# Appendix E.4

Air Permit Application, Project Update #1, November 2013

ESA

# Crude by Rail
## Air Permit Application

## Project Update Document # 1

Valero Benicia Refinery
Benicia, California
BAAQMD Plant No. B2626

***Public Copy***

November 2013

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Valero Refining Co. - California

# Crude by Rail
## Air Permit Application

## Project Update Document # 1

Valero Benicia Refinery
Benicia, California
BAAQMD Plant No. B2626

November 2013

***Public Copy***

Project No. 0186851

**Environmental Resources Management**
1277 Treat Boulevard
Suite 500
Walnut Creek, CA 94597
T: (925) 946-0455
F: (925) 946-9968

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| | |
|---|---|
| ATC | Authority to Construct |
| BAAQMD | Bay Area Air Quality Management District |
| BACT | Best Available Control Technology |
| bbl | barrel |
| CAPCOA | California Air Pollution Control Officers Association |
| CARB | California Air Resources Board |
| CBR | Crude by Rail |
| CEQA | California Environmental Quality Act |
| CFR | Code of Federal Regulations |
| CO | carbon monoxide |
| $CO_2e$ | carbon dioxide equivalent |
| District | Bay Area Air Quality Management District |
| DPM | diesel particulate matter |
| EFR | external floating roof |
| GHG | greenhouse gas |
| HAP | hazardous air pollutant |
| HRA | Health Risk Assessment |
| HRSA | Health Risk Screening Assessment |
| LDAR | Leak Detection and Repair |
| MACT | Maximum Achievable Control Technology |
| MEIR | Maximum Exposed Individual Residential |
| MEIW | Maximum Exposed Individual Worker |
| MMbbl | million barrels |
| MSR | Maximum Sensitive Receptor |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NOx | oxides of nitrogen |
| NPOC | non-precursor organic compound |
| NSPS | New Source Performance Standards |
| NSR | New Source Review |
| PM | particulate matter |
| POC | precursor organic compound |
| PSD | Prevention of Significant Deterioration |
| PTO | Permit to Operate |
| $SO_2$ | sulfur dioxide |

| | |
|---|---|
| TAC | toxic air contaminant |
| TBACT | Best Available Control Technology for Toxics |
| UP | Union Pacific Railroad Company |
| VOC | volatile organic compound |

# 1.0 INTRODUCTION

This document supplements the application (AN 25242) for Authority to Construct (ATC) for the Valero Crude by Rail (CBR) project ("project"), dated February 2013, previously submitted to Bay Area Air Quality Management District ("BAAQMD" or "District"). Valero Refining Co. - California (Valero) proposes to incorporate changes to the existing permit application by excluding Tank 1776 (BAAQMD Source # S-97) from the project scope and rerouting the crude oil that would be received at the proposed rail car unloading rack to the existing tanks located in the Crude Tank Farm. The emissions estimates from the affected sources have been revised in this project update document.

This document has been prepared such that only modified sections from the existing ATC Application (AN 25242), dated February 2013, will be discussed. Modified sections are included in their entirety to facilitate the incorporation of the proposed modifications into the existing permit application.

## 1.1 Facility Contact Information

NO CHANGE

## 1.2 Overview

Valero currently receives crude oil by pipeline and by ship. The project would install one rail car unloading rack capable of unloading two parallel rows of crude oil-laden rail cars on the refinery property 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. The project would not result in an increase in the production of existing products or byproducts. No modifications would be made to refinery process equipment.

## 1.3 Schedule

Valero plans to begin construction in second quarter of 2014 and commence operating the CBR unloading facility in late 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; and
- Appendix D – Health Risk Assessment.

# 2.0 FACILITY AND PROJECT DESCRIPTION

## 2.1 Facility Description

NO CHANGE

*Figure 2-1 Valero Benicia Refinery Location Map*

NO CHANGE

## 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 rack. An unloading rack 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 storage tanks (1701 through 1708) located in the Crude Tank Farm. The rack 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.
- Pipeline and associated components. New piping of approximately 4,000 feet of primarily 16-inch diameter and associated components (pumps, valves, flanges, and connectors) would be installed between the rail car unloading rack and Crude Tank Farm. The new piping from the rail car unloading rack would tie into existing 20-inch-diameter piping near tank 1776.
- Rail tracks. Two parallel unloading rail spurs and a parallel rail car storage and departure track would be constructed on refinery property to allow receipt of rail cars at the unloading rack. 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, existing firewater pipeline, compressor station, and underground infrastructure would be relocated to accommodate the new rail tracks and unloading rack. A service road, adjacent to the proposed rail spurs, would also be relocated.

Crude oil offloaded from the new unloading rack would be stored in existing external floating roof (EFR) storage tanks, Tanks 1701 through 1708. These tanks are currently permitted to store crude oil. The tanks currently comply with all the requirements of BAAQMD Regulation 8-5 for the type of material stored, such as control and seal requirements, and associated permit conditions. The tanks will continue to comply with all these requirements with the implementation of this project without requiring any physical modifications or change in service that would impact emissions.

Figure 2-2 shows the location of the rail car unloading rack, pipeline routing and Crude Tank Farm. A process flow diagram is provided in Appendix A.

*Figure 2-2 Location Map*

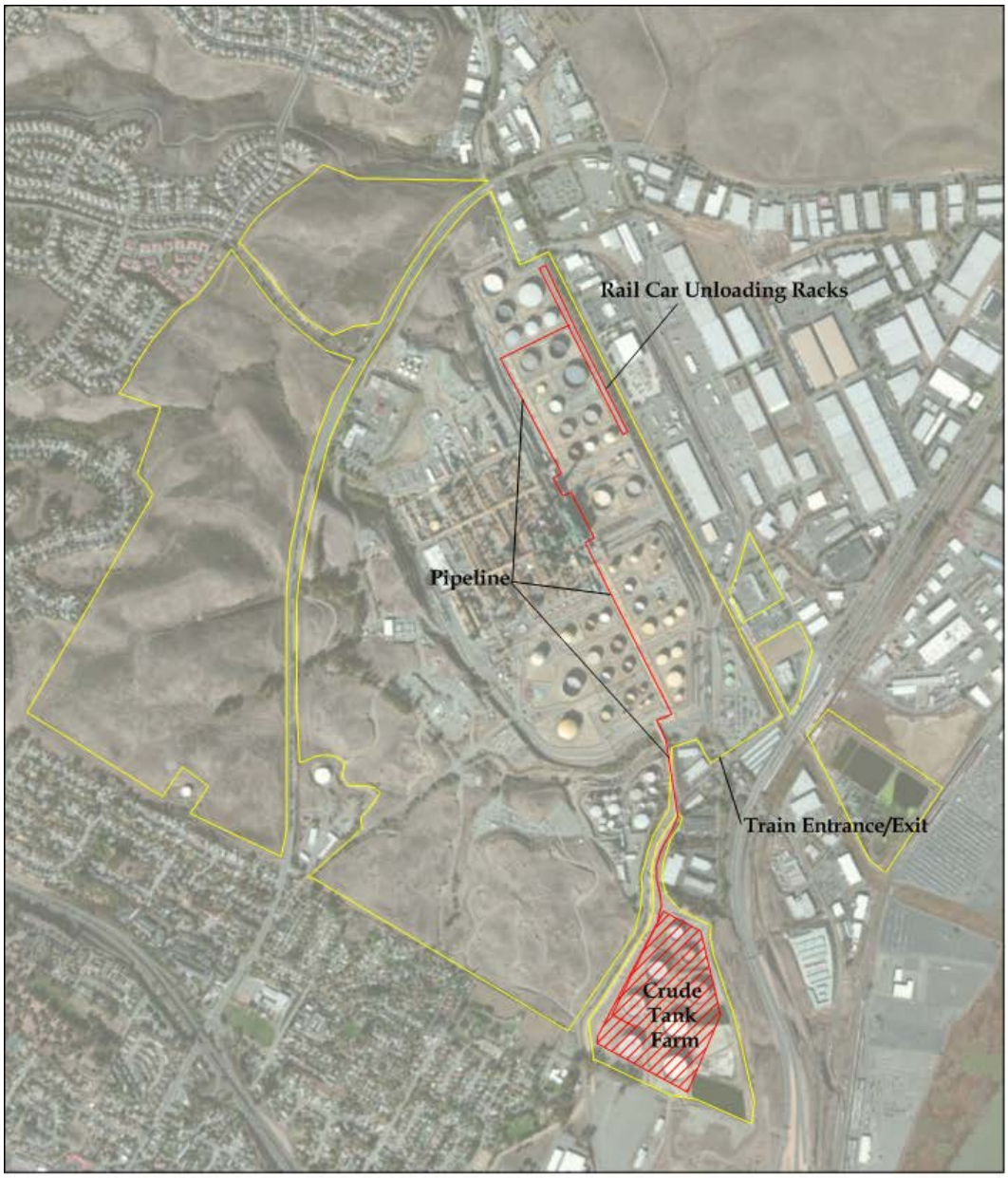



Figure 2-2
*Valero Crude by Rail Project*
*Location Map*
*Benicia, California*

### 2.2.1 Unloading Rack

An unloading rack would be constructed for this project, capable of unloading two parallel rows of rail cars (one row on each side) and transferring crude oil to the existing crude oil storage tanks located in the Crude Tank Farm. The rack 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. Each side of the 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 rack by train). Each side of the rack would have 25 unloading stations, which would "bottom-unload" closed-dome rail cars using a 4-inch-diameter hose, with dry disconnect couplings, that would connect to a common header routed between the two sides of the rack (a 2-inch-diameter check valve, connected to the top of each rail car, would open to allow ambient air to enter during unloading and immediately close when unloading is finished). Three new pumps, two operating in parallel and one as an installed spare pump, would pump the crude oil from the unloading rack header via a new 16-inch pipeline tied into an existing 20-inch pipeline to Crude Tank Farm storage tanks (see Section 2.2.2 for tank details). Once emptied, the 50 rail cars would be disconnected from the rack, moved to the parallel, on-site departure spur, 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 1,500-foot-long unloading rack 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 rack. As a result, the only emissions associated with the unloading rack would be fugitive emissions from flanges, connectors, valves, and pumps (at the unloading rack and between the unloading rack and Crude Tank Farm). The rack would use isolation valves specified to comply with Best Available Control Technology (BACT) requirements for fugitive emissions.

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 | Total Estimated Count – Post Project* |
|---|---|
| Pumps | 3 |
| Valves | 600 |
| Flanges | 1,081 |
| Connectors | 340 |
| Pressure Relief Valves/Other | 6 |

All components in light liquid service.
Estimated counts include contingency factor of 15% for valves, flanges, and connectors.

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)~~Tanks 1701-1708 (District Sources S-57 - S-62, S-1047, and S-1048)

Tank 1776 is no longer a part of the revised project. In the revised project, the crude oil received at the proposed rail car unloading rack will be transferred to the existing storage

tanks 1701 through 1708, located in Crude Tank Farm, and not to tank 1776, as proposed in the original project.

Tanks 1701 through 1708 (BAAQMD Facility #B5574, S-57 through S-62, and BAAQMD Facility #B2626 S-1047 and S-1048) are existing EFR tanks that are currently permitted to store crude oil. These tanks would be used to store the crude oil transferred from the rail car unloading rack, up to 70,000 bbl per day (25.55 MMbbl per year). Materials stored in these tanks are in full compliance with Regulation 8, Rule 5, for the type of material stored. Tanks 1701 through 1706 have historically stored crude oil delivered by ships and pipeline. Tanks 1707 and 1708 were recently constructed and were permitted under new source review (NSR) to store crude oil delivered by marine vessels and pipeline. Crude oil from marine vessels, pipelines, and the rail car unloading rack would be stored in these tanks after the project.

These tanks comply with the control and seal requirements of BAAQMD Regulation 8, Rule 5, and applicable permit conditions and will continue to do so with the implementation of this project without requiring physical modifications. Tanks 1701 through 1708 have a combined throughput limit of 62.6 MMbbl per year. Because these tanks are currently equipped and permitted to store crude oil, no changes in service or physical modifications are required or requested.

*Table 2-2* ~~*Tank 1776 Capacity and Dimensions*~~*Tanks 1701-1708 Capacity and Dimensions*

These tanks have a welded steel shell and their pontoon-type 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.

### 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 rack and the Union Pacific Railroad Company (UP) tracks southeast of the refinery and Highway 680. UP locomotive(s) would transport up to 50 rail cars at a time to the unloading rack. The locomotive(s) would remain with the rail cars while at the refinery. All trains 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 train entrance/exit).

After the 50 rail cars are emptied at the unloading rack, the locomotive(s) would move the empty rail cars to the adjacent storage and departure track where they would be reassembled into one 50-car train. The UP locomotive(s) would then 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 be 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 revised 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. After consultation with the District, the baseline period was not revised for this project update document. Emissions presented in this project update document were estimated for the original baseline period of 3 years from December 2009 through November 2012.

A summary of project net emissions is presented in Table 3-1. Fugitive emissions from components reflect the increased number of components associated with the unloading rack and the additional pipeline from the unloading rack to Crude Tank Farm, 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 fugitive component emissions (unloading rack, pumps, etc.) are the only pollutant increases associated with the project subject to District permitting requirements.

Tanks 1701 through 1708 are not affected by the revised project. Pursuant to BAAQMD Rules 2-1-233 and 2-1-234, these tanks are neither altered nor modified sources; therefore, these tanks are not subject to ATC and NSR requirements.

Tanks 1701 through 1708 will not undergo any of the following changes that could result in any increase in emissions:

- Physical modifications. No physical modifications to the tanks are required or requested. The tanks are currently constructed, equipped, and permitted to store crude oil. The tanks will continue to comply with these requirements with the implementation of this project without requiring physical modifications.
- Increase in throughput above the permitted level. No change in the throughput limit is requested. 70,000 bbl/day of crude oil from rail car offloading activities would replace an equivalent amount of crude oil offloaded from marine vessels to these tanks. No change is requested in the combined throughput limit for these tanks.
- Changes in material stored. The tanks are currently permitted to store crude oil received by marine vessels and pipeline. With the implementation of this project, the tanks will continue to store crude oil. The crude oil will be received from rail cars, as well as from marine vessels and pipeline. Tanks 1701 through 1706 have historically stored crude oil delivered by ships and pipeline. Tanks 1707 and 1708 were recently constructed and were permitted under NSR to store crude oil. These tanks currently comply with all the requirements in Regulation 8, Rule 5, and associated permit conditions.

*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** |
| Unloading Rack and Pipeline Fugitive Components | 1.88 | - | - | - | - | - | - |
| 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** | (1.61) | (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 $CO_2$ equivalent ($CO_2e$)

## 3.1 ~~Tank Emissions~~

NOT APPLICABLE

### 3.1.1 ~~POC Emissions~~

NOT APPLICABLE

*Table 3-2 ~~Tank 1776 POC Emissions~~*

NOT APPLICABLE

### 3.1.2 ~~TAC Emissions~~

NOT APPLICABLE

*Table 3-3 ~~Tank 1776 TAC Emissions~~*

NOT APPLICABLE

## 3.2 Fugitive Component Emissions

### 3.2.1 POC Emissions

Net fugitive POC emissions from the project are based on the total count of new/additional components associated with the CBR project. POC emission increases are based on emission factors developed using the Correlation Equation Method (California Air Pollution Control Officers Association [CAPCOA]/California Air

Resources Board [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 increase from fugitive components are estimated to be 1.88 tons per year as presented in Table 3-4.

*Table 3-4 Fugitive Component POC Emissions*

| Component Type | POC Emissions Increase (tons/yr) |
|---|---|
| Pumps | 0.07 |
| Valves | 0.41 |
| Flanges | 1.22 |
| Connectors | 0.15 |
| Pressure Relief Valves/Other | 0.03 |
| **Total** | **1.88** |

All components in light liquid (crude oil) service. POC emissions increase represents net potential emissions. Existing pipeline has long pipe span with only a couple of valves and flanges, resulting in negligible baseline emissions.

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

### 3.2.2 Toxic Air Contaminant Emissions

Fugitive POC emissions contain compounds that are classified as toxic air contaminants (TACs). Using the liquid fraction for the default crude oil speciation provided in TANKS 4.09d program, TAC emissions were calculated from project component fugitive POC emissions and are presented in Table 3-5.

Per BAAQMD memorandum, dated April 23, 2013, to the original permit application, the crude oil currently available to Valero refinery is expected to have a sulfur content below 1.0 percent by weight. Though there is no direct correlation between the sulfur content and hydrogen sulfide concentration in crude oil, to be conservative for toxic health risk assessment purposes, the District requested Valero to assume 1 percent by weight sulfur as hydrogen sulfide in the crude oil.

*Table 3-5 Fugitive Component TAC Emissions*

| TAC | CAS # | Wt. Percent in Crude Oil | Post-Project TAC Emissions | |
|---|---|---|---|---|
| | | | lb/hr | lb/yr |
| Benzene | 00071-43-2 | 0.60% | 2.57E-03 | 22.53 |
| Ethylbenzene | 00100-41-4 | 0.40% | 1.71E-03 | 15.02 |
| Hexane (n-) | 00110-54-3 | 0.40% | 1.71E-03 | 15.02 |
| Toluene | 00108-88-3 | 1.00% | 4.29E-03 | 37.55 |
| Xylenes (m-) | 01330-20-7 | 1.40% | 6.00E-03 | 52.57 |
| Hydrogen Sulfide | 6/4/7783 | 1.00% | 4.29E-03 | 37.55 |

Consistent with District Rule 2-5-601, fugitive components on additional piping 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

NO CHANGE

*Table 3-6 Cargo Carrier Criteria Pollutant Emissions*

NO CHANGE

# 4.0 APPLICABLE REGULATIONS

NO CHANGE

## 4.1 District Rules and Regulations

### 4.1.1 Regulation 1 – General Provisions and Definitions

NO CHANGE

### 4.1.2 Regulation 2 – Permits

#### 4.1.2.1 Rule 2-1 – General Requirements

***Section 2-1-301 – Authority to Construct***

NO CHANGE

***Section 2-1-302 – Permit to Operate***

NO CHANGE

***Section 2-1-412 – Public Notice, Schools***

NO CHANGE

#### 4.1.2.2 Rule 2-2 – New Source Review

NO CHANGE

***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. Fugitive components (pumps, valves, flanges, connectors) would be subject to BACT because post-project POC emissions would be above 10 pounds per day. Cargo carriers (trains) are not subject to BACT per Section 2-2-206.

Fugitive components would meet the requirements specified in BAAQMD *Regulation 8, Rule 18, Equipment Leaks* and the specific BAAQMD *BACT Guidelines for Petroleum Refinery Fugitive Emissions* applicable to the component type. Fugitive components will be subject to the BAAQMD approved inspection and compliance program in Regulation 8-18 and District BACT guidelines for POC emissions.

After installation of the fugitive components associated with the CBR project, an actual count of fugitive components will be conducted when the new components are added to the Valero's Leak Detection and Repair (LDAR) program. This information will be provided to the BAAQMD to determine if any adjustments are needed for compliance with applicable requirements (i.e., a possible change in the quantity of required emission offsets).

Tanks 1701 through 1708 are not subject to NSR and BACT as they are not modified sources.

*Table 4-1* ~~*BACT for EFR Tanks*~~

***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 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 Increase (ton/yr) | NOx Emissions Increase (ton/yr) | $PM_{10}$ Emissions Increase (ton/yr) | $SO_2$ Emissions Increase (ton/yr) |
|---|---|---|---|---|
| **Project Emissions** | | | | |
| Fugitive Components | 1.88 | 0 | 0 | 0 |
| Cargo Carriers (Trains, Marine Vessels) | * | * | * | * |
| *Subtotal* | *1.88* | *0* | *0* | *0* |
| **Contemporaneous Emission Reductions** | | | | |
| None | 0 | 0 | 0 | 0 |
| *Subtotal* | *0* | *0* | *0* | *0* |
| **Net Project Emission Increase** | **1.88** | **0** | **0** | **0** |
| **Emission Offset Requirement** | **2.16** | **-** | **-** | **-** |

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***

NO CHANGE

***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 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 fugitive components associated with the project 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 the associated project fugitive components pursuant to Section 2-2-317. Nevertheless, the BACT limits for fugitive components also constitute TBACT.

#### 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. The trigger levels presented in Table 4-3 below are the trigger levels in the latest version of District Regulation 2-5, Table 2-5-1. These are updated from the levels that were presented in Table 4-3 of the original permit application.

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 and a detailed Health Risk Assessment (HRA) in Appendix D.

*Table 4-3 TAC Emissions and District Trigger Levels*

| Pollutant | CAS Number | Post-Project Potential Emissions (lb/hr) | Emissions Increase Over Baseline (lb/year) | Trigger Levels (District Table 2-5-1) | | Exceed Acute Trigger Level? | Exceed Chronic Trigger Level? |
|---|---|---|---|---|---|---|---|
| | | | | lb/hr (Acute) | lb/yr (Chronic) | | |
| **Fugitive Components** | | | | | | | |
| Benzene | 71-43-2 | 2.57E-03 | 22.53 | 2.9 | 3.8 | No | Yes |
| Ethylbenzene | 100-41-4 | 1.71E-03 | 15.02 | NA | 43 | No | No |
| Hexane (n-) | 110-54-3 | 1.71E-03 | 15.02 | NA | 270,000 | No | No |
| Toluene | 108-88-3 | 4.29E-03 | 37.55 | 82 | 12,000 | No | No |
| Xylenes (m-) | 1330-20-7 | 6.00E-03 | 52.57 | 49 | 27,000 | No | No |
| Hydrogen Sulfide | 7783-06-4 | 4.29E-03 | 37.55 | 0.093 | 390 | No | No |

TAC emissions associated with locomotive operation are not subject to BAAQMD Regulation 2-5, which is applicable only to stationary sources requiring an ATC or a permit to operate (PTO). However, for the purposes of impact analysis under the California Environmental Quality Act (CEQA), the applicant conducted a detailed HRA that included diesel particulate matter (DPM) emissions from locomotive operation.

The Table 4-4 below summarizes the results of the detailed HRA for CEQA impact analysis. The details of the HRA are provided in Appendix D.

*Table 4-4 Maximum Cancer Risk and Non-Cancer Health Effects Including Cargo Carrier for CEQA Analysis*

| **Type of Estimated Health Impact** | **Cancer Risk** | **Chronic** | **Acute** |
|---|---|---|---|
| | **(per million), (Receptor Location)** | **Hazard Index, (Receptor Location)** | **Hazard Index, (Receptor Location)** |
| Maximum Exposed Individual Residential (MEIR)* – Hypothetical residential receptors assumed at radii ≥ 40 m from the train tracks. | 2.27<br>Hypothetical receptor at 150 m from center and 130° from north (578686E, 4215678N) | 0.0009<br>Hypothetical receptor at 150 m from center and 130° from north (578686E, 4215678N) | 0.0030<br>(575694E, 4212345N) |
| Maximum Exposed Individual Worker (MEIW)** | 4.45<br>(576144E, 4214145N) | 0.0137<br>(576144E, 4214145N) | 0.0113<br>(576094E, 4212895N) |
| Maximum Sensitive Receptor (MSR)*** | 0.28<br>(574594E, 4212895N) The Learning Patch - Benicia (day care center) | 0.0005<br>(574594E, 4212895N) The Learning Patch - Benicia (day care center) | 0.0004<br>(574900E, 4212500N) Robert Semple Elementary School |
| **CEQA Threshold Exceeded (Yes/No)** | **10**<br>**No** | **1.0**<br>**No** | **1.0**<br>**No** |

* MEIR Cancer Risk = Modeled 70-year Resident Risk x 1.7 (ASF).

** 70-year residential cancer risk multiplied by adjustment factor 0.2199 to convert to worker cancer risk for MEIW.

*** MSR Cancer Risk = HARP Modeled 70-year Resident Risk x 9 years x 3 (ASF)/70 years.

*Table 4-5 Maximum Cancer Risk and Non-Cancer Health Effects from Sources Requiring ATC*

| Type of Estimated Health Impact | Cancer Risk (per million), (Receptor Location) | Chronic Hazard Index, (Receptor Location) |
|---|---|---|
| Maximum Exposed Individual Residential (MEIR)* | 0.031 (575694E, 4212345N) | 0.0001 (575694E, 4212345N) |
| Maximum Exposed Individual Worker (MEIW)** | 0.108 (576120E, 4213278N) | 0.0031 (576120E, 4213278N) |
| Maximum Sensitive Receptor (MSR)** | 0.002 (574900E, 4212500N) Robert Semple Elementary School | 0.00003 (574900E, 4212500N) Robert Semple Elementary School |
| **Regulation 2-5 Threshold Exceeded (Yes/No)** | **1.0** | **0.2** |
| | **No** | **No** |

* MEIR Cancer Risk = Modeled 70-year Resident Risk x 1.7 (ASF).

** 70-year residential cancer risk multiplied by adjustment factor 0.2199 to convert to worker cancer risk for MEIW.

*** MSR Cancer Risk = HARP Modeled 70-year Resident Risk x 9 years x 3 (ASF)/70 years.

As noted above, Regulation 2-5 is applicable only to stationary sources requiring an ATC or PTO. With respect to Regulation 2-5 applicability, the project includes only the fugitive piping components/equipment. For the project to trigger TBACT, the cancer risk must be greater than 1.0 in one million and/or the chronic hazard index must be greater than 0.2 per Regulation 2-5-301. As shown in Table 4-5, the risk values determined for this source indicate that the project is in compliance with Regulation 2-5-301 and 2-5-302 and does not trigger TBACT.

#### 4.1.2.4 Rule 2-6 – Major Facility Review

NO CHANGE

### 4.1.3 Regulation 3 – Fees

NO CHANGE

### 4.1.4 Regulation 6 – Particulate Matter

Regulation 6, Rule 1, limits particulate matter and visible emissions. The 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

NO CHANGE

### 4.1.6 Regulation 8 – Organic Compounds

#### 4.1.6.1 Rule 8-5 – Storage of Organic Liquids

NOT APPLICABLE TO REVISED PROJECT ELEMENTS

#### 4.1.6.2 Rule 8-18 – Equipment Leaks

NO CHANGE

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

NO CHANGE

### 4.1.7 Regulation 10 – Standards of Performance for New Stationary Sources

NO CHANGE

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

NO CHANGE

## 4.2 California Environmental Quality Act

NO CHANGE

## 4.3 Federal Rules and Regulations

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

NO CHANGE

### 4.3.2 40 CFR 60 Subpart A – General Provisions

Any source subject to an applicable standard under Title 40 of the Code of Federal Regulations (CFR) Part 60 is also subject to the general provisions of Subpart A. Because none of the project elements are subject to any other subparts of 40 CFR 60, the requirements of Subpart A do not apply.

### 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

NOT APPLICABLE TO REVISED PROJECT ELEMENTS.

According to the definition of reconstruction or modification under the New Source Performance Standards (NSPS), tanks 1701 through 1708 are not being reconstructed or modified due to the proposed project. These tanks are not affected sources; therefore, they are not subject to 40 CFR 60 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

NO CHANGE

### 4.3.6 40 CFR 61 Subpart FF – Benzene Waste Operations NESHAP

NO CHANGE

### 4.3.7 40 CFR 63 Subpart A – General Provisions

NO CHANGE

### 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. The project's fugitive component equipment leaks would be subject to this rule.

# 5.0 ESTIMATED PERMIT FEES

TO BE DETERMINED BY BAAQMD

*Table 5-1 Estimated Permit Fees*

TO BE DETERMINED BY BAAQMD

# 6.0 REFERENCES

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

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

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*
# *Project Drawings and Specifications*

Attachment A-1 – Process Flow Diagram – [REVISED]

Attachment A-2 – Plot Plan – [NO CHANGE]

*Attachment A-1*
*Process Flow Diagram*

[REVISED]

LEGEND
NEW
EXISTING

(TYPICAL OF 50)

RAIL CAR

EQUALIZATION PIPE

NEW | EXIST.

CRUDE OFF-LOADING PUMPS

CRUDE FIELD STORAGE TANKS

CRUDE FEED PUMPS

CRUDE TO CRUDE UNIT

CONTAINMENT

CONTAINMENT

| REV. | DATE | DESCRIPTION | DSN. | CKD. | APD. | APD. |
|---|---|---|---|---|---|---|
| F | 11-6-13 | UPDATED TITLE BLOCK INFORMATION | SKL | | | |
| E | 10-14-13 | REVISED CRUDE DISPOSITION TO EXISTING CRUDE FIELD STORAGE FACILITIES | SKL | | | |
| D | 7/8/13 | GENERAL REVISION - PUBLIC VERSION | ALK | | | |
| C | 1-31-13 | GENERAL REVISION | SLK | | | |
| B | 12-28-12 | GENERAL REVISION | SKL | | | |
| A | 12-10-12 | CRUDE BY RAIL | SKL | | | |

| | | | |
|---|---|---|---|
| DSN. | VALERO | FOR INFORMATION - PHONE | AR/MR |
| DWN. | SKL 12/10/12 | | PS |
| CKD. | | | DDR |
| APD. | | | I/E |
| APD. | | | DBASE |

VALERO REFINING COMPANY-CALIFORNIA
BENICIA REFINERY

TANKAGE — UNIT 32

# CRUDE BY RAIL

PROCESS FLOW DIAGRAM

| SCALE | DRAWING NO. | REVISION |
|---|---|---|
| NONE | 132-FD-1-3588093 (P) | F |
| DATE 12/10/12 | | |

132FD1-3588093(P)-E.DWG SKL 131106.1009 CHK

*Attachment A-2*
*Plot Plan*

[NO CHANGE]

# *Appendix B*
# *Emission Calculations*

~~Attachment B-1 – Tank 1776 Baseline Throughput and Emissions~~

[EXCLUDED]

~~Attachment B-2 – Tank 1776 Post-Project Emissions~~

[EXCLUDED]

Attachment B-3 – Fugitive Component Emissions

[REVISED]

Attachment B-4 – Cargo Carrier Emissions

[NO CHANGE]

~~*Attachment B-1*~~
~~*Tank 1776 Baseline Throughput and Emissions*~~

[EXCLUDED]

~~*Attachment B-2*~~
~~*Tank 1776 Post-CBR Emissions*~~

[EXCLUDED]

# *Attachment B-3*
# *Fugitive Component Emissions*

[REVISED]

**Crude By Rail Project**
**Post-Project Fugitive Component Emissions Estimates**
10/21/2013

**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

**Post-Project Component Count Estimates**

| Component Type | Component Count Estimate | | |
|---|---|---|---|
| | Total | % Contin | Total (w/Contin) |
| Pumps | 3 | 0 | **3** |
| Valves | 521 | 15% | **600** |
| Flanges | 940 | 15% | **1081** |
| Connectors | 295 | 15% | **340** |
| PSVs/Other | 6 | 0% | **6** |
| **Total** | | | **2,030** |

Equipment counts per Valero, October 2013. Total component counts for valves, flanges, and connectors 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) | Hydrogen Sulfide |
| | | | | | 0.60% | 0.4% | 0.4% | 1.00% | 1.4% | 1.00% |
| | | | 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) | Annual Emissions (lb/yr) |
| Pumps | 3 | 0.12803 | 0.38 | 140.2 | 0.84 | 0.56 | 0.56 | 1.40 | 1.96 | 1.40 |
| Valves | 600 | 0.00375 | 2.25 | 820 | 4.92 | 3.28 | 3.28 | 8.20 | 11.49 | 8.20 |
| Flanges | 1,081 | 0.00619 | 6.69 | 2,442 | 14.65 | 9.77 | 9.77 | 24.42 | 34.19 | 24.42 |
| Connectors | 340 | 0.00240 | 0.82 | 297.9 | 1.79 | 1.19 | 1.19 | 2.98 | 4.17 | 2.98 |
| PSVs | 6 | 0.02485 | 0.15 | 54.42 | 0.33 | 0.22 | 0.22 | 0.54 | 0.76 | 0.54 |
| **Total** | 2,030 | - | **10.29** | **3,755** | **22.53** | **15.02** | **15.02** | **37.55** | **52.57** | **37.55** |

TAC speciation percentages based on EPA TANKS 4.09d default speciaiton profile for Crude Oil for BTEX and n-hexane. H2S assumed to be equal to total sulfur content in crude oil.

**Emissions Summary (ton/yr)**

| Component Type | POC | Benzene | Ethylbenzene | Hexane (-n) | Toluene | Xylenes (-m) | Hydrogen Sulfide |
|---|---|---|---|---|---|---|---|
| Pumps | 0.07 | 4.21E-04 | 2.80E-04 | 2.80E-04 | 7.01E-04 | 9.81E-04 | 7.01E-04 |
| Valves | 0.41 | 2.46E-03 | 1.64E-03 | 1.64E-03 | 4.10E-03 | 5.74E-03 | 4.10E-03 |
| Flanges | 1.22 | 7.33E-03 | 4.88E-03 | 4.88E-03 | 1.22E-02 | 1.71E-02 | 1.22E-02 |
| Connectors | 0.15 | 8.94E-04 | 5.96E-04 | 5.96E-04 | 1.49E-03 | 2.08E-03 | 1.49E-03 |
| PSVs | 0.03 | 1.63E-04 | 1.09E-04 | 1.09E-04 | 2.72E-04 | 3.81E-04 | 2.72E-04 |
| **Total** | **1.88** | **1.13E-02** | **7.51E-03** | **7.51E-03** | **1.88E-02** | **2.63E-02** | **1.88E-02** |

# *Attachment B-4*
# *Cargo Carrier Emissions*

Train Criteria Pollutant and GHG Emissions

Marine Vessel Criteria Pollutant and GHG Baseline Emissions

[NO CHANGE]

*Train*
*Criteria Pollutant and GHG Emissions*

[NO CHANGE]

*Marine Vessel*
*Criteria Pollutant and GHG*
*Baseline Emissions*

[NO CHANGE]

# *Appendix C*
# *District ATC Application Forms*

Form P-101B - [NO CHANGE]

~~Form T -~~ [EXCLUDED]

Form HRSA - [REVISED]

Public Copy

**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: Fugitive Piping Components/Equipment

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

Fugitive emissions from pipeline component/equipment leaks

***(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 | See Appendix D | | | | | |
| B3 | | | | | | |
| B4 | | | | | | |
| B5 | | | | | | |
| B6 | | | | | | |
| B7 | | | | | | |
| B8 | | | | | | |

***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.***

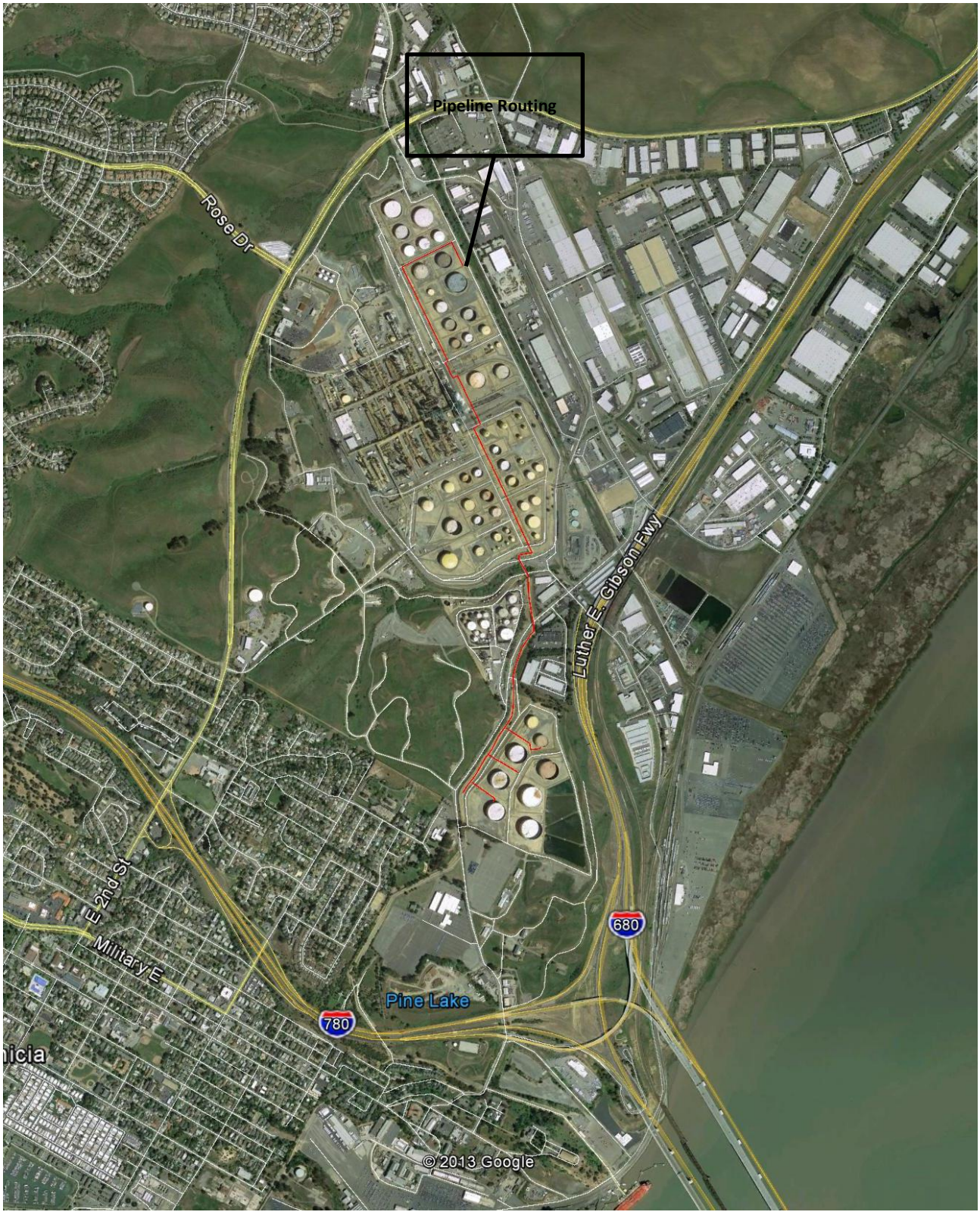
1. Indicate the area where the source is located (check one):
   - ☐ zoned for residential use
   - ☐ zoned for mixed residential and commercial/industrial use
   - ☒ zoned for commercial and/or industrial use
   - ☐ zoned for agricultural use
2. Distance from source (stack or building) to nearest facility 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

HRSA-2




Source: Google Earth, queried October 2013.

# *Appendix D*
# *Health Risk Assessment*

[Modeling files on CD]

This health risk assessment (HRA) is being submitted to BAAQMD as part of the Project Update Document #1 for BAAQMD Regulation 2-5 review. A comprehensive HRA was conducted for the purposes of health risk impact analysis under CEQA. This comprehensive HRA included both sources that will require an ATC and the sources that are not subject to ATC requirements, such as cargo carriers.

Results of the HRA performed by ERM are provided in Tables 1 and 2 below. Table 1 provides results of the comprehensive HRA, including all sources requiring and not requiring an ATC. Table 2 provides the results from only those sources that will require an ATC. As discussed in the project update document, only the piping components such as valves and flanges require an ATC for the revised project.

This risk analysis includes toxics listed in BAAQMD Reg. 2-5, including benzene, diesel particulate matter (DPM), ethylbenzene, toluene, xylenes, hexane, and hydrogen sulfide. As shown in Table 1, the cancer risk at the maximum exposed individual residential (MEIR) receptor, maximum exposed individual worker (MEIW) receptor, and maximum sensitive receptor (MSR) each is below 10 in a million. The chronic hazard index and the acute hazard index, at the MEIR, MEIW and MSR, are also below 1.0.

**Table 1: Maximum Cancer Risk and Non-cancer Health Effects Including Cargo Carriers for CEQA Analysis**

| Type of Estimated Health Impact | Cancer Risk (per million), (Receptor Location) | Chronic Hazard Index, (Receptor Location) | Acute Hazard Index, (Receptor Location) |
|---|---|---|---|
| Maximum Exposed Individual Residential (MEIR)* – Hypothetical residential receptors assumed at radii ≥ 40 m from the train tracks. | 2.27<br>Hypothetical receptor at 150 m from center and 130° from North (578686E, 4215678N) | 0.0009<br>Hypothetical receptor at 150 m from center and 130° from North (578686E, 4215678N) | 0.0030<br>(575694E, 4212345N) |
| Maximum Exposed Individual Worker (MEIW)** | 4.45<br>(576144E, 4214145N) | 0.014<br>(576144E, 4214145N) | 0.0113<br>(576094E, 4212895N) |
| Maximum Sensitive Receptor (MSR)*** | 0.28<br>(574594E, 4212895N)<br>The Learning Patch - Benicia (day care center) | 0.0005<br>(574594E, 4212895N)<br>The Learning Patch - Benicia (day care center) | 0.0004<br>(574900E, 4212500N)<br>Robert Semple Elementary School |
| **CEQA Threshold** | **10** | **1** | **1** |
| **Exceeded (Yes/No)** | **No** | **No** | **No** |

* MEIR Cancer Risk = Modeled 70-yr Resident Risk x 1.7 (ASF)

** 70-year residential cancer risk multiplied by adjustment factor 0.2199 to convert to worker cancer risk for MEIW

*** MSR Cancer Risk = HARP Modeled 70-yr Resident Risk x 9 years x 3 (ASF)/70 years

As shown in Table 2, the cancer risk from fugitive piping components/equipment leaks at the maximum exposed individual residential (MEIR) receptor, maximum exposed individual worker (MEIW) receptor, and maximum sensitive receptor (MSR) each is below 1 in a million and the chronic hazard index at the MEIR, MEIW and MSR each is also below 0.2. Therefore, the project is in compliance with Regulation 2-5-301 and 2-5-302 and does not trigger TBACT.

**Table 2: Maximum Cancer Risk and Non-cancer Health Effects**

| Type of Estimated Health Impact | Cancer Risk (per million), (Receptor Location) | Chronic Hazard Index, (Receptor Location) |
|---|---|---|
| Maximum Exposed Individual Residential (MEIR)* | 0.031 (575694E, 4212345N) | 0.0001 (575694E, 4212345N) |
| Maximum Exposed Individual Worker (MEIW)** | 0.108 (576120E, 4213278N) | 0.0031 (576120E, 4213278N) |
| Maximum Sensitive Receptor (MSR)** | 0.002 (574900E, 4212500N) Robert Semple Elementary School | 0.00003 (574900E, 4212500N) Robert Semple Elementary School |
| **Regulation 2-5 Threshold** | **1.0** | **0.2** |
| **Exceeded (Yes/No)** | **No** | **No** |

* MEIR Cancer Risk = Modeled 70-yr Resident Risk x 1.7 (ASF)

** 70-year residential cancer risk multiplied by adjustment factor 0.2199 to convert to worker cancer risk for MEIW

*** MSR Cancer Risk = HARP Modeled 70-yr Resident Risk x 9 years x 3 (ASF)/70 years

The following sources were modeled for the HRA using the ISCST3 air dispersion model:

1. Locomotive idling – as point source;
2. Locomotive transit – as a line of volume sources;
3. Locomotive switching – as a line of volume sources;
4. Fugitive equipment leak – as a line of rectangular area sources

Locomotive emissions during transit mode were modeled over a track length of 4 miles out from the unloading rack. The modeling domain around the refinery was taken out to approximately 4 miles, as this is distance beyond which there would be minimal impacts from the piping fugitives and train idling. It must be noted that there are no residences along the 4 miles of modeled train route. However, in Fairfield (within the BAAQMD jurisdiction), there are residences as close as 40 meters from the train route. Since the modeling domain did not extend all the way to Fairfield, additional hypothetical residential receptors were assumed, in polar coordinate system at spacing of 10 degrees and radial distance of 30m through 150 m from the locomotive volume source to account for the exposure to nearby residences as the train passes through Fairfield. Residences in Benicia near the refinery are much farther away from the locomotive activity than 40 meters. Therefore, for TAC exposure from locomotive idling and fugitives the estimated MEIR risk shown above is very conservative.

Locomotive emissions during switching mode were modeled over an approximate two train–lengths (3300 feet) from the unloading rack. As a portion of the track within the facility would be used for both switching and transit, emissions from the two activities were added and assigned to the common volume sources. Five years of meteorological data from the BAAQMD meteorological site "Valero Admin" (Site Id 8704) was used. These data can be downloaded from the BAAQMD website. The NAD 27 UTM coordinate system was used to identify source, receptor and building/structure locations. Digital Elevation Model (DEM) files were used to obtain the elevations for sources, receptors, and buildings/structures.

Figure 1 shows the receptor grid modeled and Figure 2 shows the location of modeled sources, facility boundary, and locations of maximum exposed receptors.

Risk was directly modeled in ISCST3 using the unit risk factors (URFs) for cancer risk and reference exposure levels (RELs) for non-cancer health effects, as the exposure pathway for all the toxic air contaminants (TACs) emitted from the above sources is inhalation only. The risk input to the ISCST3 model, for each source, was calculated as shown below. As a result, the ISCST3 model output is residential cancer risk in terms of risk per million and non-cancer risk in terms of hazard index.

$$Cancer\ Risk\ Modeled_j = \sum_i ER_i\ x\ URF_i\ x\ 10^6$$

$$Non - Cancer\ Risk\ Modeled_j = \sum_i \frac{ER_i}{REL_i}$$

*Where:*

| | | |
|---|---|---|
| *j* | = | *Emissions source modeled* |
| *i* | = | *Toxic air contaminant* |
| *ER* | = | *Emission rate of toxic air contaminant i in g/s from source j* |
| *URF* | = | *Unit risk factor of toxic air contaminant i* |
| *REL* | = | *Reference exposure level of toxic air contaminant i* |

Cancer risk at the MEIR was estimated as modeled residential risk multiplied by the BAAQMD-recommended age specific factor of 1.7.

Cancer risk at the MEIW was estimated as modeled residential risk multiplied by 0.2199, which is the average OEHHA adjustment factor to convert inhalation based cancer risk estimates for a residential receptor to a worker receptor, based on the difference in the length of time of exposure.

The sensitive receptor with highest modeled residential cancer risk is a day care center (The Learning Patch Benicia). Cancer risk at this day-care was estimated as shown below:

$$Cancer\ Risk\ at\ Day\ Care = \frac{Modeled\ Residential\ Risk\ x\ ED_C x\ ASF}{ED_R}$$

*Where:*

*$ED_C$ = Exposure duration for children at school = 9 years*
*ASF = Age sensitivity factor for children at school = 3*
*$ED_R$ = Exposure duration for residential receptor = 70 years*

*Factors listed above are standard factors used in the calculation.*

Public Copy

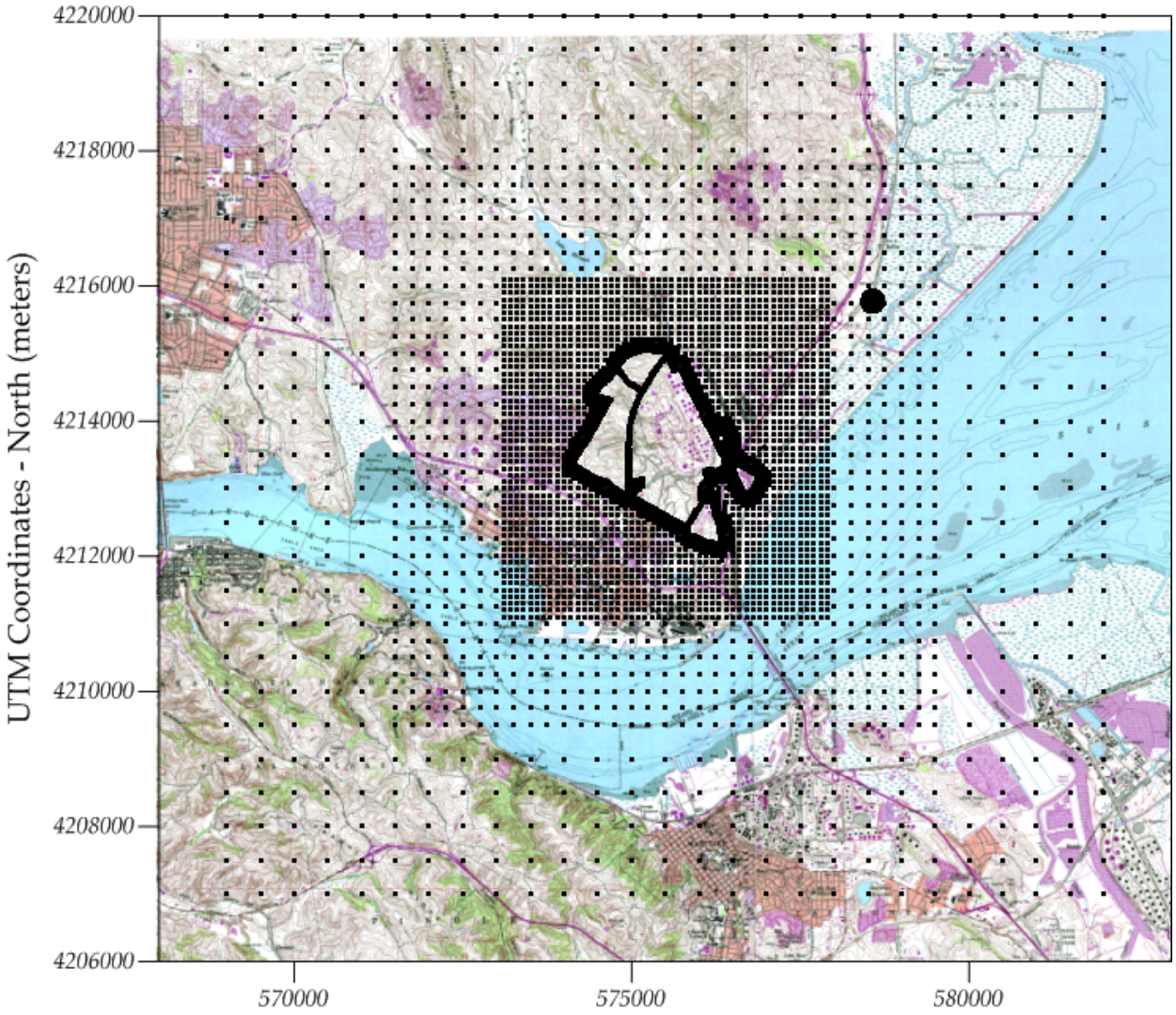



Figure 1

*Receptor Locations*
*Valero - Crude by Rail Project*
*Benicia, California*

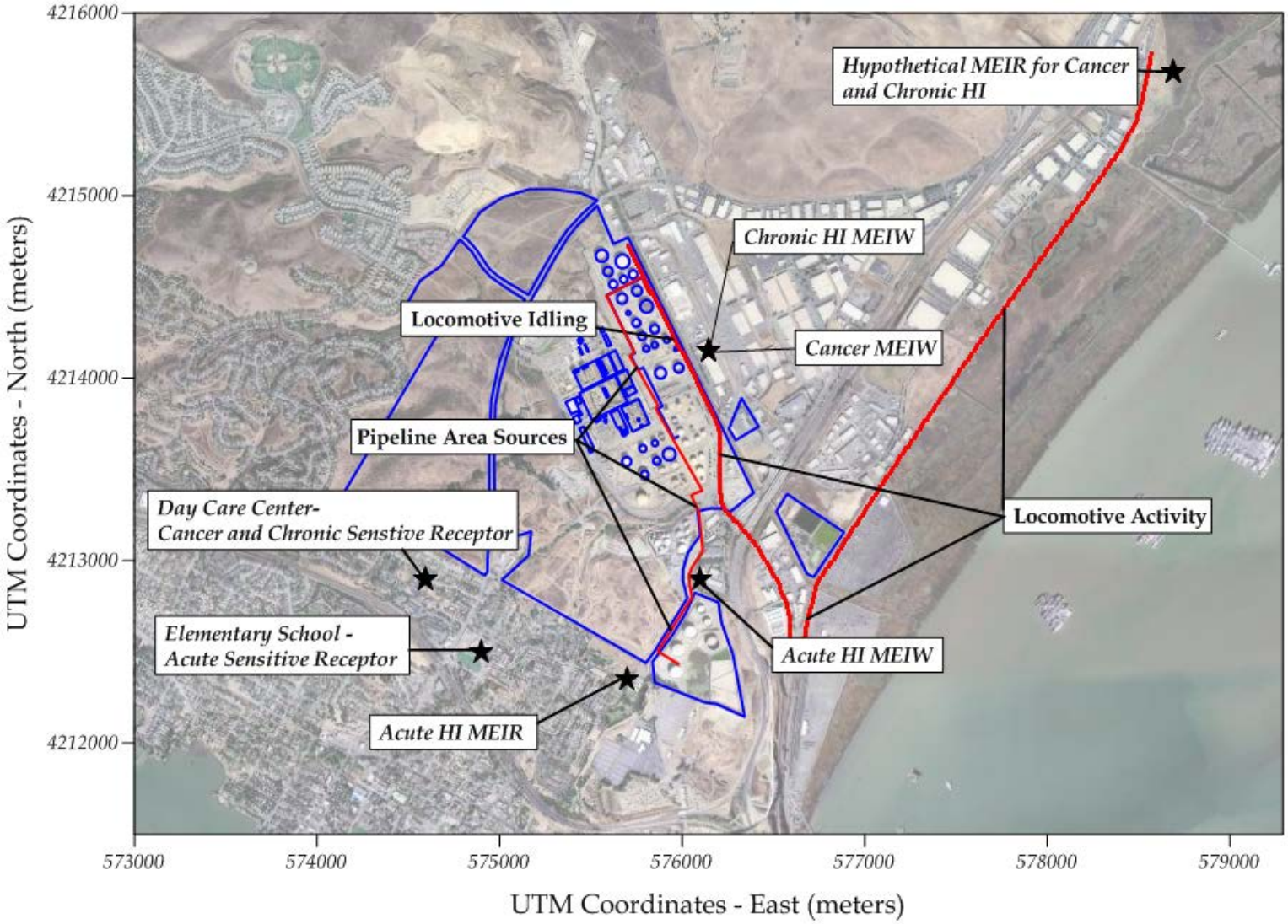



Figure 2

*Source and Health Risk Assessment Result Locations*
*Valero - Crude by Rail Project*
*Benicia, California*