref - CARB 2007, Appendix B Emissions Estimation Methodology for Commercial Harbor Craft Operating in California

Appendix C
District ATC Application Forms

Form P-101B

Form T

Form HRSA

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, CA 94109
Engineering Division (415) 749-4990
www.baaqmd.gov fax (415) 749-5030

Form P-101B
Authority to Construct/
Permit to Operate

1. Application Information

BAAQMD Plant No. B2626 Company Name Valero Refining Co. - California

Equipment/Project Description Crude By Rail Project

2. Plant Information *If you have not previously been assigned a Plant Number by the District or if you want to update any plant data that you have previously supplied to the District, please complete this section.*

Equipment Location 3400 East Second Street

City Benicia Zip Code 94510

Mail Address 3400 East Second Street

City Benicia State CA Zip Code 94510

Plant Contact Donald Cuffel Title Manager - Environmental Engineering

Telephone (707) 745 - 7545 Fax ( ) Email don.cuffel@valero.com

NAICS (North American Industry Classification System) see www.census.gov/epcd/naics02/naico602.htm 324110

3. Proximity to a School (K-12)

The sources in this permit application (*check one*) ☐ Are ☒ Are not within 1,000 ft of the outer boundary of the nearest school.

4. Application Contact Information *All correspondence from the District regarding this application will be sent to the plant contact unless you wish to designate a different contact for this application.*

Application Contact Susan Gustofson Title Staff Environmental Engineer

Mail Address 3400 East Second Street

City Benicia State CA Zip Code XXXX

Telephone (707) 745 - 7011 Fax ( ) Email susan.gustofson@valero.com

5. Additional Information *The following additional information is required for all permit applications and should be included with your submittal. Failure to provide this information may delay the review of your application. Please indicate that each item has been addressed by checking the box. Contact the Engineering Division if you need assistance.*

☐ If a new Plant, a local street map showing the location of your business

☒ A facility map, drawn roughly to scale, that locates the equipment and its emission points

☒ Completed data form(s) and a pollutant flow diagram for each piece of equipment.
(See www.baaqmd.gov/Forms/Engineering.aspx)

☒ Project/equipment description, manufacturer's data

☒ Discussion and/or calculations of the emissions of air pollutants from the equipment

6. Trade Secrets *Under the California Public Records Act, all information in your permit application will be considered a matter of public record and may be disclosed to a third party. If you wish to keep certain items separate as specified in Regulation 2, Rule 1, Section 202.7, please complete the following steps.*

☐ Each page containing trade secret information must be labeled "trade secret" with the trade secret information clearly marked.

☐ A second copy, with trade secret information blanked out, marked "public copy" must be provided.

☐ For each item asserted to be trade secret, you must provide a statement which provides the basis for your claim.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, CA 94109
Engineering Division (415) 749-4990
www.baaqmd.gov fax (415) 749-5030

Form P-101B
Authority to Construct/
Permit to Operate

7. Small Business Certification *You are entitled to a reduced permit fee if you qualify as a small business as defined in Regulation 3. In order to qualify, you must certify that your business meets all of the following criteria:*

☐ The business does not employ more than 10 persons and its gross annual income does not exceed $750,000.

☐ And the business is not an affiliate of a non-small business. (Note: a non-small business employs more than 10 persons and/or its gross income exceeds $750,000.)

8. Green Business Certification *You are entitled to a reduced permit fee if you qualify as a green business as defined in Regulation 3. In order to qualify, you must certify that your business meets all of the following criteria:*

☐ The business has been certified under the Bay Area Green Business Program coordinated by the Association of Bay Area Governments and implemented by participating counties.

☐ A copy of the certification is included.

9. Accelerated Permitting *The Accelerated Permitting Program entitles you to install and operate qualifying sources of air pollution and abatement equipment* ***without waiting for the District to issue a Permit to Operate****. To participate in this program you must certify that your project will meet all of the following criteria. Please acknowledge each item by checking each box.*

☐ Uncontrolled emissions of any single pollutant are each less than 10 lb/highest day, or the equipment has been precertified by the BAAQMD.

☐ Emissions of toxic compounds do not exceed the trigger levels identified in Table 2-5-1 (see Regulation 2, Rule 5).

☐ The source is not a diesel engine.

☐ The project is not subject to public notice requirements (the source is either more than 1000 ft. from the nearest school, or the source does not emit any toxic compound in Table 2-5-1).

☐ For replacement of abatement equipment, the new equipment must have an equal or greater overall abatement efficiency for all pollutants than the equipment being replaced.

☐ For alterations of existing sources, for all pollutants the alteration does not result in an increase in emissions.

☐ Payment of applicable fees (the minimum permit fee to install and operate each source). See Regulation 3 or contact the Engineering Division for help in determining your fees.

10. CEQA *Please answer the following questions pertaining to CEQA (California Environmental Quality Act).*

A. Has another public agency prepared, required preparation of, or issued a notice regarding preparation of a California Environmental Quality Act (CEQA) document (initial study, negative declaration, environmental impact report, or other CEQA document) that analyzes impacts of this project or another project of which it is a part or to which it is related? ☒YES ☐NO If no, go to section 10B.

Describe the document or notice, preparer, and date of document or expected date of completion:

A Land Use Permit application for this project was submitted to the City of Benicia in December 2012.

The City of Benicia will serve as Lead Agency.

B. List and describe any other permits or agency approvals required for this project by city, regional, state or federal agencies:

None.

C. List and describe all other prior or current projects for which either of the following statements is true: (1) the project that is the subject of this application could not be undertaken without the project listed below, (2) the project listed below could not be undertaken without the project that is the subject of this application:

None.

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, CA 94109
Engineering Division (415) 749-4990
www.baaqmd.gov fax (415) 749-5030

Form P-101B
Authority to Construct/
Permit to Operate

11. Certification *I hereby certify that all information contained herein is true and correct. (Please sign and date this form)*

Name of person certifying (print)	Title of person certifying	Signature of person certifying	Date
Donald Cuffel	Manager - Environmental Engineering	Susan K Gustofson for Don Cuffel	2/28/2013

Send all application materials to the **BAAQMD Engineering Division, 939 Ellis Street, San Francisco, CA 94109.**

DATA FORM T
Organic Liquid Evaporation
(tankage, loading and handling)

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

939 Ellis Street .. San Francisco, CA 94109. (415) 749-4990 FAX (415)-749-5030

1. Business Name: **Valero Refining Co. - California** Plant No: **B2626** (if unknown, leave blank)
2. SIC No: **2911** Date of Initial Operation **~2014 (planned)** Source No S- **97**
3. Name or Description **TK-1776 (External Floating Roof) – Change to Include Crude Oil Service**
4. Code materials* in order of highest throughputs: 1) **89** (crude oil) 2) ____ 3) ____ 4) ____
5. Total throughput (all materials), last 12 months: ________ thousand gal **or** **0 (crude)** thousand bbl
6. Typical % of total annual throughput: Dec-Feb **25** % Mar-May **25** % Jun-Aug **25** % Sep-Nov **25** %

☐ Check box if loading/handling facility; complete lines 7-11 and omit the remainder of this form. (Also complete one Form T for each storage tank)

~~7. ● Usage type: ☐ Bulk plant (truck/rail car) ☐ Bulk plant (marine) ☐ Vehicle service station~~
~~☐ Aircraft/marine servicing Other: ________~~

~~8. ● How many nozzles/loading arms? ________ How many pumps? ________~~

~~9. ● Make and model of nozzles/loading arms: ________~~

~~10. ● Nozzle/arm loads tank by: ☐ splash fill ☐ submerged fill ☐ part splash, part submerged~~

~~11. ● Upon loading, vapor space in tank(s) is: ☐ Vented directly to atmosphere~~
~~☐ Collected by nozzle/arm and sent to Abatement Device(s): A ________ A ________~~

12. Annual Average: Storage vapor pressure __ psia **or** tank temperature ambient°F and RVP **9.4** psia
13. Highest v.p. of all materials stored: ___ psia **or** high tank temperature ambient°F and high RVP **9.4** psia
14. Highest °API of all material stored: **~43.5** Lowest initial B.P. of all materials stored: **80-100** °F
15. Tank Type: ☐ underground ☐ fixed roof ☐ internal floating roof ☒ floating roof ☐ pressure ☐ other: ________
16. Tank volume: ____ thousand gallons **or** **110** thousand barrels
17. Tank Diameter: **128** ft height or length: **~48** ft Check if applicable: ☐ heated ☐ insulated

Fixed Roof Tanks Only

~~18. Maximum fill rate: ______ gal/hr or ________ bbl/hr~~

~~19. Average height of vapor space: ________ ft Highest head space reactivity ________ %~~
~~☐ Check box if emissions from this tank are controlled; complete lines 20 and 21.~~

~~20. ● Emissions vent to what source(s) and/or abatement device(s)? S______ S______ A______ A______~~

~~21. ● Do all gauging/sampling devices have gas-tight covers? ☐ yes ☐ no~~

~~22. Paint color: ☐ Aluminum ☐ White ☐ Light grey ☐ Medium grey ☐ Other ________~~

~~23. Paint Condition: ☐ good ☐ poor~~

Floating Roof Tanks Only

24. Shell Type: ☐ gunited ☐ riveted ☒ welded ☐ other: ________
25. Seal Type: ☐ single ☒ double ☐ other: ________ Condition: ☒ tight ☐ loose
26. Maximum withdrawn rate: ________ gal/hr **or** **~3,000** bbl/hr
27. Do all gauging/sampling devices enter below liquid level and have gas-tight covers? ☒ yes ☐ no
28. Roof type: ☐ pan ☒ pontoon ☐ other: ________ Is emergency roof drain at least 90% covered? ☒ yes ☐ no

Person completing this form **S. Gustofson**	Date **2/28/2013**

***See Material Code Reference List.**

Form HRSA

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

939 Ellis Street . . . San Francisco, CA 94109. . . (415) 749-4990 . . . FAX (415) 749-5030 OR 4949
WEBSITE: WWW.BAAQMD.GOV

Health Risk Screening Analysis

IMPORTANT: For any permit application that requires a Health Risk Screening Analysis, fill out one form for each source that emits a Toxic Air Contaminant(s) [or for a group of sources that exhaust through a common stack]. Emissions can be from a discrete point source (with stack) or a source with fugitive emissions (area or volume source). You must provide a plot plan (drawn to scale, if possible) and a local map (aerial photos are recommended), which clearly demonstrate the location of your site, the source(s), property lines, and any surrounding buildings [see attached example]. Label streets, schools, residences, and other businesses. List major dimensions of all buildings surrounding the source in Section C.

Plant Name: Valero Refining Co. - California Plant No.: B2626

Source Description: Tank 1776 (external floating roof tank)

Source No.: S-97 (if known) Emission Point No.: P-____ (if known)

SECTION A *(Point Source)*

1. Does the source exhaust at clearly defined emission point; i.e., a stack or exhaust pipe? ☐ YES OR ☒ NO

   (If YES continue at #2, If NO, skip to Section B)

2. ~~Does the stack (or exhaust pipe) stand alone or is it located on the roof of a building? ☐ alone OR ☐ on roof~~

   ~~*Important: If stack is on a roof, provide building dimensions on line B1 in* Section C.~~

3. ~~What is the height of the stack outlet above ground level? _____ feet OR _______ meters?~~

4. ~~What is the inside diameter of the stack outlet? _____ inches OR _______ feet OR _______ meters~~

5. ~~What is the direction of the exhaust from the stack outlet? ☐ horizontal OR ☐ vertical~~

6. ~~Is the stack outlet: ☐ open or hinged rain flap OR ☐ rain capped (deflects exhaust downward or horizontally)~~

7. ~~What is the exhaust flowrate during normal operation? __feet^3/min OR ___ meters^3/second~~
8. ~~What is the typical temperature of the exhaust gas? __ degrees Fahrenheit OR ___ degrees Celsius~~

   ~~***(Skip Section B and Go on to Section C)***~~

SECTION B *(Area/Volume Source)*

This section applies to fugitive emissions that are NOT captured by a collection system nor directly emitted through a stack or other emission point. Volume sources have fugitive emissions generally released within a building or other defined space (e.g., dry cleaner, gasoline station canopy). Area sources are generally flat areas of release (e.g., landfill, quarry).

1. Is the emission source located within a building? ☐ YES (go to #2) OR ☒ NO (go to #3)

2. ~~If YES (source inside building), provide building dimensions on line B1 in Section C~~

   a. ~~Does the building have a ventilation system that is vented to the outside? ☐ YES OR ☐ NO~~

   b. ~~If NO (ventilation), are the building's doors & windows kept open during hours of operation? ☐ YES OR ☐ NO~~

3. If NO (source not inside building), provide a description of the source, dimensions, & indicate location on plot plan.

   External floating roof tank. Diameter = 128 ft, shell height = 48 ft. See attached figure for location (and Figures 2-1 and 2-2 of application for surrounding area).

(Go on to Section C)

SECTION C *(Building Dimensions)*

Provide building dimensions. Use Line B1 only for building with source/stack on the roof or with fugitive emissions inside building. Use Lines B2-B9 for buildings surrounding the source (within 300 feet). Distance and direction are optional if map and/or aerial photo are adequately labeled with locations of buildings. Check one for units: ☐ feet OR ☐ meters

B#	Building name or description	Height	Width	Length	Distance To Source	Direction To Source
B1	Building with source:				n/a	n/a
B2						
B3						
B4						
B5						
B6						
B7						
B8						

See attached figure for structures surrounding S-97.

NOTE: Label buildings by B# on plot plan, map and/or aerial photo. Provide comments below for any details that need additional clarification (e.g., list buildings that are co-occupied by your employees and other workers, residents, students, etc).

(Go on to Section D)

SECTION D *(Receptor Locations)*

NOTE: Indicate on maps or aerial photos the residential and nonresidential areas surrounding your facility.

1. Indicate the area where the source is located (check one):
   - ☐ zoned for residential use
   - ☐ zoned for mixed residential and commercial/industrial use
   - ☒ zoned for commercial and/or industrial use
   - ☐ zoned for agricultural use
2. Distance from source (stack or building) to nearest facility property line = ~650 feet OR ____ meters
3. Distance from source (stack or building) to the property line of the nearest residence = ~4,000 feet OR _______ meters
4. Describe the nearest nonresidential property (check one): ☒ Industrial/Commercial OR ☐ Other _______________
5. Distance from source (stack or building) to property line of nearest nonresidential site = ~750 feet OR ___ meters
6. Distance from source to property line of nearest school* (or school site) = _______ feet OR ☒ Greater than 1,000 feet

   [Note: Helpful website with California Dept. of Education data: www.greatschools.net]

   Provide the names and addresses of all schools* that have property line(s) within 1,000 feet of the source:

*K-12 and more than twelve children only

Form HRSA: Plot plan showing location of S-97 (Tank 1776) .

Source: Google Maps, queried January 2013.