APPENDIX AQ/GHG

Air Quality and Greenhouse Gas Technical Analysis

ALG ASHWORTH LEININGER GROUP

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Martinez Renewable Fuels Project

Air Quality and Greenhouse Gas Technical Analysis

Prepared for
Tesoro Refining & Marketing Company LLC, an indirect, wholly owned subsidiary of Marathon Petroleum Corporation

July 2021

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Abbreviations

AEI	Annual Emission Inventory
ATC	Authority to Construct
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BARCT	Best Available Retrofit Control Technology
bpd	barrels per day
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEMS	Continuous Emission Monitoring System
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
Cl_2	chlorine
CO	carbon monoxide
CRU	catalytic reforming unit
DAF	Dissolved Air Flotation
DNF	Dissolved Nitrogen Flotation
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
ERC	emission reduction credit
ESP	Electrostatic Precipitator
F_2	fluorine
FCCU	Fluidized Catalytic Cracking Unit
FGRS	flare gas recovery system
FTL	Fischer-Tropsch Liquids
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HCl	hydrogen chloride
HDN	hydrodenitrogenation
HDO	hydrodexoygenation
HDS	hydrodesulfurization
HF	hydrogen fluoride
HRA	Health Risk Assessment
HSVGO	high sulfur vacuum gas oil
kPa	kilopascals
LCFS	Low Carbon Fuel Standard
LDAR	leak detection and repair
MACT	Maximum Achievable Control Technology
Marathon	Marathon Petroleum Corporation
MBBR	moving bed biofilm reactor

MCPU	miscellaneous organic chemical manufacturing process unit
Mg/yr	megagrams per year
MMBtu/hr	million British thermal unit per hour
MMscf/yr	million standard cubic feet per year
MOTEMS	Marine Oil Terminal Engineering and Maintenance Standards
MPV	miscellaneous process vent
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_X	nitrogen oxides
NSCR	non-selective catalytic reduction
NSR	New Source Performance Standards
NSR	New Source Review
OHAP	organic hazardous air pollutant
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POC	precursor organic compound
ppm	parts per million
ppmw	parts per million weight
PRD	pressure relief device
Project	Martinez Renewable Fuels Project
PRPU	petroleum refining process unit
PSD	Prevention of Significant Deterioration
psia	pounds per square inch, absolute
PTO	Permit to Operate
RACT	Reasonably Available Control Technology
RMMU	remediation material management unit
SAP	Sulfuric Acid Manufacturing Plant
SCR	selective catalytic reduction
SIC	Standard Industrial Classification
SO_2	sulfur dioxide
SOCMI	synthetic organic chemical manufacturing industry
SRU	Sulfur Recovery Unit
TAB	total annual benzene
TAC	Toxic Air Contaminant
tpy	tons per year
TVP	true vapor pressure
VGO	vacuum gas oil
VHAP	volatile hazardous air pollutant
VOC	volatile organic compound

1.0 Introduction and Summary

Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation (herein referenced as Marathon), has applied for land use approval and other permits to construct and operate the proposed Martinez Renewable Fuels Project (project) at its existing Martinez Refinery (herein referenced as Martinez or facility) and Amorco Terminal. This project is subject to review under the California Environmental Quality Act (CEQA). This report provides Marathon's air quality and greenhouse gas (GHG) technical data and emissions analysis to support the CEQA evaluation being prepared by Contra Costa County, which is the Lead Agency for the project. The document provides the following:

- Pre-project and post-project stationary source and mobile source emissions (criteria pollutant, Toxic Air Contaminants (TACs), and greenhouse gas (GHG) emissions;
- Construction emissions estimates;
- Health Risk Assessment (HRA) comparing pre-project operational conditions to post-project conditions, and an HRA evaluating impacts of diesel particulate matter from construction activities. The results from the HRA are compared to the significance thresholds set by the Bay Area Air Quality Management District (BAAQMD or District) CEQA Guidelines;
- A modeling analysis comparing pre-project operational $PM_{2.5}$ impacts to post-project $PM_{2.5}$ impacts. The results from analysis are compared to the significance threshold set by BAAQMD CEQA Guidelines;
- An evaluation of potential carbon monoxide and odor impacts related to the project. Evaluation of these impacts is part of the District's CEQA Guidelines.

This technical analysis concludes the following:

- The Renewable Fuels Project results in a net decrease in criteria pollutant and GHG emissions for both stationary and mobile sources;
- Modeled health risks from the project are significantly less than BAAQMD CEQA significance thresholds;
- $PM_{2.5}$ impacts from the project are significantly less than BAAQMD CEQA significance thresholds;
- Potential odor and carbon monoxide impacts are less than significant; and
- Construction emissions are anticipated to be less than significant under CEQA.

Section 2 of this document provides a brief project description. Section 3 evaluates the potential air quality impacts from the operation of the project. Section 4 summarizes the GHG emissions from the project. Section 5 presents the results from the HRA. Section 6 presents the results from the $PM_{2.5}$ modeling analysis. Sections 7 and 8 evaluate the carbon monoxide and odor impacts from the project. Section 9 provides ambient air quality monitoring information. Section 10 provides the regulatory applicability analysis addressed in the Authority to Construct application pending before the BAAQMD. Finally, the anticipated emissions from onsite and offsite construction are presented in Section 11.

2.0 Project Description

The Martinez Renewable Fuels Project will convert the existing Martinez Refinery from its current production of fossil fuels (i.e., conventional diesel fuel, gasoline, distillates, propane, and various by-products) to the production of renewable fuels, including renewable diesel, renewable propane, and renewable naphtha. The proposed project will allow the Martinez Facility to help meet the growing demand in California for renewable fuels. The Refinery is currently permitted to refine approximately 161,000 barrels per day (bpd) of crude oil. After completion of the project, the facility's capacity will be approximately 48,000 bpd of renewable feedstocks. Many of the overall facility's other operations, including the receipt, storage, and distribution of products, will continue, although with some changes to existing equipment.

California has established ambitious goals to reduce greenhouse gases through regulatory policies such as the Low Carbon Fuel Standard (LCFS). The LCFS is catalyzing investments in cleaner alternative fuels, like this proposed project, to provide consumers with more choices, while reducing emissions of toxic pollutants and greenhouse gases. According to the BAAQMD's 2017 Clean Air Plan, in order "[t]o meet California's…climate goals, demand for traditional transportation fuels will need to be dramatically reduced. California's refineries will likely need to shift production to a renewable fuel portfolio and/or steadily decrease, and in some cases, even cease production." This project will result in a significant reduction in GHGs in furtherance of California and the Bay Area meeting their respective climate goals.

The proposed project consists primarily of a change in production processes rather than a change in facilities (i.e., construction), as it will mostly use existing refining equipment and transportation facilities. The major change will be the elimination of crude oil processing and the use of renewable feedstocks to manufacture renewable fuels. The renewable feedstocks are expected to include biological-based oils (e.g., soybean oil and corn oil), rendered fats, and other miscellaneous renewable feedstocks including, but not limited to, used cooking oils, other vegetable oils, and alternative biologically derived feedstocks, however, it will not use palm oil.

Figure 2-1 presents the block flow diagram of the proposed project. A more detailed description of the project has been provided under separate cover to Contra Costa County Planning and Development Department.

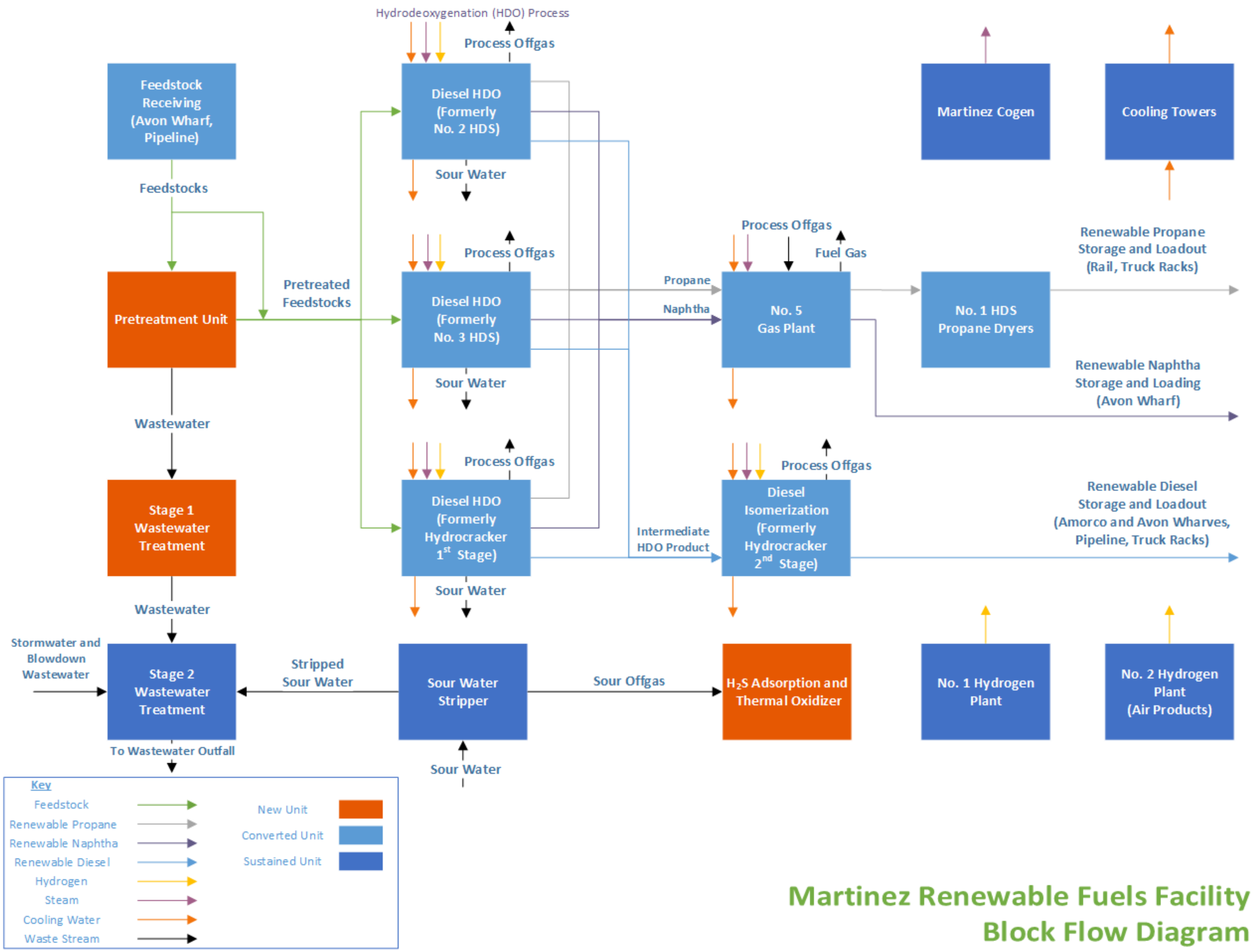

Figure 2-1 Block Flow Diagram

3.0 Air Quality

This section describes the methodology used to estimate emissions from new, modified, and existing emissions sources associated with the project. This section specifically describes the methodology used to evaluate both stationary and mobile sources related to the project. Emissions calculations supporting this analysis are provided in **Appendix A** and **Appendix B** to this report.

3.1 Stationary Source Emission Units

Emissions from new stationary emissions sources and from modifications/changes to existing sources at the facility are quantified in this section. Emissions increases from new emissions units are based on the potential to emit of the individual emissions units. Emissions changes from existing emissions units are based on the difference between the post-project emissions and pre-project emissions. The BAAQMD source identification numbers are used throughout this section to identify existing emission units that are part of the project.

3.1.1 New Emissions Units

The proposed project involves the construction of the following new sources:

- Sour Water Stripper Offgas Thermal Oxidizer
- Fugitive Emissions Components (e.g., valves, pumps, compressors, connections, etc.), including new components added to existing process units and new units (e.g., Pretreatment Unit)
- Stage 1 Wastewater Treatment Unit

The methodology for estimating emissions from these new sources is provided below.

3.1.1.1 Sour Water Stripper Offgas Thermal Oxidizer

Sour Water Stripper Offgas Thermal Oxidizer emissions are based on the maximum designed duty (1.91 MMBtu/hr) and the design offgas composition. Nitrogen oxide (NO_x), ammonia (NH_3), sulfur dioxide (SO_2), and carbon monoxide (CO) emissions are estimated based on emission factors and concentrations provided by the equipment manufacturer. SO_2 emissions are based on the anticipated sulfur concentration at the outlet of the H_2S adsorption vessel. PM, POC, and TAC emission factors are from AP-42 Section 1.4 for natural gas combustion.[1] Default natural gas emission factors from 40 Code of Federal Regulations (CFR) Part 98 Tables C-1 and C-2 are used to estimate GHG emissions.[2]

[1] US. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (EPA - AP-42),* Section 1.4: Natural Gas Combustion, July 1998.
[2] As amended at 81 FR 89252, Dec. 9, 2016

3.1.1.2 Fugitive Equipment Leaks from New, Modified, and Replaced Components

Fugitive equipment leak emissions from new, modified, and replaced components in POC service installed as part of this project are estimated based on associated component counts, representative emission factors, and process stream composition data.

New source identification numbers were added to represent the components (e.g., pumps, process valves, compressors, flanges, etc.) that are in POC service for the new Pretreatment Unit and Stage 2 Wastewater Treatment Unit (S-# 2025 and 2001, respectively). The associated counts for components in gas/vapor, light liquid, and heavy liquid services within existing process units were estimated based on the facility's leak detection and repair (LDAR) database and changes described in the associated project piping and instrumentation diagrams. Additional heavy liquid components not otherwise documented in the LDAR database were estimated by BAAQMD Heavy Liquid Multipliers.[3]

Light liquid and gas/vapor emissions for new process units were estimated based on the California Air Resources Board (CARB) and California Air Pollution Control Officers Association (CAPCOA)[4] revised 1995 United States Environmental Protection Agency (EPA) screening correlation equations and factors. Screening values were estimated using leak thresholds defined in BAAQMD Regulation 8-18: Equipment Leaks for specific component types. Heavy liquid emissions were estimated using BAAQMD *Refinery Emission Inventory Guidelines:* Table A-3 – Default Emission Factors for Equipment Leaks.

POC and TAC emissions were estimated using process stream composition data used in Annual Emission Inventories (AEIs) submitted to the District pursuant to BAAQMD Regulation 12, Rule 15, and/or data provided by Marathon's engineering staff.

3.1.1.3 Stage 1 Wastewater Treatment

The air emissions from the new Stage 1 Wastewater Treatment unit were estimated based on design information (flow rates, composition, equipment configuration, and equipment dimensions) and modeled using Toxchem wastewater treatment air emission estimation software.[5] Toxchem is included in Appendix C of 40 CFR Part 63 as an accepted alternative to Water 8/9 for the estimation of wastewater treatment emissions. Modeling results are included in **Appendix A**.

3.1.2 Existing Emission Units

Emissions from existing sources that will be physically changed or undergo a change in the method of operation as a result of the project are described below. Included in this section are those sources that are "modified," as defined under BAAQMD Regulation 2, Rule 1. Additionally, emissions units that are not modified, but realize a change in utilization are discussed. Finally, emissions units that will be shutdown are listed in this section. Emission units that will not be modified or used in support of future project

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[3] BAAQMD, Petroleum Refinery Emissions Inventory Guidelines*:* Table 3.2-2, July 2019.

[4] California Air Resources Board (CARB) and CAPCOA, California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks: Table IV-3a, February 1999.

[5] Hydromantis Environmental Software Solutions, Inc., Toxchem, Version 4.4

operations are excluded in this evaluation (e.g., firewater pumps, which are unaffected). Emissions changes are calculated as follows for existing emissions units:

- Modified Emissions Units: Difference between the post-project potential to emit and pre-project emissions;
- Existing Emissions Units Only Realizing Change in Utilization: Difference between post-project projected emissions and pre-project emissions; and
- Shutdown Sources: Difference between zero emissions post-project and pre-project emissions.
- Unaffected Emission Units: Not included in the pre- or post-project emissions since the project will not affect emissions from these sources.

For the purposes of this analysis, pre-project emissions from existing stationary sources are calculated following the same methodologies used to prepare the AEI required per BAAQMD Regulation 12, Rule 15. October 2015 – September 2020 average activity levels are used to define the pre-project emission rates. The pre-project emissions are summarized in **Appendix A**.

Post-project emissions from existing stationary sources are calculated as described below for each source type (modified, change in utilization, and shutdown sources). The post-project emissions calculations are summarized in **Appendix A**.

3.1.2.1 Existing Sources – Modified

The sources listed below will be modified as part of the project. The project includes physical modifications or changes to the method of operation to the equipment to accommodate the production of renewable fuels at the facility. The impact of each modification results in a change in emissions; depending on the emission source some sources will realize a decrease in emissions post-project while other equipment will realize an increase in emissions to accommodate the modification. Pre-project emissions from modified sources are based on annual average actual emissions between October 2015 and September 2020, and post-project emissions are based on the proposed potential to emit for the specific equipment. The following types of emission units identified as being modified include:

- Storage Tanks
- Wastewater Treatment Equipment

3.1.2.1.1 Storage Tanks

Certain project-affected storage tanks have firm limits[6] and others do not.[7] Emissions from tanks with firm limits are estimated at their potential to emit/permitted limits. Sources that do not have firm limits are

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[6] Storage tanks that are physically modified or undergo a change in the method of operations with firm limits include: BAAQMD Source Nos. S-323, S-1463, S-1464, S-1465, S-1496, S-1554

[7] Storage tanks that are physically modified or undergo a change in the method of operations with grandfathered limits or exempt status include: BAAQMD Source Nos. S-432, S-517, S-601, S-620, S-621, S-622, S-651, S-692, S-711, S-873, A932

considered "grandfathered" sources in the BAAQMD permit. For the grandfathered tanks, the potential to emit after the project is based on maximum physical and operational design.

POC and TAC emissions from project-affected storage tanks are estimated based on storage material conditions (e.g., throughput, material properties, temperature, tank configuration, etc.), and the equations and procedures outlined within AP-42 Section 7.1.[8] The stored liquid temperatures are determined for tanks with insulation and a heater. Stored material properties (e.g., vapor pressure, molecular weight, density, TAC content, etc.) for renewable naphtha, renewable diesel, and intermediate HDO product are engineering estimates. Stored material properties for all other materials (e.g., slops, sour water) are conservatively assumed to be the same as their pre-project equivalents with the understanding that the new materials are expected to have similar or lower volatility and TAC content. The calculations utilize the site-specific meteorological data from the Martinez Refinery's AEI calculations.

3.1.2.1.2 Wastewater Treatment

The Wastewater Surge Ponds (BAAQMD Source No. S-830) will undergo a physical change, and the ponds have a grandfathered limit. Two existing storage tanks (BAAQMD Source Nos. S-432 and S-1496) will undergo physical changes as part of repurposing the tanks to function as wastewater treatment equipment. Tank A-876 (S-1496) has a firm limit and Tank A-432 (S-432) has a grandfathered limit. Both of these tanks are evaluated at their post-project potential to emit as compared to pre-project actual emissions.

Similar to the Stage 1 Wastewater Treatment calculation methodology described above, the Wastewater Surge Ponds (S-830) and repurposed storage tanks (S-432 and S-1496) post-project potential to emit were estimated based on design information (flow rates and composition) and modeled using Toxchem[5] wastewater treatment air emission estimation software.

3.1.2.2 Existing Sources – Change in Utilization

The operation of the existing stationary combustion units (process heaters) will result in a change in utilization from the pre-project operation for these heaters. No physical changes affecting emissions will be made to these emissions units. However, increased firing or actual throughput would potentially affect pollutant emission rates.

Pre-project emissions from these heaters are based on actual operations, and post-project emissions are based on anticipated future actual operations. The nature of the utilization changes for this source category is discussed further below. Emissions calculations for this source are provided in **Appendix A.**

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[8] EPA's AP-42, Section 7.1: Organic Liquid Storage Tanks, June 2020.

3.1.2.2.1 Stationary Combustion Units

Several of the existing process heaters will undergo a change in utilization as a result of the project. Each has firm BAAQMD permit limits[9]. The process heaters post-project projected actual emissions have been calculated by applying emission factors to the projected actual firing rate of each heater. Additionally, the Delayed Coker Heater #1 (S-1511) was permitted to heat coker feed and will be repurposed to function as a hot oil heater, supplying hot oil duty to the Pretreatment unit (1PTU), Second Stage Hydrocracker (2HCR), and the 5GAS unit. Hot oil is an engineered heat transfer medium. S-1511 will heat the hot oil heat transfer medium that circulates in a closed system.

The renewable fuel gas properties (carbon content, heat value) are calculated based on design information provided by Marathon's project engineers. Emission factors vary by heater and by pollutant, relying upon emission limits where present, manufacturer data, stack testing, or EPA emission factors when no other factors are available. Sulfur concentration will no longer be limited by NSPS Subpart J and is expected to decrease as a result of the project. Sulfur concentration limits have been proposed in the BAAQMD permit application to assure no increase in the potential to emit sulfur dioxide (SO_2) from these combustion sources.

3.1.2.3 Existing Sources - Shutdown

The project proposes to shut down several process units and emission sources. Pre-project emissions from shutdown sources are based on annual average actual emissions between October 2015 and September 2020, and post-project emissions are assumed to be zero.

All equipment within the following source categories will be shut down as part of the project:

- Catalytic Reforming Unit
- Fluid Catalytic Cracking Unit
- Sulfur Recovery Unit

Select emission sources from the following categories will be shut down as part of the project:

- Cooling Towers
- Equipment Leaks
- Fugitive Dust Sources
- Stationary Combustion Units
- Storage Tanks
- Wastewater Units

Emissions calculations for these sources are provided in **Appendix A**. The complete list of emission sources to be shut down are specified below in Table 3-1.

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[9] The process heaters that will undergo a change in the method of operations with firm limits include: BAAQMD Source Nos. S-919, S-920, S-928, S-929, S-930, S-931, S-932, S-933, S-934, and S-937

Table 3-1 Specific Emission Sources that will be Shutdown

S-#[10]	Source Description	Source Category
97	FCCU Catalyst Fines Hopper, Abated by A30 ESP or by A3 and A4 (Cyclone and Baghouse)	Fluid Catalytic Cracking Unit
98	FCCU East Catalyst Hopper, Abated by A30 ESP or by A3 and A4 (Cyclone and Baghouse)	Fluid Catalytic Cracking Unit
99	FCCU West Catalyst Hopper, Abated by A30 ESP or by A3 and A4 (Cyclone and Baghouse)	Fluid Catalytic Cracking Unit
606	50 Unit Wastewater Air Stripper A [Brine Stripper], Abated by S950 (F50)	Wastewater
607	50 Unit Wastewater Air Stripper B [Brine Stripper], Abated by S950 (F50)	Wastewater
771	Tank 2-A-713, White, DEA (Alcohol, Amine)	Storage Tanks
795	#3 Reformer V-307, Tan Perchloroethylene, Abated by A-796 Vapor Balance during loading	Storage Tanks
802	FCCU Fluid Catalytic Cracker Regenerator, Abated by S-901 CO Boiler and A-30 ESP	Fluid Catalytic Cracking Unit
804	FCCU Blowdown Tower	Fluid Catalytic Cracking Unit
815	No. 1 Feed Prep	Equipment Leaks
816	No. 2 Feed Prep	Equipment Leaks
821	Coke Storage Pile	Fugitive Dust
822	Cracker Area Blowdown	Equipment Leaks
834	No. 50 Crude Unit Blowdown Drum	Equipment Leaks
851	Ammonia Recovery Unit	Equipment Leaks
853	FCCU Feed Surge Drum	Equipment Leaks
856	Spare DEA Stripper	Equipment Leaks
901	No. 7 Boiler, Refinery Fuel Gas, FCCU Flue Gas, Abates: S802	Stationary Combustion
902	FCCU Startup Heater, (Startup use only), Refinery Fuel Gas, Natural Gas	Stationary Combustion
904	No. 6 Boiler, Refinery Fuel Gas	Stationary Combustion
908	No. 3 Crude Heater (F8), Natural Gas, Refinery Fuel Gas, Abated by A-908 SCR	Stationary Combustion
909	No. 1 Feed Prep Heater (F9), Refinery Fuel Gas, Natural Gas	Stationary Combustion
913	No. 2 Feed Prep Heater (F13), Refinery Fuel Gas, Natural Gas	Stationary Combustion
915	Platformer Intermediate Heater (F15), Refinery Fuel Gas, Natural Gas	Stationary Combustion

[10] The S# refers to the source identification number specified by the BAAQMD in the facility permit to operate.

S-#[10]	Source Description	Source Category
916	No. 1 HDS Heater (F16), Natural Gas, Refinery Fuel Gas	Stationary Combustion
917	No. 1 HDS Prefract Reboiler (F17), Refinery Fuel Gas, Natural Gas	Stationary Combustion
921	No. 2 HDS Charge Heater (F21), Refinery Fuel Gas, Natural Gas	Stationary Combustion
926	No. 2 Reformer Splitter Reboiler (F26), Refinery Fuel Gas, Natural Gas	Stationary Combustion
927	No. 2 Reformer Heat/Reheating (F27), Refinery Fuel Gas, Natural Gas, Abated by A-1431 SCR	Stationary Combustion
950	50 Unit Crude Heater (F50), Refinery Fuel Gas, Natural Gas, Abated by A- 1432 SCR, Abates: S-606; S-607	Stationary Combustion
951	No. 2 Reformer Aux Reheater (F51), Refinery Fuel Gas, Natural Gas	Stationary Combustion
955	Internal Combustion Engine: No. 4 Gas Plant Vapor Compressor No. 4064, Natural Gas, Abated by A-955 SCR	Stationary Combustion
956	Internal Combustion Engine; No. 4 Gas Plant Vapor Compressor No. 4065, Natural Gas, Abated by A-956 SCR	Stationary Combustion
957	Internal Combustion Engine; No. 4 Gas Plant Vapor Compressor NO. 4066, Natural Gas, Abated by A-957 SCR	Stationary Combustion
958	Internal Combustion Engine; No. 4 Gas Plant Vapor Compressor No. 4067, Natural Gas, Abated by A-958 SCR	Stationary Combustion
959	Internal Combustion Engine, No. 4 Gas Plant Vapor Compressor No. 4068, Natural Gas, Abated by A-959 SCR	Stationary Combustion
960	Internal Combustion Engine; No. 4 Gas Plant Vapor Compressor No. 4096, Natural Gas, Abated by A-960 SCR	Stationary Combustion
971	No. 3 Reformer UOP Furnace (F53), Refinery Fuel Gas, Natural Gas, Abated by A-1433 SCR. A-1433 vents to combined stack with S-972	Stationary Combustion
972	No. 3 Reformer Debutanizer Reboiler (F54), Refinery Fuel Gas, Natural Gas, S- 972 shares stack with S-971, but flue gas from S- 972 is not abated by A1433.	Stationary Combustion
974	No. 3 HDS Fract Feed Heater (F56), Refinery Fuel Gas, Natural Gas, Abated by A-31 SCR on combined stack (P79) with S-973	Stationary Combustion
975	No. 4 Gas Plant Cooling Tower	Cooling Towers
977	No. 3 Crude Unit Cooling Tower	Cooling Towers
979	No. 2 Feed Prep Cooling Tower	Cooling Towers
983	Alky/No. 2 Reformer Cooling Tower	Cooling Towers
987	No. 50 Unit Cooling Tower	Cooling Towers
988	No. 3 Reformer Cooling Tower	Cooling Towers
990	Rich DEA Tank, Tank 749, Green, Abated by A-1526 packed bed scrubber and A- 1525 SRU Stack Incinerators	Storage Tanks

S-#[10]	Source Description	Source Category
1001	No 50 Crude Unit	Equipment Leaks
1004	No. 2 Catalytic Reformer	Catalytic Reforming Unit
1006	NO. 1 HDA Unit	Equipment Leaks
1009	ALKYLATION UNIT	Equipment Leaks
1020	No. 3 UOP Reformer	Catalytic Reforming Unit
1038	Benzene Saturation/Pentane-Hexane Isomerization	Equipment Leaks
1040	Butadiene Unit	Equipment Leaks
1105	No. 4 HDS Unit	Equipment Leaks
1106	No. 4 HDS Reactor Feed Heater (F72), Natural Gas	Stationary Combustion
1401	Sulfur Recovery Unit, Abated by A-1402 SCOT Tail Gas Unit and A-1525 SRU Stack Incinerators	Sulfur Recovery Unit
1404	Sulfur Storage Tank A-756, Abated by A-1422 Venturi Scrubber	Storage Tanks
1405	Sulfur Collection Pit, Abated by SRU (S1401) or SAP (S1411)	Storage Tanks
1418	Rich DEA Tank A-750, Abated by A-1418 Packed Bed Scrubber and Abated by A- 1525 SRU Stack Incinerators	Storage Tanks
1422	Sour Water Feed Tank M-782 Ammonia Recovery Unit Feed Tank	Storage Tanks
1470	No. 3 Crude Vacuum Distillation Heater (F71), Refinery Fuel Gas, Natural Gas, Abated by A-908 SCR	Stationary Combustion
1484	Oil Water Separator; Pressure Vessel, 50 Unit Desalter Brine, A-14 Vapor Recovery	Wastewater
1510	Delayed Coker	Equipment Leaks
1513	Coke Screen/Crusher	Fugitive Dust
1514	Coke Silo #1, Abated by A-1514 Baghouse	Fugitive Dust

3.1.3 Off-Site Emission Units

The Martinez Renewable Fuels Project will require the operation of new equipment or changes to existing equipment at off-site terminals within the BAAQMD and in San Joaquin Valley APCD jurisdiction. The equipment anticipated for use includes small natural gas fired heaters to maintain the temperature of the renewable feedstock, piping components, renewable feedstock storage tanks, and unloading/loading racks to transfer the renewable feedstock from/to rail or vessel.

In addition, the Martinez facility will receive hydrogen from the neighboring Air Products facility, in support of the Renewable Fuels Project.

3.2 Mobile Sources

This section describes the mobile source emissions from the project. Emissions from trucks, rail, marine vessels/barges, and employee commute within the state of California are considered in the analysis.

For the purposes of this analysis, pre-project emissions from existing trucking and rail operations, and employee commute are based on the average activity level that occurred over the pre-project period from October 2015 through September 2020. Pre-project emissions from the Amorco Terminal vessel operations are based on the level of activity and emissions presented in the 2014 Final Environmental Impact Report (FEIR) as prepared for the California State Lands Commission (CSLC)[11]. The pre-project emissions from the Avon Terminal vessel operations are based on the 2015 Final Environmental Impact Report (FEIR) as prepared by the CSLC[12]. Vessel emissions from the Avon terminal operations have been separately permitted with the BAAQMD, which have been fully mitigated with offsets. The proposed project has no effect on the Avon Terminal BAAQMD throughput and emission limits.

The use of the FEIR emission values to establish the pre-project emissions from vessel operations is discussed in **Appendix F**. The pre-project emissions values from mobile sources are summarized in **Appendix B**.

Post-project emissions from each mode of transportation (trucks, rail, vessels/barges, and employee commute) were calculated as described below for each transportation source type. The post-project emissions are summarized in **Appendix B**.

3.2.1 Trucks

Marathon will receive various commodities for use in the production of renewable fuels by way of truck transport on a daily basis. Some of the finished commodities produced at the facility will also be delivered to end-users via truck transport. Post-project, the majority of truck operations will support the transportation of conventional diesel and gasoline and renewable diesel within the BAAQMD. Truck route mileage was established based on known locations for receipt and delivery of commodities, assuming the trucks complete all trips primarily via freeway.

Criteria pollutant emissions associated with truck transport have been calculated using CARB's EMFAC2017 Web Database (V1.0.3) for the T7 Tractor truck type heavy-duty vehicles. The emission inventory data is based on operations within the BAAQMD, assuming an aggregation of all expected vehicle model years for diesel-fueled trucks. Both the pre-project and post-project emissions were based

[11] California State Lands Commission, *Final Environmental Impact Report for the Tesoro Amorco Marine Oil Terminal Lease Consideration*, February 2014.
[12] California State Lands Commission, *Final Environmental Impact Report for the Tesoro Avon Marine Oil Terminal Lease Consideration, January 2015*. The BAAQMD permit limits are different from the values presented in this FEIR. However, as noted in the text, all emissions were fully offset and mitigated such that no increases in emissions occurred after mitigation was applied.

on the average of 2022 – 2024 inventory data in order to evaluate the impact of the project on a consistent basis.

Emissions associated with truck transport have been characterized based on location and the distances traveled within each location:

- *On-Site:* movement of trucks through the facility to support renewable fuels processing;
- *BAAQMD:* movement of trucks outside facility boundaries, within the BAAQMD;
- *California:* total movement of trucks outside facility boundaries, inclusive of all air districts within the state of California. Emissions are assessed on a state-wide basis for GHG emissions (Section 5.0)

3.2.2 Rail

Railcars are used to transport various commodities over longer distances, typically outside BAAQMD and outside the state of California. As a result of the project, some commodities will no longer be transported by rail. The number of railcars transported in support of this project is anticipated to increase post-project due to the movement of renewable feedstock from out of state; however, the associated transportation duration will decrease within the BAAQMD due to a shift in railcar travel. A portion of the renewable feedstock will be transported to the facility by way of rail, where it will be offloaded at Avon terminal rail yard. Due to the limitations in the number of railcars that the Avon terminal rail yard can handle in a given day, the project is proposing to transport the remaining renewable feedstock via rail to a yet to be determined location as far away as Stockton, California, at which point it will be transferred onto a barge (or another vessel type) and delivered to the facility. Train route mileage was established for each commodity moved based on the California Region Timetable 20[13]. This data set describes routes, distances, and speed limits for each freight rail line that may be used to transport commodities for the project in the state of California.

Transport of the railcars to/from the facility assumes the use of up to four line-haul duty locomotives per train. Line-haul locomotives are the largest category of locomotives, designed to travel long distances with long trains. Each line-haul locomotive is assumed to be 4,400 bhp. Criteria pollutant emission factors for large line-haul duty locomotives come from the U.S. EPA[14] assuming the average of 2022 – 2024 for both the pre-project and post-project periods in order to evaluate the impact of the project on a consistent basis. A composite engine load assumed for line-haul operations is based on the EPA estimated duty-cycles[15] and the assumed load factor by notch[16].

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[13] California State Geoportal, *California Rail Network*, gis.data.ca.gov/datasets/.

[14] U.S. EPA, *Emission Factors for* Locomotives, Document No. EPA-420-F-09-025, April 2009.

[15] U.S. EPA, *Locomotive Emission Standards Regulatory Support Document (Locomotive RSD)*, Document No. EPA-420-R-98-101, April 1998.

[16] Fritz, Steven G., *Diesel Fuel Effects on Locomotive Exhaust Emissions*, SwRI, October 2000.

As noted above, certain commodities will be delivered directly to the facility. Once the railcars are delivered on-site via the existing facility rail spur at Avon, a smaller locomotive, referred to as a switch locomotive, is used to move the railcars to the designated track section within the Avon rail yard. "Switching" refers to the on-site movement of railcars over short hauls of small trains. Typically, railcar switching occurs up to four times in a day, with each switch taking roughly 30 minutes to complete. The actual time to complete railcar switching is dependent on the types of rail cars being moved, and the track section to which the railcars are moved. Railcar switching is conducted with a RailKing 330 Mobile Railcar Mover, which is powered by a Tier 3 Cummins QSB 6.7 204 bhp engine. Criteria pollutant emissions for the switcher are calculated using the U.S. EPA Locomotive Exhaust Emission Standards for Tier 3 Switch Duty-Cycle locomotives (EPA-420-B-16-024). Engine load associated with the idle and push modes of operations are based on line-haul engine data presented in the U.S. EPA Locomotive Emission Standards Regulatory Support Document (Locomotive RSD) Document No. EPA-420-R-98-101. Throttle notch position for switch duty cycle engines is based on the Roseville Rail Yard Study (October 14, 2004).

3.2.3 Vessel/Barges

Tankers and barges are also used to transport feedstocks and products to and from the facility. There are two locations available for docking and loading or unloading of commodities: Avon Terminal, which is approximately 0.5 miles north of the Refinery, and Amorco Terminal, located approximately 2.5 miles west of the Refinery. This project does not change the loading/unloading capacities of the two terminals. Existing refinery pumps and pipeline hydraulic limitations dictate loading capacity. There will be no increase in pump flow rates or in the hydraulic limitations on the pipelines.

As discussed in the Rail section above, the renewable feedstock is anticipated to be transported via rail to a location or locations as far away as Stockton, California[17]; barges will be used to transport the feedstock from this location to Avon Terminal. This trip contributes emissions in both the San Joaquin Valley Air Pollution Control District (SJVAPCD) and the BAAQMD. Renewable diesel is anticipated to be shipped out of Amorco via tanker. In addition, tankers will be used to transport other materials into and renewable products out of the facility at the Avon Terminal. Overall, the number of vessel calls at Amorco is expected to decrease, while the number of vessel calls at Avon is expected to increase relative to past actual operations due to the smaller capacity barges frequenting the terminal; however, the existing throughput limits and fully offset emission limits applicable to Avon will not be exceeded.

Transport of the feedstock from a location as far as the Stockton area was considered using Articulated Tug/Barge (ATBs) or by using traditional barge operations with up to two barges in tow. ATB's are barges that are mechanically connected to a dedicated tugboat. ATB's do not need escort tugs during transit; however, two assist tugs will be utilized for docking and undocking at both Stockton and Avon. The ATB's under consideration can carry up to 110 thousand barrels (kbbl) of cargo per vessel. Feedstock transport using two barges in tow allows for the potential movement of up to 50 kbbl (25 kbbl per barge).

[17] The exact location where feedstock will be transported to has not yet been defined. To be conservative Marathon has assumed Stockton as the furthest distance out that could be used in order to establish the reasonable worst case transportation by barge/vessel scenario.

Traditional barges will be pulled by escort tugs during transit and maneuvered into the dock with assist tugs. Onboard pump engines will be used at Avon to off-load the barges and transport the material onshore. The travel route for both the ATB and two-barge transit will be on the San Joaquin River, through Suisun Bay. This evaluation considers emissions from the two-barge tow scenario, as it represents a reasonable worst-case scenario of potential future operations.

Aside from the barge trips from a location as far away as Stockton, Ocean Going Vessels (OGV) travel to Avon or Amorco Terminals using established vessel traffic lanes. OGV's will be used for the delivery of some of the feedstock, as well as the movement of renewable diesel, renewable naphtha, gasoline, or distillate. The OGV's under consideration are classified as HandyMax or HandySize Tankers capable of carrying between 260 – 285 kbbl per vessel. Emissions are calculated for the round-trip starting from the Pilot Boarding/Sea Buoy location (approximately 11 nautical miles west of the Golden Gate Bridge) to the relevant terminal. Portions of the trip from the Pilot Boarding/Sea Buoy location to the terminals are segmented to account for emissions from the marine vessels' various operating modes, distances, and speeds. The OGV's (HandyMax or HandySize category) to be used include a main engine, auxiliary generator, and auxiliary boiler. Escort tugs may be required for some segments of the trip, depending on whether the vessel is loaded or empty and the nature of the material carried. A total of two assist tugs (which may include the escort tug, if present) will be utilized during docking and undocking. Tugboats are assumed to have two main engines and an auxiliary generator, all meeting at least Marine Tier 2 emission standards. Tug emissions are also included for an assumed 30-minute trip to/from a central transport hub to the escort or assist locations.

Post-project emission factors, load factors, and emission calculation methods used are from the following documents: Port of Long Beach Air Emissions Inventory – 2013 (July 2014, Starcrest Consulting Group, LLC); Emission Estimation Methodology for Commercial Harbor Craft Operating in California (California Air Resources Board, 2007); and the California Barge and Dredge Emissions Inventory Database (California Air Resources Board, 2011). Vessel capacities and engine sizes were informed by Marathon staff estimates and specification sheets for likely vessels to be operated in the post-project scenario.

3.2.4 Employee Transportation

Marathon employee transportation in support of on-going operations at the facility were considered. Pre-project operations assume 520 employees commuting to the facility per day with an average commute distance of 20 miles each way. The 20-mile distance represents the typical employee commute from surrounding communities in the North Bay and East Bay regions. Post-project, Marathon staffing needs will decrease to 110 employees commuting to the facility per day.

Criteria pollutant emissions associated with employee transportation have been calculated using CARB's EMFAC2017 Web Database (V1.0.3) assuming half of the employees drive a standard light duty passenger vehicle, with the other half driving a light duty truck. The emission inventory data is based on operations within the BAAQMD, assuming an aggregation of all expected vehicle model years for light duty vehicles and trucks. Both the pre-project and post-project emissions were based on the average of 2022 – 2024 inventory data in order to evaluate the impact of the project on a consistent basis.

Emissions associated with truck transport have been characterized based on location and the distances traveled within each location:

- *On-Site:* Assume 40% of employees arrive at the facility through the north gate, and 60% arrive through the south gate;
- *BAAQMD:* transportation of employees to the facility boundary within the BAAQMD;

3.3 Summary of Emissions Changes

This section presents the project emissions changes occurring within the BAAQMD and compares those emissions changes against the BAAQMD CEQA Thresholds defined in Table 2-1 of the guidelines[18].

3.3.1 Stationary Source Emissions

Operation of the proposed project will result in a reduction in criteria pollutant emissions. Table 3-2 and Table 3-3 present the estimated increases and decreases from the project on a lb/day and tons/year basis. Detailed emissions calculations are included in **Appendix A** to this report.

[18] BAAQMD, *California Environmental Quality Act Air Quality Guidelines, May 2017.*

Table 3-2 Summary of Stationary Source Daily Emission Changes (lb/day)

Equipment Category	NOx	SO2	CO	POC	PM10	PM2.5
Catalytic Reforming Unit	0.00	0.00	0.00	-3.73	0.00	0.00
Cooling Towers	0.00	0.00	0.00	-62.11	-474.60	-452.44
Delayed Coker	0.00	0.00	0.00	-22.16	-0.04	-0.01
Equipment Leaks	0.00	0.00	0.00	-229.84	0.00	0.00
External Floating Roof Tank	0.00	0.00	0.00	-17.81	0.00	0.00
Fixed Roof Tank	0.00	-6.74	0.00	-7.58	0.00	0.00
Fluid Catalytic Cracking Unit	-929.90	-551.07	-1272.23	-9.69	-300.02	-300.02
Fugitive Dust	0.00	0.00	0.00	0.00	-79.48	-62.28
Hydrogen Plant	0.00	0.00	0.00	0.00	0.00	0.00
Loading Operations	0.00	0.00	0.00	258.89	-0.04	-0.04
Stationary Combustion	-842.68	-622.89	-1468.27	-206.24	-358.29	-358.29
Storage Tanks	0.00	0.00	0.00	-6657.16	0.00	0.00
Sulfur Recovery Unit	-10.94	-164.62	-613.77	-5.76	0.00	0.00
Wastewater	0.00	-45.08	0.00	18.33	0.00	0.00
Facility Total	**-1783.52**	**-1390.40**	**-3354.26**	**-6944.86**	**-1212.46**	**-1173.07**

Table 3-3 Summary of Stationary Source Annual Emission Changes (Ton/Year)

Status	NOx	SO2	CO	POC	PM10	PM2.5
Catalytic Reforming Unit	0.00	0.00	0.00	-0.68	0.00	0.00
Cooling Towers	0.00	0.00	0.00	-11.33	-86.61	-82.57
Delayed Coker	0.00	0.00	0.00	-4.04	-0.01	0.00
Equipment Leaks	0.00	0.00	0.00	-0.06	0.00	0.00
External Floating Roof Tank	0.00	0.00	0.00	-3.25	0.00	0.00
Fixed Roof Tank	0.00	-1.23	0.00	-1.38	0.00	0.00
Fluid Catalytic Cracking Unit	-169.71	-100.57	-232.18	-1.77	-54.75	-54.75
Fugitive Dust	0.00	0.00	0.00	0.00	-14.51	-11.37
Hydrogen Plant	0.00	0.00	0.00	2.27	0.00	0.00
Loading Operations	0.00	0.00	0.00	-2.67	-0.01	-0.01
Stationary Combustion	-132.72	-113.90	-248.44	-37.23	-62.33	-62.33
Storage Tanks	0.00	0.00	0.00	0.29	0.00	0.00
Sulfur Recovery Unit	-2.00	-30.04	-112.01	-1.05	0.00	0.00
Wastewater	0.00	-8.23	-0.02	-16.41	0.00	0.00
Facility Total	**-304.42**	**-253.97**	**-592.66**	**-77.33**	**-218.21**	**-211.02**

3.3.2 Mobile Source Emissions

Emissions associated with the trucking of raw materials and finished commodities are anticipated to increase in the BAAQMD due to an increase in the trip mileage associated with distributing the renewable diesel during post-project operations. Emissions associated with employee transport, rail and vessel operations are generally anticipated to decrease for most pollutants in the BAAQMD. The reduction in emissions from rail operations is due to a reduction in locomotive transit time in the BAAQMD in the post-project scenario. The reduction in emissions from marine vessel operations is due to a shift in vessel type, from using ocean going vessels (OGV) to complete all marine transport, to using articulated tug barges (ATB), which are lower emitting, for ~ 85% of the total trips, with the remaining trips completed by OGV.

Table 3-4 and Table 3-5 present the emissions changes from the mobile source operations on a lb/day and tons/year basis. Detailed emissions calculations are included in **Appendix B** to this report.

Table 3-4 Summary of Mobile Source Daily Emission Changes - BAAQMD (lb/day)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Employee Vehicles	-1.46	-0.10	-14.03	-0.45	-10.69	-1.70
Trucks	9.45	0.06	-1.89	-0.04	0.07	0.14
Rail	-2.03	0.00	-0.64	-0.06	-0.05	-0.04
Vessels	-1,342.55	-2,197.27	-25.33	-83.48	-150.15	-55.80
Mobile Total	**-1,336.59**	**-2,197.32**	**-41.89**	**-84.03**	**-160.82**	**-57.40**

Table 3-5 Summary of Mobile Source Annual Emission Changes - BAAQMD (ton/year)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Employee Vehicles	-0.19	-0.01	-1.82	-0.06	-1.39	-0.22
Trucks	1.73	0.01	-0.35	-0.01	0.01	0.03
Rail	-0.37	0.00	-0.12	-0.01	-0.01	-0.01
Vessels	-245.02	-401.00	-4.62	-15.23	-27.40	-10.18
Mobile Total	**-243.85**	**-401.00**	**-6.91**	**-15.31**	**-28.79**	**-10.39**

3.3.3 Off-Site Emissions

Emissions associated with storing and heating the renewable feedstock, piping to the loading dock, and loading it onto barges for transport to Martinez will result in additional emissions in the San Joaquin Valley Air Pollution Control District, where the barges are anticipated to be loaded. In addition, the hydrogen Martinez will receive from the operation of the neighboring hydrogen plant reformer furnace will result in additional emissions.

Table 3-6 and Table 3-7present the estimated emissions from these off-site sources on a tons/year basis. Detailed emissions calculations are included in **Appendix A** to this report.

Table 3-6 Summary of Off-Site Emissions - BAAQMD (ton/year)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Hydrogen Plant Reformer Furnace	9.66	3.08	1.93	0.12	0.33	0.33
Feedstock Storage Tank				0.66		
Total	**9.66**	**3.08**	**1.93**	**0.78**	**0.33**	**0.33**

Table 3-7 Summary of Off-Site Emissions - SJVAPCD (ton/year)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Tank Heater	0.53	1.23	9.91	0.30	0.33	0.33
Feedstock Storage Tanks (4)				2.64		
Loading Rack				2.40		
Piping Components Connecting Feedstock Tanks to Loading Dock				1.72		
Total	**0.53**	**1.23**	**9.91**	**7.07**	**0.33**	**0.33**

3.3.4 Overall Emissions Changes in the BAAQMD

The total project change in emissions associated with the operation of the stationary source and mobile source emissions are summarized below in Table 3-8 and Table 3-9. As summarized, project emissions are anticipated to be below the average daily and maximum annual operational-related Air Quality CEQA Thresholds of Significance for criteria pollutant emissions in BAAQMD as defined in Table 2-1 of the guidelines.

Table 3-8 Summary Total Project Daily Emission Changes in BAAQMD (lb/day)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Stationary Source	-1,783.52	-1,390.40	-3,354.26	-6,944.86	-1,212.46	-1,173.07
Mobile Source	-1,336.59	-2,197.32	-41.89	-84.03	-160.82	-57.40
Off-Site Stationary Sources	**52.94**	**16.90**	**10.57**	**4.28**	**1.81**	**1.81**
Project Total	**-3,067.16**	**-3,570.81**	**-3,385.58**	**-7,024.60**	**-1,371.47**	**-1,228.66**
BAAQMD CEQA Threshold	54	NA	NA	54	82	54

Table 3-9 Summary Total Project Annual Emission Changes in BAAQMD (ton/year)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Stationary Source	-304.42	-253.97	-592.66	-77.33	-218.21	-211.02
Mobile Source	-243.85	-401.00	-6.91	-15.31	-28.79	-10.39
Off-Site Stationary Sources	**9.66**	**3.08**	**1.93**	**0.78**	**0.33**	**0.33**
Project Total	**-538.61**	**-651.89**	**-597.64**	**-91.86**	**-246.67**	**-221.08**
BAAQMD CEQA Threshold	10	NA	NA	10	NA	NA

4.0 Greenhouse Gases (Global Climate Change)

This section summarizes the GHG emissions changes from the project throughout the state of California. The methodology for estimating GHG emissions from the project generally follows the same approach discussed in Section 3.

4.1 Stationary Source Emissions

Operation of the stationary source equipment associated with the proposed project will result in a reduction in GHG emissions. Table 4-1 presents the estimated increases and decreases from the project on a metric ton/year basis. Detailed emissions calculations are included in **Appendix A** to this report.

Table 4-1 Summary of Stationary Source Annual GHG Emission Changes (Metric Ton/Year)

Status	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	Total CO_2e (MT)
Catalytic Reforming Unit	-98	0	0	-99
Cooling Towers	0	0	0	0
Delayed Coker	0	-4	0	-90
Equipment Leaks	-32	-4	0	-121
External Floating Roof Tank	0	0	0	0
Fixed Roof Tank	0	0	0	0
Fluid Catalytic Cracking Unit	-454,874	-13	-3	-455,980
Fugitive Dust	0	0	0	0
Hydrogen Plant	104,086	0	0	104,086
Loading Operations	0	0	0	0
Stationary Combustion	-820,331	-35	-7	-823,168
Storage Tanks	0	0	0	0
Sulfur Recovery Unit	-6,981	0	0	-6,981
Wastewater	0	0	0	0
Facility Total	**-1,178,230**	**-57**	**-9**	**-1,182,352**

4.2 Mobile Source Emissions

Emissions associated with the trucking of raw materials and finished commodities are anticipated to increase due to an increase in the trip mileage associated with distributing the renewable diesel during post-project operations both within BAAQMD and in surrounding air districts. Emissions associated with transport of the renewable feedstock is anticipated to increase the total contribution to railcar GHG emissions statewide, due to the movement of the feedstock from out of state. Emissions associated with employee transport and vessel operations are anticipated to decrease. The reduction in emissions from marine vessel operations is due to a shift in vessel type, from using ocean going vessels (OGV) to complete all marine transport, to using articulated tug barges (ATB) for ~ 85% of the total trips, with the remaining trips completed by OGV. The reduction in emissions associated with employee transport is due to staffing reductions in the post-project operations.

Table 4-2 presents the estimated increases and decreases from the mobile source operations on metric ton/year basis. Detailed emissions calculations are included in **Appendix B** to this report.

Table 4-2 Summary of Mobile Source Annual GHG Emission Changes (Metric Ton/Year)

Source	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	Total CO_2e (MT)
Employee Vehicles	-1,214	-0.01	-0.11	-1,248
Trucks	7,231	0.01	1.14	7,584
Rail	3,402	0.27	0.08	3,434.34
Vessels	-21,233	-0.25	-1.46	-21,692
Mobile Total	**-11,813**	**0.03**	**-0.24**	**-10,674**

4.3 Overall Emissions Changes

The total project change in greenhouse gas emissions associated with the construction and operation of the stationary source and related mobile source emissions are summarized below in Table 4-3. Total on-site and off-site construction emissions were estimated for sources constructed in both the BAAQMD and within the State of California. These construction emissions are amortized over a 30-year period, consistent with BAAQMD CEQA guidelines. As summarized, project emissions are anticipated to be below the maximum annual operational-related Air Quality CEQA Threshold of Significance for greenhouse gas emissions in BAAQMD as defined in Table 2-1 of the guidelines.

Table 4-3 Summary Total Project Annual Emission Changes (Metric ton/year)

Source	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	Total CO_2e (MT)
Stationary Source	-1,178,230	-56.78	-9.45	-1,182,352
Mobile Source	-11,813	0.03	-0.24	-10,674
Off-Site BAAQMD Stationary Sources	303,918	2.43	0.24	304,044
On-Site Construction	154	0.01	0.02	160
Off-Site Construction	74	0.00	0.01	78
Project Total	**-885,897**	**-54.32**	**-9.42**	**-888,744**
BAAQMD CEQA Threshold	NA	NA	NA	1,100

5.0 Health Risk Assessment

A Health Risk Assessment (HRA) was prepared to estimate cancer and non-cancer chronic and acute risk from toxic air contaminant emissions associated with the project. Two separate analyses were performed – one for emissions associated with operational sources, and one for emissions associated with construction. Risk values were compared to BAAQMD CEQA *Thresholds of Significance* to see whether the project is considered significant.

This section summarizes the HRA methodology, the relevant CEQA Thresholds of Significance, and the results from the modeling analysis. A detailed HRA report is provided in **Appendix C**.

5.1 Methodology

For the operational source analysis, project cancer and chronic risk were determined by subtracting pre-project risk from post-project risk at offsite receptors. This approach was taken to assess the impact of the project itself (i.e., to determine if the proposed project increased or reduced offsite risk).

Pre-project sources included all equipment associated with the project, including those that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Post-project sources included all new sources, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Acute risk was based on post-project emissions only[19]. Both stationary and mobile sources were considered.

For the construction source analysis, sources considered were onroad and offroad diesel-fired equipment. Diesel particulate matter (DPM) was the only pollutant modeled. As no acute health risk assessment values have been developed for DPM, only cancer and chronic risk were evaluated.

Modeling was performed using the current versions of the AERMOD air dispersion model (v. 21112) and the HARP risk assessment tool (v. 21081) following BAAQMD and OEHHA guidance[20]. Cancer, chronic,

[19] Because the maximum acute risk at any receptor could occur under different meteorological conditions for the pre-project and the post-project scenarios, subtracting pre-project maximum acute risk from post-project maximum acute risk would potentially provide inaccurate estimates of the increase (or decrease) in risk. Therefore, a conservative approach of only considering post-project emissions was taken. For any source with lower post-project emissions than pre-project emissions for a particular toxic chemical, acute risk from that chemical from that source would be reduced.

[20] Bay Area Air Quality Management District, *BAAQMD Health Risk Assessment Modeling Protocol*, August 2020.

California Office of Environmental Health Hazard Assessment (OEHHA) 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments*, February 2015.

and acute risk were calculated at each fenceline, grid, and sensitive receptor included in the analysis. A full description of the modeling methodology is included in Appendix C.

5.2 Thresholds

The BAAQMD CEQA Thresholds of Significance for toxic air contaminant emissions are defined in Table 2-1 of the BAAQMD CEQA Air Quality Guidelines and are provided below:

- Increased cancer risk of >10.0 in a million
- Increased non-cancer risk of > 1.0 Hazard Index (chronic or acute)

If the HRA shows that project cancer and non-cancer chronic and acute risk are below these thresholds, project risks are not considered significant.

5.3 Summary of Results

The predicted increase in health risks at maximally exposed offsite receptors resulting from the project operational sources are summarized by category in Table 5-1. As shown, the highest calculated cancer and chronic risks are negative, indicating a reduction in risk at all modeled receptors. Increases in acute risk are well below the CEQA Thresholds of Significance. Therefore, the project risk impacts are less than significant.

Table 5-1 Summary of Results at Maximally Exposed Offsite Receptors, Operational Sources

Location	Risk/HI Value	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Cancer Risk (Per Million)[21]				
Point of maximum impact (PMI)	-0.55	11755	576400	4204500
Chronic Hazard Index				
Point of maximum impact (PMI)	-0.0022	18609	574800	4212100
Acute Hazard Index				
Point of maximum impact (PMI)	0.336	192	581794.8	4210144.5
Residential receptor	0.097	8911	583750	4206400
Offsite workplace receptor	0.107	1646	583625	4206650
Sensitive Receptor	0.074	22708	584099	4205924

As noted above, acute risk was conservatively modeled based on post-project emissions only, and air toxics emissions reductions anticipated from the project were not considered in the analysis.

The predicted increase in health risks at maximally exposed offsite receptors resulting from construction sources are given by category in Table 5-2 below. As shown, the highest calculated cancer and chronic risks at residential, worker, and sensitive receptors are below the CEQA Thresholds of Significance. Note

[21] As cancer and chronic risk were below zero at all receptors, only the highest values are shown here.

that as only diesel particulate matter (DPM) emissions were modeled from construction sources and no acute health risk assessment values have been developed for DPM, acute risk was not considered.

Table 5-2 Summary of Results at Maximally Exposed Offsite Receptors, Construction Sources

Location	Risk/HI Value	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Cancer Risk (Per Million)				
Residential receptor	2.65	4861	585025	4209500
Offsite workplace receptor	0.04	3444	584825	4208650
Sensitive Receptor	0.70	22689	579754	4207262
Chronic Hazard Index				
Residential receptor	0.0015	4861	585025	4209500
Offsite workplace receptor	0.0015	3444	584825	4208650
Sensitive Receptor	0.0004	22689	579754	4207262

Details of the HRA results are provided in **Appendix C** to this report.

6.0 $PM_{2.5}$ Impacts

BAAQMD CEQA Guidelines[22] state that a project has a significant impact of there is an incremental increase of greater than 0.3 micrograms per cubic meter ($\mu g/m^3$) annual average $PM_{2.5}$. A modeling analysis was performed where the post-project annual average $PM_{2.5}$ concentrations were subtracted from pre-project annual average $PM_{2.5}$ concentrations at receptors in the vicinity of the facility.

Pre-project sources included all equipment associated with the project, including those that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Post-project sources included all new sources, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Mobile sources of $PM_{2.5}$ from onsite truck, rail, and employee vehicles, along with ship hoteling at the Avon and Amorco wharfs, were also included.

Results of the modeling analysis show that impacts from the project are below BAAQMD CEQA thresholds. Post-project $PM_{2.5}$ concentrations were found to be lower than pre-project concentrations at all receptors (i.e., net change at all receptors was negative). Notably, the highest average $PM_{2.5}$ concentration when only considering post-project emissions was 0.12 $\mu g/m^3$.

Details of the $PM_{2.5}$ modeling analysis are provided in **Appendix D** to this report.

[22] Bay Area Air Quality Management District, California Environmental Quality Act Air Quality Guidelines, May 2017, Table 2-1.

7.0 Carbon Monoxide Impacts

This section evaluates the potential impacts associated with CO emissions associated with vehicle traffic. As per the BAAQMD CEQA guidelines, occurrences of localized CO concentrations, known as hotspots, are often associated with heavy vehicle traffic congestion, which most frequently occurs at signalized intersections of high-volume roadways. The threshold of significance for CO impacts is based on the California Ambient Air Quality Standards (CAAQS) of 20 ppmv (1-hour averaging) and 9 ppmv (8-hour averaging time).

7.1 Mobile Source CO Impacts

Potential CO impacts associated with vehicle traffic are the result of ongoing truck traffic to receive commodities for use in the production of renewable fuels, as well as the delivery of finished products. Additional impacts may come from the daily commute of staff to and from the facility.

The BAAQMD criteria for determining whether a project is expected to result in a significant impact to localized CO concentrations is based on an evaluation of vehicle traffic as summarized below per Section 3.3 of the BAAQMD CEQA Guidelines:

- The project is consistent with an applicable congestion management program established by the county congestion management agency for designated roads or highways, regional transportation plan, and local congestion management agency plans.
- The project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour.
- The project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway)

As discussed in Section 3.2.1, truck transportation is anticipated to decrease as a result of this project, and facility staff transportation is expected to remain unchanged. As such, the project will not result in additional localized CO emissions from vehicular traffic. No CO impact is anticipated.

8.0 Odor Impacts

This section summarizes the potential impacts associated with odors from the project. The threshold of significance for odor impacts are qualitative in nature and are based on the impact of siting a new source of potential odor. The BAAQMD defines the thresholds of significance for odor impacts in Section 3.4 of the CEQA Guidelines as follows:

- Projects that would site a new odor source farther than the applicable screening distance from an existing receptor would not likely result in a significant odor impact.
- A type of odor source with five (5) or more confirmed complaints in the new source area per year averaged over three years is considered to have a significant impact on receptors within the applicable screening distance.

8.1 Stationary Source Odor Impacts

Operation of the stationary source equipment associated with the proposed project will result in a reduction of potential odor impacts. The primary source of odors from the pre-project operations includes the treatment of sour gas streams on-site and the recovery and production of sulfur at the Sulfur Recovery Unit (SRU) and sulfuric acid at the Sulfuric Acid Plant (SAP). The SRU and the SAP will be shut down as a result of this project. As such, sulfur-based odors from these operations will be eliminated post-project.

Post project, the storage of the renewable feedstock, including tallow, in several existing tanks, has the potential to contribute odors. These post-project odor sources are anticipated to be insignificant due to the use of odor management best practices, including carbon canisters and nitrogen blanketing in the tanks. The facility has an existing vapor control system that will continue to be used. Vapors from the loading and unloading activities will be collected by this vapor recovery system. Tanks that are not already connected to this vapor recovery system will be vented through carbon canisters to capture any odor-containing compounds in the vapor space. For sources that have the potential to emit hydrogen sulfide, the sources will also be controlled with existing vapor recovery or activated carbon.

The facility currently utilizes a third-party contractor to conduct odor monitoring throughout the facility and surrounding communities to evaluate type and strength of any odors present. These monitoring events are conducted routinely in order to mitigate any potential odor before it leaves the facility. This monitoring practice will continue under the post-project operating scenario.

9.0 Ambient Air Quality Monitoring

There are no ambient air quality monitoring stations in the immediate vicinity of the facility. There are two stations within five miles of the facility. The Martinez station is located about three miles to the east, and the Concord station is located just under five miles to the south. Monitoring station details are shown in Table 9-1 below.

Table 9-1 Ambient Air Monitoring Stations Near Marathon Facility

Station AQS ID	Address	Latitude/Longitude	Distance from Facility	Pollutants Monitored
06-013-2001	521 Jones St, Martinez, CA 94553	38.012816, -122.134467	3.0 miles	SO_2, toxics
06-013-0002	2956-A Treat Blvd, Concord CA 94518	37.936013, -122.026154	4.8 miles	O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, toxics

Current and historical air quality data can be viewed at https://www.baaqmd.gov/about-air-quality/current-air-quality/air-monitoring-data/#/aqi-highs?date=2021-04-22&view=hourly.

A complete description of the BAAQMD ambient air monitoring network can be found at https://www.baaqmd.gov/about-air-quality/air-quality-measurement/ambient-air-monitoring-network.

10.0 Applicable Requirements

This section describes the applicability of pertinent regulations, and prohibitory rules to the proposed project. Appendix G includes a summary of the major Federal, State, and BAAQMD air quality programs that were reviewed both for the project-affected emissions units and for the overall source as a result of changing from a petroleum refinery to a renewable fuels production facility. The summary includes a discussion regarding expected compliance with each applicable rule and regulation.

10.1 Federal Standards (NSPS, MACT, and NESHAP)

The U.S. EPA establishes and maintains emission standards of performance for new stationary sources under Federal CAA Section 111(b), known as the New Source Performance Standards (NSPS). Categories of existing stationary sources can also be retroactively controlled under Federal CAA Section 111(d). Categories of sources that cause HAP emissions are controlled through separate standards under CAA Section 112, National Emission Standards for Hazardous Air Pollutants (NESHAP). These standards are specifically designed to reduce the potency, persistence, or potential for bioaccumulation of toxic air pollutants. The emission standards for HAPs under Federal CAA Section 112 prevent adverse health risks and carcinogenic effects from targeted types of facilities.

The proposed transition from operating as a petroleum refinery to a renewable fuel production facility will result in a change in the applicable federal standards – including NSPS and NESHAP standards. Most of the regulations applicable to the pre-project operations will continue to apply during post-project operations. Marathon anticipates continued compliance based on existing facility procedures. Post-project, the facility will become subject to additional NSPS and NESHAP standards; however, some of the existing applicable federal requirements will no longer apply due to the facility no longer being classified as a petroleum refinery. The standards the facility will become subject to are summarized in Table 10-1, with the remaining existing applicable federal requirements summarized in Table 10-2.

Table 10-1 Summary of Federal Requirements that will become applicable Post-Project

Part	Subpart	Rule Name
40 CFR 60	Db	Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units
40 CFR 60	NNN	Standards of Performance for Volatile Organic Compound (VOC) Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations
40 CFR 63	FFFF	National Emission Standards for Hazardous Air Pollutants for Miscellaneous Organic Chemical Manufacturing (23 subcategories)

Table 10-2 Summary of Federal Requirements that will continue to apply Post-Project

Part	Subpart	Rule Name
40 CFR 60	Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units
40 CFR 60	H	Standards of Performance for Sulfuric Acid Plants
40 CFR 60	IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
40 CFR 60	Ka	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984
40 CFR 60	Kb	Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction or Modification Commenced After July 23, 1984
40 CFR 61	FF	National Emissions Standard for Benzene Waste Operations
40 CFR 61	M	National Emission Standard for Asbestos
40 CFR 63	DDDDD	National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters
40 CFR 63	GGGGG	National Emission Standards for Hazardous Air Pollutants for Remediation Sites
40 CFR 63	Q	National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers
40 CFR 63	R	National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations)
40 CFR 63	Y	National Emission Standards for Marine Tank Vessel Loading Operations
40 CFR 63	ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
40 CFR 64	---	Compliance Assurance Monitoring for Major Stationary Sources
40 CFR 68	---	Chemical Accident Prevention Provisions (RMP)
40 CFR 70	---	State Operating Permit Programs
40 CFR 82	---	Protection of Stratospheric Ozone
40 CFR 98	---	Federal Greenhouse Gas Reporting Rule

10.2 California State Regulations

The California Air Resources Board (CARB) is charged with protecting public health through reduction of air pollutants in the state of California. The California Ambient Air Quality Standards (CAAQS) were established as the basis CARB would use to achieve the goal of protecting public health. Through the authority given to CARB in the California Health and Safety Code (HSC), CARB is authorized to develop emission reduction strategies to address airborne toxics, emissions from stationary sources, area wide sources, mobile sources, and fuels in order to meet the CAAQS and National Ambient Air Quality Standards (NAAQS). While CARB has jurisdiction over all air pollutant sources in the State; it has delegated to local air districts the responsibility for stationary sources and has retained authority over emissions from mobile sources.

The construction and operation of the facility post-project, including the use of mobile source, non-road, and portable equipment to support the ongoing activities at the stationary source are governed by several California state regulations as summarized in Appendix G. The focus of many of these regulations is the reduction of NOx and diesel PM from off-road, on-road, portable, and marine vessel engines.

Table 10-3 Summary of Applicable CARB Regulations

CHS&C Section	Regulation Title
13 CCR §2449	Regulation for In-Use Off-Road Diesel-Fueled Fleets
13 CCR §2485	ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling
17 CCR §2450	Portable Equipment Registration Program
17 CCR §93105	Asbestos ATCM for Construction, Grading, Quarrying and Surface Mining Operations
17 CCR §93115	ATCM for Stationary Compression Ignition Engines
17 CCR §93116	ATCM for Diesel Particulate Matter from Portable Engines Rated at 50 Horsepower and Greater
17 CCR §93118.3	ATCM for Auxiliary Diesel Engines Operation on Ocean-Going Vessels At-Berth in a California Port
17 CCR §93118.5	ATCM for Commercial Harbor Craft
17 CCR §95100-95163	Regulation for the Mandatory Reporting of Greenhouse Gas Emissions

During the construction phase, Marathon anticipates the use of off-road and non-road equipment. Such equipment will comply with the engine tier standards and diesel fuel specifications defined by the applicable state regulations (13 CCR § 2449 and 17 CCR § 93116). Contractors maintain documentation, which identifies the equipment to be brought onsite complies with the requirements for portable equipment and off-road engines.

Additional state regulations impact the ongoing, post-project operations, including Air Toxic Control Measures (ATCMs) to limit diesel-fueled commercial motor vehicle idling (13 CCR § 2485), the ATCM for auxiliary diesel engines operated in ocean-going vessels at berth (17 CCR § 93118.3), the ATCM for commercial harbor craft (17 CCR § 93118.5), and the ATCM for stationary compression ignition engines (17 CCR §93115). Diesel-fueled vehicles come to the facility on a daily basis for delivery of goods used by the facility, as well as to load fuel at the loading racks. Truck drivers maintain compliance with the idling limitations as part of their contractual obligations while onsite.

During pre-project operations the facility was subject to the Mandatory Reporting Rule (MRR) based on its classification as a Petroleum Refinery, with specific reporting requirements for petroleum refineries specified in Section 95113. Post-project, the facility will remain subject to the MRR.

10.3 Bay Area Air Quality Management District Rules

Local air pollution control districts in California have jurisdiction over stationary sources in their respective areas, as delegated by CARB through the CCAA and must adopt plans and regulations necessary to demonstrate attainment of Federal and State air quality standards (NAAQS and CAAQS). As directed by the Federal and State Clean Air Acts, local air districts are required to prepare plans with strategies for attaining and maintaining State and Federal ozone standards. The proposed project is governed by the air quality rules and regulations promulgated by the Bay Area AQMD (BAAQMD).

The proposed modification from operating as a petroleum refinery to a renewable fuel production facility will result in a change in the rules applicable in the BAAQMD. A detailed discussion of the BAAQMD rule applicability is found in Section 4 of the BAAQMD permit application for the Martinez Renewable Fuels Project. The following tables summarize the BAAQMD rules that will no longer apply (Table 10-4) and the BAAQMD that will apply post-project (Table 10-5):

Table 10-4 Summary of Non-Applicable BAAQMD Rules – Post-Project

BAAQMD Rule No.	Rule Name	Post-Project Impact
Regulation 6, Rule 5	Particulate Emissions from Refinery Fluidized Catalytic Cracking Units 2018 Amendment (Current)	Since the FCCU will be shutdown, this rule shall no longer apply.
Regulation 8, Rule 9	Vacuum Producing Systems	Post-project, the facility will not have any process operated under a vacuum.
Regulation 11, Rule 7	Benzene	This rule will no longer apply because none of the equipment will be in benzene service (>10% by weight).

As documented in Appendix E of the BAAQMD permit application, most of the BAAQMD rules applicable to the pre-project operations will continue to apply during post-project operations without modification to the rule-level applicably. Marathon anticipates continued compliance with the applicable rules based on existing plans and procedures established to demonstrate compliance. An overview of the applicable rules is provided below; please see Appendix E of the BAAQMD permit application for specific details on applicability.

Table 10-5 Summary of Applicable BAAQMD Rules – Post-Project

BAAQMD Regulation	Regulation Title	Applicable Rules
Regulation 1	General Provisions & Definitions	Reg 1, Rule 1 – General Requirements
Regulation 2	Permits	Reg 2, Rule 1 – General Requirements Reg 2, Rule 4 – Emission Banking Reg 2, Rule 6 – Major Facility Review Reg 2, Rule 9 – Interchangeable Emissions Reduction Credits
Regulation 3	Fees	Fees (Effective 7/1/20)
Regulation 4	Air Pollution Episode Plan	Air Pollution Episode Plan
Regulation 5	Open Burning 2019 Amendment	Open Burning 2019 Amendment
Regulation 6	Particulate Matter – Common Definitions and Test Methods	Reg 6, Rule 1 – General Requirements 2018 Amendments
Regulation 7	Odorous Substances	Odorous Substances
Regulation 8	Organic Compounds	Reg 8, Rule 3 - Architectural Coatings Reg 8, Rule 4 - General Solvent and Surface Coating Operations Reg 8, Rule 5 - Storage of Organic Liquids Reg 8, Rule 6 - Terminals and Bulk Plants Reg 8, Rule 7 - Gasoline Dispensing Facilities Reg 8, Rule 8 - Wastewater (Oil-Water) Separators Reg 8, Rule 10 - Process Vessel Depressurization Reg 8, Rule 16 - Solvent Cleaning Operations Reg 8, Rule 18 - Equipment Leaks Reg 8, Rule 28 - Episodic Releases From Pressure Relief Devices at Petroleum Refineries and Chemical Plants Reg 8, Rule 33 - Gasoline Bulk Terminals and Gasoline Delivery Vehicles Reg 8, Rule 40 - Aeration of Contaminated Soil and Removal of Underground Storage Tanks Reg 8, Rule 44 - Marine Vessel Loading Terminals Reg 8, Rule 49 - Aerosol Paint Products Reg 8, Rule 51 - Adhesive and Sealant Products
Regulation 9	Inorganic Gaseous Pollutants	Reg 9, Rule 1 - Sulfur Dioxide Reg 9, Rule 2 - Hydrogen Sulfide Reg 9, Rule 8 - Nitrogen Oxides And Carbon Monoxide from Stationary Internal Combustion Engines Reg 9, Rule 10 - Nitrogen oxides And Carbon Monoxide From Boilers, Steam Generators And Process Heaters in Petroleum Refineries

BAAQMD Regulation	Regulation Title	Applicable Rules
Regulation 11	Hazardous Pollutants	Reg 11, Rule 2 - Asbestos Demolition, Renovation and Manufacturing Reg 11, Rule 10 - Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers 2018 Amendment (Current) Reg 11, Rule 18 - Reduction of risk from air toxic emissions at existing facilities
Regulation 12	Miscellaneous Standards of Performance	Reg 12, Rule 4 - Sandblasting Reg 12, Rule 6 - Acid Mist From Sulfuric Acid Plants Reg 12, Rule 11 - Flare Monitoring at Petroleum Refineries Reg 12, Rule 12 - Flares at Petroleum Refineries Reg 12, Rule 15 – Petroleum Refining Emissions Tracking 2019 Amendment (Current)

11.0 Construction Emissions

The Martinez Renewable Fuels Project will require the construction of new equipment or changes to existing equipment both on-site the Martinez facility as well as at off-site locations within the BAAQMD and in the San Joaquin Valley APCD. These construction activities will result in criteria pollutant emissions over the duration of the construction phase for each location. Equipment estimates for each construction site are based on engineering estimates and the estimated acreage of land disturbance as detailed in Appendix D – Default Data Tables for the California Emissions Estimator Model (CalEEMod) User's Guide (November 2017). Construction emission have been evaluated against the local district CEQA construction thresholds as described in the following sections.

11.1 On-Site Construction

The on-site construction phase is anticipated to last for approximately 22 months. Table 11-1 summarizes the anticipated daily average criteria pollutant emissions from the use of off-road diesel equipment, on-road vehicles, material movement, asphalt paving, and surface coating activities. This daily emission summary assumes all on-site construction elements could occur within the same day. As summarized in Table 11-1, the daily average emissions are below the BAAQMD thresholds of significance for construction-related criteria air pollutants and precursors as described in Table 2-4 of the BAAQMD CEQA Guidelines. Detailed emissions calculations are included in **Appendix E** to this report.

Table 11-1 Summary Total Daily On-Site Construction Emissions (lb/day)

Project Source	NOx	SO2	CO	POC	PM10	PM2.5
Martinez Renewable Fuels	43.67	0.19	758.46	42.50	11.60	4.37
Avon Rail Extension	0.68	0.00	1.43	0.14	0.25	0.11
Avon Marine Oil Terminal Piping Upgrades	0.41	0.00	3.55	0.94	0.09	0.02
Amorco Marine Oil Terminal Fender Upgrades	0.73	0.00	3.17	3.57	0.10	0.04
On-Site Construction Total	**45.49**	**0.20**	**766.62**	**47.16**	**12.05**	**4.54**
BAAQMD CEQA Threshold	54	NA	NA	54	82	82

Construction emissions assume the operation of off-road equipment up to eight hours per day. Operation of on-road vehicles was determined based on the number of workers necessary to operate the off-road equipment each day, plus the movement of materials and maintenance of the construction site (e.g., cement trucks, dump trucks, water trucks). Emission factors for the on-road vehicles came from the CARB EMFAC2017[23] emission inventory. Factors were selected based on the vehicle class, operated in

[23] CARB EMFAC Emission Inventory for on-road vehicles: https://arb.ca.gov/emfac/

BAAQMD, aggregated for all potential engine model years that could be in use during the anticipated construction period between 2021 – 2023. Emission factors for the off-road equipment came from the CARB OFFROAD2017 – Orion emission inventory[24]. Factors were selected for each equipment category, based on an average expected horsepower for each equipment category, with operation during the anticipated construction period of 2021 – 2023. Emission factors from the 2021 – 2023 period were averaged to result in a composite emission factor for each vehicle and off-road equipment category considered.

11.2 Off-Site Construction

The Martinez Renewable Fuels Project will require the construction of new equipment or changes to existing equipment at off-site locations within the BAAQMD as well as in San Joaquin Valley APCD. These construction activities will result in criteria pollutant emissions over the duration of the construction phase for each site. Construction phase emissions are evaluated against the CEQA thresholds for construction activities in each air district. Table 11-2 summarizes the anticipated daily average criteria pollutant emissions from the use of off-road diesel equipment, on-road vehicles, material movement, asphalt paving, and surface coating activities for locations within the BAAQMD, but off-site from the Martinez facility.

Off-site construction emissions within the BAAQMD are summarized in Table 11-2, which are expected to be below the BAAQMD thresholds of significance for construction-related criteria air pollutants and precursors (Table 2-4 of the BAAQMD CEQA Guidelines). Off-site construction emissions within the San Joaquin Valley APCD (SJVAPCD) are summarized in Table 11-3, which are also expected to be below the SJVAPCD annual thresholds of significance for construction-related criteria air pollutants and precursors.

Table 11-2 Summary of Off-Site Total Daily Construction Emissions in BAAQMD (lb/day)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Off-Site BAAQMD Terminal	7.35	0.03	11.91	0.70	2.02	0.43
Off-Site Construction Total	**7.35**	**0.03**	**11.91**	**0.70**	**2.02**	**0.43**
BAAQMD CEQA Threshold	54	NA	NA	54	82	82

[24] CARB OFFROAD2017 emission inventory for off-road equipment: https://www.arb.ca.gov/orion/

Table 11-3 Summary of Off-Site Total Annual Construction Emissions in SJVAPCD (TPY)

Source	NOx	SO2	CO	POC	PM10	PM2.5
Off-Site SJVAPCD Terminal	5.31	0.02	3.21	0.62	1.54	0.50
SJVAPCD Construction Total	**5.31**	**0.02**	**3.21**	**0.62**	**1.54**	**0.50**
SJVAPCD CEQA Threshold	10	27	100	10	15	15

11.3 Overall Construction Emissions (BAAQMD)

The combined emissions associated with the construction and modification of stationary source equipment within the BAAQMD are summarized below in Table 11-4. As summarized, construction emissions are anticipated to be below the average daily construction-related Air Quality CEQA Thresholds of Significance for criteria pollutant emissions in BAAQMD as defined in Table 2-4 of the guidelines.

Table 11-4 Summary of Total Daily Construction Emissions in BAAQMD (lb/day)

Source	NOx	SO2	CO	POC	PM10	PM2.5
On-Site Construction (Table 11-1)	45.49	0.20	766.62	47.16	12.05	4.54
Off-Site Construction (Table 11-2)	7.35	0.03	11.91	0.70	2.02	0.43
Construction Total	**52.84**	**0.23**	**778.53**	**47.86**	**14.06**	**4.97**
BAAQMD CEQA Threshold	54	NA	NA	54	82	82

11.4 Health Risk Associated with Construction Activities

As summarized in Section 5, an HRA was prepared to estimate cancer and non-cancer chronic and acute risk from toxic air contaminant emissions associated with construction in support of the proposed project. Risk values were compared to BAAQMD CEQA *Thresholds of Significance* to see whether the construction activities would be considered significant. The calculated cancer and chronic risks at residential, worker, and sensitive receptors are below the CEQA Thresholds of Significance. Note that as only diesel particulate matter (DPM) emissions were modeled from construction sources and no acute health risk assessment values have been developed for DPM, acute risk was not considered. See **Appendix C** for additional details.

Appendix A

Stationary Source Emissions Summaries

Marathon - Martinez

Renewable Fuels Project

Air Quality and GHG Technical Analysis

Table A.1-1a Pre-Project Criteria Pollutant Emission Summary (Affected Units) [tpy]

Device ID	Description	Source Category	NO_X Emissions (tons)	SO_2 Emissions (tons)	CO Emissions (tons)	POC Emissions (tons)	PM_{10} Emissions (tons)	$PM_{2.5}$ Emissions (tons)	CO_2 Emissions (metric tons)	N_2O Emissions (metric tons)	CH_4 Emissions (metric tons)	GHG (mass) Emissions (metric tons)	GHG (CO2e) Emissions (metric tons)
	Facility ID: 14628												
115	RAILROAD TANK CAR LOADING RACK NORTH OF WATER	Loading_Operations	-	-	-	0.00	-	-	-	-	-	-	-
323	TANK A-323	Fixed_Roof_Tank	-	-	-	0.01	-	-	-	-	-	-	-
432	Tank A-432	Fixed_Roof_Tank	-	-	-	4.31	-	-	-	-	-	-	-
517	TANK A-517	Fixed_Roof_Tank	-	-	-	6.10	-	-	-	-	-	-	-
601	TANK A-601	Internal_Floating_Roof_Tank	-	-	-	0.46	-	-	-	-	-	-	-
620	TANK A-620	Fixed_Roof_Tank	-	-	-	3.37	-	-	-	-	-	-	-
621	Tamk A-621	External_Floating_Roof_Tank	-	-	-	0.03	-	-	-	-	-	-	-
622	Tank A-622	Fixed_Roof_Tank	-	-	-	0.79	-	-	-	-	-	-	-
650	Tank A-650 - Sour Water	External_Floating_Roof_Tank	-	-	-	0.01	-	-	-	-	-	-	-
651	Tank 651	External_Floating_Roof_Tank	-	-	-	0.22	-	-	-	-	-	-	-
656	Foul Water Stripper Charge Tank #846	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
658	Foul Water Stripper Charge Tank #847	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
692	TANK A-692	External_Floating_Roof_Tank	-	-	-	1.95	-	-	-	-	-	-	-
699	Tank A-699, White, API Separator Recovered Oil, A-14	Fixed_Roof_Tank	-	-	-	0.02	-	-	-	-	-	-	-
700	Tank 2-A-700, Light grey, API Separator Sludge	Fixed_Roof_Tank	-	-	-	0.05	-	-	-	-	-	-	-
711	TANK 80-A-711	External_Floating_Roof_Tank	-	-	-	2.15	-	-	-	-	-	-	-
819	API OIL WATER SEPARATOR	Wastewater	-	-	0.02	0.00	-	-	-	-	-	-	-
830	WATER TREATMENT SURGE PONDS	Wastewater	-	-	-	4.21	-	-	-	-	-	-	-
831	BIO-OXIDATION POND	Wastewater	-	-	-	17.89	-	-	-	-	-	-	-
842	WASTEWATER TREATMENT PLANT	Wastewater	-	-	-	0.00	-	-	-	-	-	-	-
1026	DAF Air Stripper	Wastewater	-	-	0.00	0.00	-	-	-	-	-	-	-
850	No 3 HDS Unit	Equipment_Leaks	-	-	-	1.02	-	-	-	-	0.23	0.23	4.83
872	Tank A-872, New External Floating Roof Tank for LSVGO	External_Floating_Roof_Tank	-	-	-	0.16	-	-	-	-	-	-	-
873	Tank A-895, Fixed Roof Tank for Fuel Oil	Fixed_Roof_Tank	-	-	-	0.97	-	-	-	-	-	-	-
919	No. 2 HDS Heater (F19)	Stationary_Combustion	3.01	2.30	9.51	1.06	0.75	0.75	12,033.79	0.13	0.67	12,034.59	12,089.08
920	No. 2 HDS Charge Heater (F20)	Stationary_Combustion	4.19	3.12	10.90	1.44	1.02	1.02	16,323.57	0.18	0.91	16,324.66	16,398.87
928	HDN Reactor A Heater (F28)	Stationary_Combustion	2.02	0.90	0.07	0.22	0.30	0.30	5,683.35	0.06	0.32	5,683.73	5,709.55
929	HDN Reactor B Heater (F29)	Stationary_Combustion	1.49	0.78	0.06	0.19	0.26	0.26	5,022.74	0.06	0.28	5,023.08	5,045.90
930	HDN Reactor C Heater (F30)	Stationary_Combustion	1.80	0.88	0.06	0.21	0.29	0.29	5,586.98	0.06	0.31	5,587.35	5,612.75
931	Hydrocracker Reactor 1 Heater (F31)	Stationary_Combustion	1.53	0.87	0.06	0.21	0.29	0.29	5,575.94	0.06	0.31	5,576.31	5,601.66
932	Hydrocracker Reactor 2 Heater (F32)	Stationary_Combustion	1.66	0.96	0.07	0.23	0.31	0.31	6,155.30	0.07	0.34	6,155.72	6,183.71
933	Hydrocracker Reactor 3 Heater (F33)	Stationary_Combustion	2.30	1.09	0.08	0.26	0.36	0.36	6,780.21	0.08	0.38	6,780.66	6,811.49
934	Hydrocracker Stabilizer Reboiler (F34)	Stationary_Combustion	10.38	4.79	1.07	0.11	1.56	1.56	32,338.64	0.36	1.80	32,340.80	32,487.97
937	Hydrogen Plant Heater (F37)	Stationary_Combustion	44.30	16.43	14.13	1.47	10.38	10.38	178,199.89	1.05	6.20	178,207.13	178,655.36
973	No. 3 HDS Recycle Gas Heater (F55)	Stationary_Combustion	1.06	3.78	0.13	0.04	1.18	1.18	17,247.96	0.19	0.96	17,249.11	17,327.55
1002	No 1 HDS Unit	Equipment_Leaks	-	-	-	1.49	-	-	-	-	0.33	0.33	7.03
1003	NO. 2 HDS UNIT	Equipment_Leaks	-	-	-	0.90	-	-	-	-	0.20	0.20	4.23
1005	No.1 HYDROGEN PLANT	Hydrogen_Plant	-	-	-	5.33	-	-	270,306.65	-	-	270,306.65	270,306.65
1007	Hydrocracker Unit	Equipment_Leaks	-	-	-	1.16	-	-	-	-	0.26	0.26	5.49
1008	HDN UNIT	Equipment_Leaks	-	-	-	0.18	-	-	-	-	0.04	0.04	0.86
1025	Truck/Rail Bulk Plant,	Loading_Operations	-	-	-	16.89	-	-	-	-	-	-	-
1463	Tank 867; New 240,000 BBL Tank in Tract 4	External_Floating_Roof_Tank	-	-	-	0.43	-	-	-	-	-	-	-
1464	Tank 868; New 100,000 BBL Tank in Tract 6	External_Floating_Roof_Tank	-	-	-	0.03	-	-	-	-	-	-	-
1465	Tank 869; New 100,000 BBL Tank in Tract 6 (Tank A-869)	External_Floating_Roof_Tank	-	-	-	0.02	-	-	-	-	-	-	-
1496	Fixed Roof Tank A-876	Fixed_Roof_Tank	-	-	-	3.38	-	-	-	-	-	-	-
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks	-	-	-	2.96	-	-	-	-	-	-	-
1511	Delayed Coker Heater #1 F78	Stationary_Combustion	0.70	1.17	0.14	0.22	5.00	5.00	71,246.47	0.13	1.34	71,247.95	71,316.41
1512	Delayed Coker Heater #2 F79	Stationary_Combustion	0.71	1.13	0.45	0.23	4.83	4.83	68,855.80	0.13	1.30	68,857.23	68,923.39
1526	No.5 Gas Plant	Equipment_Leaks	-	-	-	0.42	-	-	-	-	0.09	0.09	1.97
1554	Tank A-943	Fixed_Roof_Tank	-	-	-	3.13	-	-	-	-	-	-	-
1560	Avon Wharf Berth 1A	Loading_Operations	-	-	-	1.73	-	-	-	-	-	-	-
A905	Source Not Listed on District Permit	Fixed_Roof_Tank	-	-	-	2.70	-	-	-	-	-	-	-
2028	Source Not Listed on District Permit	Fixed_Roof_Tank	-	-	-	1.05	-	-	-	-	-	-	-
A933	Source Not Listed on District Permit	Fixed_Roof_Tank	-	-	-	2.93	-	-	-	-	-	-	-
656-658	Foul Water	Equipment_Leaks	-	-	-	1.03	-	-	-	-	-	-	-
97	CATALYST FINES HOPPER WITH ZURN IND #310A BLOWER	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
98	EAST CATALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
99	WEST CAYALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
515	Tank A-515	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
516	Tank A-516	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
554	TANK A-554	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
572	TANK A-572	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
585	TANK A-585	Fixed_Roof_Tank	-	-	-	0.87	-	-	-	-	-	-	-
590	DEA Flash Drum, V010	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
598	TANK A-598	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
599	Tank A-599	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
606	WASTEWATER AIR STRIPPER A FOR NO. 50 UNIT	Wastewater	-	4.11	-	0.04	-	-	-	-	-	-	-
607	WASTEWATER AIR STRIPPER B FOR NO. 50 UNIT	Wastewater	-	4.11	-	0.04	-	-	-	-	-	-	-
618	Tank A-618	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
638	TANK A-638	External_Floating_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table A.1-1a Pre-Project Criteria Pollutant Emission Summary (Affected Units) [tpy]

Device ID	Description	Source Category	NO_X	SO_2	CO	POC	PM_{10}	$PM_{2.5}$	CO_2	N_2O	CH_4	GHG (mass)	GHG (CO2e)
			Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)
639	Tank A-639	External_Floating_Roof_Tank	-	-	-	1.45	-	-	-	-	-	-	-
640	TANK A-640	External_Floating_Roof_Tank	-	-	-	0.86	-	-	-	-	-	-	-
641	TANK A-641	External_Floating_Roof_Tank	-	-	-	0.93	-	-	-	-	-	-	-
714	Spent Acid at Alkylation Unit	Fixed_Roof_Tank	-	-	-	0.50	-	-	-	-	-	-	-
771	DEA TANK 2-A-713	External_Floating_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
795	No. 3 Reformer Chloriding Agent Perchloroethylene Tank	Fixed_Roof_Tank	-	-	-	0.02	-	-	-	-	-	-	-
802	FCCU	Fluid_Catalytic_Cracking_Unit	169.71	100.57	232.18	1.76	52.60	52.60	454,500.48	2.66	13.31	454,516.45	455,605.28
802TorchOi	FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	0.01	2.16	2.16	373.05	0.00	0.02	373.07	374.37
815	NO. 1 FEED PREP. UNIT	Equipment_Leaks	-	-	-	0.34	-	-	-	-	0.08	0.08	1.59
816	NO. 2 FEED PREP. UNIT	Equipment_Leaks	-	-	-	0.58	-	-	-	-	0.13	0.13	2.74
817	No 3 Crude Unit	Equipment_Leaks	-	-	-	0.47	-	-	-	-	0.10	0.10	2.20
821	COKE STORAGE PILE	Fugitive_Dust	-	-	-	-	-	-	-	-	-	-	-
825	DEA System for H2S Recovery	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
834	NO. 50 CRUDE UNIT BLOWDOWN DRUM	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
851	Ammonia Recovery Unit	Equipment_Leaks	-	-	-	0.03	-	-	32.38	-	0.01	32.38	32.50
853	FCCU Feed Surge Drum	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
856	Spare DEA Stripper	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
901	FCCU CO Boiler	Stationary_Combustion	13.57	7.99	7.04	0.14	2.52	2.52	195,557.10	2.18	10.89	195,570.17	196,460.81
902	CAT.CRACKER STARTUP HEATER (STARTUP USE ONLY)	Stationary_Combustion	-	-	-	0.00	0.00	0.00	10.50	0.00	0.00	10.50	10.55
904	No. 6 Boilerhouse	Stationary_Combustion	31.84	29.99	1.93	7.16	36.05	36.05	152,302.40	1.67	8.37	152,312.44	152,995.59
908	No. 3 Crude Heater	Stationary_Combustion	4.46	13.16	0.38	0.36	4.42	4.42	62,987.28	0.70	3.50	62,991.48	63,277.72
909	No. 1 Feed Prep Heater (F9)	Stationary_Combustion	27.24	5.18	0.41	0.15	1.69	1.69	24,129.89	0.27	1.34	24,131.49	24,240.97
912	No. 1 Feed Prep Heater (F12)	Stationary_Combustion	7.39	7.45	8.69	0.93	2.46	2.46	35,069.99	0.39	1.95	35,072.33	35,231.70
913	No. 2 Feed Prep Heater (F13)	Stationary_Combustion	2.81	2.78	0.62	0.02	0.86	0.86	13,607.12	0.15	0.76	13,608.03	13,669.87
915	Platformer Intermediate Heater (F15)	Stationary_Combustion	2.24	0.46	0.22	0.11	0.15	0.15	2,294.75	0.03	0.13	2,294.90	2,305.19
916	No. 1 HDS Heater (F16)	Stationary_Combustion	7.52	2.40	0.25	0.04	0.76	0.76	11,645.47	0.13	0.65	11,646.25	11,699.16
917	No. 1 HDS Prefract Reboiler (F17)	Stationary_Combustion	2.27	0.83	0.36	0.19	0.26	0.26	3,997.02	0.04	0.22	3,997.29	4,015.45
921	No. 2 HDS Heater (F21)	Stationary_Combustion	-	-	-	-	-	-	809.07	0.01	0.05	809.12	812.81
922	No. 5 Gas Plant Debutanizer Reboiler	Stationary_Combustion	12.15	5.68	2.04	10.09	1.84	1.84	28,030.26	0.31	1.56	28,032.13	28,159.47
926	No. 2 Reformer Splitter Reboiler (F26)	Stationary_Combustion	3.39	2.88	14.22	1.67	0.93	0.93	17,030.79	0.19	0.94	17,031.93	17,109.07
935	Hydrocracker Splitter Reboiler (F35)	Stationary_Combustion	11.31	5.22	1.23	0.12	1.71	1.71	34,839.48	0.39	1.94	34,841.81	35,000.34
950	No. 50 Unit Crude Feed Heater (F50)	Stationary_Combustion	11.15	23.15	0.91	0.45	7.49	7.49	115,724.21	1.29	6.44	115,731.94	116,258.53
951	No. 2 Reformer Aux Reheater (F51)	Stationary_Combustion	-	-	-	-	-	-	-	-	-	-	-
955	NO. 4 GAS PLANT COMPRESSOR NO. 4064	Stationary_Combustion	0.65	0.04	43.30	2.94	0.27	0.27	2,818.07	0.01	0.05	2,818.13	2,820.84
956	NO. 4 GAS PLANT COMPRESSOR NO. 4065	Stationary_Combustion	1.12	0.04	38.23	2.91	0.25	0.25	2,604.89	0.00	0.05	2,604.94	2,607.44
957	NO. 4 GAS PLANT COMPRESSOR NO. 4066	Stationary_Combustion	0.60	0.04	41.94	2.59	0.22	0.22	2,310.79	0.00	0.04	2,310.83	2,313.05
958	NO. 4 GAS PLANT COMPRESSOR NO. 4067	Stationary_Combustion	1.17	0.04	36.10	2.24	0.23	0.23	2,483.35	0.00	0.05	2,483.40	2,485.79
959	NO. 4 GAS PLANT COMPRESSOR NO. 4068	Stationary_Combustion	0.64	0.04	40.85	3.14	0.27	0.27	2,806.53	0.01	0.05	2,806.59	2,809.29
960	NO. 4 GAS PLANT COMPRESSOR NO. 4096	Stationary_Combustion	0.98	0.03	25.48	1.93	0.16	0.16	1,703.01	0.00	0.03	1,703.04	1,704.68
971	No. 3 Reformer Feed Preheater (F53)	Stationary_Combustion	9.01	1.11	2.34	0.24	0.56	0.56	67,063.73	0.13	1.27	67,065.12	67,129.57
972	No. 3 Reformer Debutanizer Reboiler (F54)	Stationary_Combustion	1.32	0.16	0.32	0.05	0.12	0.12	10,551.66	0.02	0.20	10,551.88	10,562.02
974	No. 3 HDS Fractionator Feed Heater (F56)	Stationary_Combustion	1.00	3.73	0.10	0.05	1.19	1.19	17,814.71	0.20	0.99	17,815.90	17,896.80
975	NO. 4 GAS PLANT COOLING TOWER	Cooling_Towers	-	-	-	3.83	32.62	31.19	-	-	-	-	-
977	NO. 3 CRUDE UNIT COOLING TOWER	Cooling_Towers	-	-	-	0.69	9.68	8.71	-	-	-	-	-
979	NO. 2 FEED PREP. COOLING TOWER	Cooling_Towers	-	-	-	0.76	3.29	3.13	-	-	-	-	-
983	ALKY AND NO. 2 REFORMER COOLING TOWER	Cooling_Towers	-	-	-	4.52	25.09	24.12	-	-	-	-	-
987	NO. 50 UNIT COOLING TOWER	Cooling_Towers	-	-	-	1.02	11.58	11.19	-	-	-	-	-
988	#3 REFORM COOLING TOWER	Cooling_Towers	-	-	-	0.51	4.36	4.22	-	-	-	-	-
990	HC Separator Tank #749	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
1001	No 50 Crude Unit	Equipment_Leaks	-	-	-	1.92	-	-	-	-	0.43	0.43	9.07
1004	NO. 2 CAT. REFORMER	Catalytic_Reforming_Unit	-	-	-	-	-	-	-	-	-	-	-
1006	NO. 1 HDA Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	1.49	-	-	-	-	0.33	0.33	7.00
1020	#3 UOP REFORMER	Catalytic_Reforming_Unit	-	-	-	0.68	-	-	98.31	0.00	0.00	98.31	98.55
1038	Benzene Saturation/Pentane-Hexane Isomerization	Equipment_Leaks	-	-	-	0.15	-	-	-	-	0.03	0.03	0.69
1040	Butadiene Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
1105	No. 4 HDS Unit	Equipment_Leaks	-	-	-	1.56	-	-	-	-	0.35	0.35	7.36
1106	FU72, No. 4 HDS Reactor Feed Heater	Stationary_Combustion	0.18	0.11	0.46	0.05	0.24	0.24	7,065.42	0.01	0.13	7,065.57	7,072.36
1401	SRU (3-Stage)	Sulfur_Recovery_Unit	2.00	30.04	112.01	1.05	-	-	6,980.87	-	-	6,980.87	6,980.87
1401c	SRU (3-Stage)	Stationary_Combustion	0.89	-	0.75	0.05	0.07	0.07	291.66	0.00	0.01	291.67	291.95
1404	SULFUR STORAGE TANK	Fixed_Roof_Tank	-	1.23	-	-	-	-	-	-	-	-	-
1405	SULFUR COLLECTION PIT	Sulfur_Recovery_Unit	-	-	-	-	-	-	-	-	-	-	-
1418	Diethanolamine Storage Tank #750	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
1422	Tank 782 Ammonia Recovery Unit Feed Tank	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
1470	F-71, Vacuum Tower Feed Heater	Stationary_Combustion	0.70	0.17	0.06	0.06	0.73	0.73	10,334.84	0.02	0.20	10,335.06	10,344.99
1484	Oil Water Separator; Pressure Vessel	Wastewater	-	-	-	-	-	-	-	-	-	-	-
1510	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Delayed_Coker	-	-	-	4.04	0.01	0.00	-	-	4.28	4.28	89.95
1513	Coke Screen/Crusher	Fugitive_Dust	-	-	-	-	9.16	7.11	-	-	-	-	-
1514	Coke Silo #1	Fugitive_Dust	-	-	-	-	1.66	1.34	-	-	-	-	-
1515	Coke Silo #2	Fugitive_Dust	-	-	-	-	1.66	1.34	-	-	-	-	-
1516	Coker Truck Loadout	Fugitive_Dust	-	-	-	-	2.03	1.56	-	-	-	-	-
1555	Reformate Splitter	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table A.1-1a Pre-Project Criteria Pollutant Emission Summary (Affected Units) [tpy]

Device ID	Description	Source Category	NO_X	SO_2	CO	POC	PM_{10}	$PM_{2.5}$	CO_2	N_2O	CH_4	GHG (mass)	GHG (CO2e)
			Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)	Emissions (metric tons)
1571	SRU Sulfur Loading Dock	Loading_Operations	-	0.00	-	-	0.01	0.01	-	-	-	-	-
A001	Cat Cracker (A001)	Equipment_Leaks	-	-	-	1.22	-	-	-	-	-	-	-
A002	Fluid Coker (A002)	Equipment_Leaks	-	-	-	0.01	-	-	-	-	-	-	-
A006	No. 2 Reformer (A006)	Equipment_Leaks	-	-	-	0.97	-	-	-	-	-	-	-
A007	No.4 Gas Plant (A007)	Equipment_Leaks	-	-	-	1.34	-	-	-	-	-	-	-
A011	No.1 Feed Prep (A011)	Equipment_Leaks	-	-	-	1.27	-	-	-	-	-	-	-
A013	No.2 Feed Prep (A013)	Equipment_Leaks	-	-	-	0.93	-	-	-	-	-	-	-
A014	Cracking Plat. DEA (A014)	Equipment_Leaks	-	-	-	0.49	-	-	-	-	-	-	-
A016	Unit No. 50 (A016)	Equipment_Leaks	-	-	-	2.76	-	-	-	-	-	-	-
A031	Boiler House No. 6 (A031)	Equipment_Leaks	-	-	-	0.27	-	-	-	-	-	-	-
A044	FCCU #7 Boiler (A044)	Equipment_Leaks	-	-	-	0.25	-	-	-	-	-	-	-
A048	No. 3 Crude (A048)	Equipment_Leaks	-	-	-	0.73	-	-	-	-	-	-	-
A075	No. 3 Reformer (A075)	Equipment_Leaks	-	-	-	1.38	-	-	-	-	-	-	-
A078	Chemical Plant "Scot" (A078)	Equipment_Leaks	-	-	-	1.33	-	-	-	-	-	-	-
A080	Chemical Plant "Ammonia" (A080)	Equipment_Leaks	-	-	-	0.47	-	-	-	-	-	-	-
A081	Chemical Plant "Sulfur" (A081)	Equipment_Leaks	-	-	-	1.35	-	-	-	-	-	-	-
A083	Chemical Plant "DEA" (A083)	Equipment_Leaks	-	-	-	3.49	-	-	-	-	-	-	-
A090	M.T.B.E (A090)	Equipment_Leaks	-	-	-	0.56	-	-	-	-	-	-	-
A091	Benzene Saturation (A091)	Equipment_Leaks	-	-	-	0.46	-	-	-	-	-	-	-
A092	HDS Plant No. 4 (A092)	Equipment_Leaks	-	-	-	2.09	-	-	-	-	-	-	-
1560fug	Avon Wharf (A015)	Equipment_Leaks	-	-	-	1.59	-	-	-	-	-	-	-
50024	No.1 Gas Plant (A034)	Equipment_Leaks	-	-	-	0.22	-	-	-	-	-	-	-
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks	-	-	-	0.67	-	-	-	-	-	-	-
55fug	Amorco Wharf (A026)	Equipment_Leaks	-	-	-	0.98	-	-	-	-	-	-	-
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks	-	-	-	-	-	-	-	-	18.37	18.37	385.81

Table A.1-1b Pre-Project Criteria Pollutant Emission Summary (Affected Units) [lb/day]

Device ID	Description	Source Category	NO_X Emissions (lb/day)	SO_2 Emissions (lb/day)	CO Emissions (lb/day)	POC Emissions (lb/day)	PM_{10} Emissions (lb/day)	$PM_{2.5}$ Emissions (lb/day)	CO_2 Emissions (lb/day)	N_2O Emissions (lb/day)	CH_4 Emissions (lb/day)	GHG (mass) Emissions (lb/day)	GHG (CO2e) Emissions (lb/day)
	Facility ID: 14628												
115	RAILROAD TANK CAR LOADING RACK NORTH OF WATER	Loading_Operations				0.92							
323	TANK A-323	Fixed_Roof_Tank				232.16							
432	Tank A-432	Fixed_Roof_Tank				2,295.14							
517	TANK A-517	Fixed_Roof_Tank				2,443.02							
601	TANK A-601	Internal_Floating_Roof_Tank				9.34							
620	TANK A-620	Fixed_Roof_Tank				1,009.91							
621	Tamk A-621	External_Floating_Roof_Tank				13.52							
622	Tank A-622	Fixed_Roof_Tank				440.42							
650	Tank A-650 - Sour Water	External_Floating_Roof_Tank				11.23							
651	Tank 651	External_Floating_Roof_Tank				6.93							
656	Foul Water Stripper Charge Tank #846	Fixed_Roof_Tank				0.17							
658	Foul Water Stripper Charge Tank #847	Fixed_Roof_Tank				0.23							
692	TANK A-692	External_Floating_Roof_Tank				37.20							
699	Tank A-699, White, API Separator Recovered Oil, A-14	Fixed_Roof_Tank				2.56							
700	Tank 2-A-700, Light grey, API Separator Sludge	Fixed_Roof_Tank				37.70							
711	TANK 80-A-711	External_Floating_Roof_Tank				22.16							
819	API OIL WATER SEPARATOR	Wastewater				0.03							
830	WATER TREATMENT SURGE PONDS	Wastewater				77.93							
831	BIO-OXIDATION POND	Wastewater				5.19							
842	WASTEWATER TREATMENT PLANT	Wastewater				0.82							
1026	DAF Air Stripper	Wastewater				10.66							
850	No 3 HDS Unit	Equipment_Leaks				33.25							
872	Tank A-872, New External Floating Roof Tank for LSVGO	External_Floating_Roof_Tank				15.47							
873	Tank A-895, Fixed Roof Tank for Fuel Oil	Fixed_Roof_Tank				609.66							
919	No. 2 HDS Heater (F19)	Stationary_Combustion	194.47	71.46	361.64	28.83	19.85	19.85	364,122.77	4.13	20.66	364,147.56	365,837.70
920	No. 2 HDS Charge Heater (F20)	Stationary_Combustion	110.38	40.56	205.25	16.37	11.27	11.27	206,664.27	2.35	11.73	206,678.35	207,637.61
928	HDN Reactor A Heater (F28)	Stationary_Combustion	76.80	12.87	0.75	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
929	HDN Reactor B Heater (F29)	Stationary_Combustion	76.80	12.87	0.71	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
930	HDN Reactor C Heater (F30)	Stationary_Combustion	76.80	12.87	0.75	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
931	Hydrocracker Reactor 1 Heater (F31)	Stationary_Combustion	76.80	12.87	0.67	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
932	Hydrocracker Reactor 2 Heater (F32)	Stationary_Combustion	76.80	12.87	0.92	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
933	Hydrocracker Reactor 3 Heater (F33)	Stationary_Combustion	76.80	12.87	0.85	2.59	3.58	3.58	65,607.71	0.74	3.72	65,612.17	65,916.70
934	Hydrocracker Stabilizer Reboiler (F34)	Stationary_Combustion	236.52	86.91	2.59	0.82	24.14	24.14	442,852.01	5.03	25.13	442,882.17	444,937.74
937	Hydrogen Plant Heater (F37)	Stationary_Combustion	1,301.74	478.30	2,420.70	13.48	132.87	132.87	2,437,326.26	27.66	138.30	2,437,492.23	2,448,805.49
973	No. 3 HDS Recycle Gas Heater (F55)	Stationary_Combustion	144.65	79.18	2.31	0.49	22.00	22.00	403,487.39	4.58	22.90	403,514.86	405,387.72
1002	No 1 HDS Unit	Equipment_Leaks				29.36							
1003	NO. 2 HDS UNIT	Equipment_Leaks				31.14							
1005	No.1 HYDROGEN PLANT	Hydrogen_Plant				45.63			2,254,081.64			2,254,081.64	2,254,081.64
1007	Hydrocracker Unit	Equipment_Leaks				36.91							
1008	HDN UNIT	Equipment_Leaks				10.98							
1025	Truck/Rail Bulk Plant,	Loading_Operations				627.58							
1463	Tank 867; New 240,000 BBL Tank in Tract 4	External_Floating_Roof_Tank				77.90							
1464	Tank 868; New 100,000 BBL Tank in Tract 6	External_Floating_Roof_Tank				10.01							
1465	Tank 869; New 100,000 BBL Tank in Tract 6 (Tank A-869)	External_Floating_Roof_Tank				10.01							
1496	Fixed Roof Tank A-876	Fixed_Roof_Tank				363.02							
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks				54.15							
1511	Delayed Coker Heater #1 F78	Stationary_Combustion	46.92	31.99	143.52	0.48	41.13	41.13	611,387.55	1.22	12.21	611,400.97	612,022.23
1512	Delayed Coker Heater #2 F79	Stationary_Combustion	46.92	31.99	143.52	0.69	41.13	41.13	610,500.17	1.22	12.21	610,513.60	611,134.85
1526	No.5 Gas Plant	Equipment_Leaks				51.86							
1554	Tank A-943	Fixed_Roof_Tank				38.14							
1560	Avon Wharf Berth 1A	Loading_Operations				317.28							
A905	Source Not Listed on District Permit	Fixed_Roof_Tank				181.77							
2028	Source Not Listed on District Permit	Fixed_Roof_Tank				208.75							
A933	Source Not Listed on District Permit	Fixed_Roof_Tank				282.87							
656-658	Foul Water	Equipment_Leaks				10.09							
1560fug	Avon Wharf (A015)	Equipment_Leaks				12.51							
50024	No.1 Gas Plant (A034)	Equipment_Leaks				6.81							
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks				19.32							
55fug	Amorco Wharf (A026)	Equipment_Leaks				2.27							
97	CATALYST FINES HOPPER WITH ZURN IND #310A BLOWER	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
98	EAST CATALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
99	WEST CAYALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-	-
515	Tank A-515	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
516	Tank A-516	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
554	TANK A-554	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
572	TANK A-572	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
585	TANK A-585	Fixed_Roof_Tank	-	-	-	4.76	-	-	-	-	-	-	-
590	DEA Flash Drum, V010	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
598	TANK A-598	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
599	Tank A-599	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-

Table A.1-1b Pre-Project Criteria Pollutant Emission Summary (Affected Units) [lb/day]

Device ID	Description	Source Category	NO_X Emissions (lb/day)	SO_2 Emissions (lb/day)	CO Emissions (lb/day)	POC Emissions (lb/day)	PM_{10} Emissions (lb/day)	$PM_{2.5}$ Emissions (lb/day)	CO_2 Emissions (lb/day)	N_2O Emissions (lb/day)	CH_4 Emissions (lb/day)	GHG (mass) Emissions (lb/day)	GHG (CO2e) Emissions (lb/day)
606	WASTEWATER AIR STRIPPER A FOR NO. 50 UNIT	Wastewater	-	22.54	-	0.24	-	-	-	-	-	-	-
607	WASTEWATER AIR STRIPPER B FOR NO. 50 UNIT	Wastewater	-	22.54	-	0.24	-	-	-	-	-	-	-
618	Tank A-618	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
638	TANK A-638	External_Floating_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
639	Tank A-639	External_Floating_Roof_Tank	-	-	-	7.96	-	-	-	-	-	-	-
640	TANK A-640	External_Floating_Roof_Tank	-	-	-	4.72	-	-	-	-	-	-	-
641	TANK A-641	External_Floating_Roof_Tank	-	-	-	5.12	-	-	-	-	-	-	-
714	Spent Acid at Alkylation Unit	Fixed_Roof_Tank	-	-	-	2.73	-	-	-	-	-	-	-
771	DEA TANK 2-A-713	External_Floating_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
795	No. 3 Reformer Chloriding Agent Perchloroethylene Tank	Fixed_Roof_Tank	-	-	-	0.09	-	-	-	-	-	-	-
802	FCCU	Fluid_Catalytic_Cracking_Unit	929.90	551.07	1,272.23	9.64	288.21	288.21	2,745,211.04	16.08	80.40	2,745,307.52	2,751,884.13
802TorchOi	FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	0.06	11.81	11.81	2,253.26	0.02	0.10	2,253.38	2,261.22
815	NO. 1 FEED PREP. UNIT	Equipment_Leaks	-	-	-	1.84	-	-	-	-	0.46	0.46	9.59
816	NO. 2 FEED PREP. UNIT	Equipment_Leaks	-	-	-	3.19	-	-	-	-	0.79	0.79	16.54
817	No 3 Crude Unit	Equipment_Leaks	-	-	-	2.56	-	-	-	-	0.63	0.63	13.28
821	COKE STORAGE PILE	Fugitive_Dust	-	-	-	-	-	-	-	-	-	-	-
825	DEA System for H2S Recovery	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
834	NO. 50 CRUDE UNIT BLOWDOWN DRUM	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
851	Ammonia Recovery Unit	Equipment_Leaks	-	-	-	0.14	-	-	195.56	-	0.03	195.59	196.28
853	FCCU Feed Surge Drum	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
856	Spare DEA Stripper	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
901	FCCU CO Boiler	Stationary_Combustion	74.34	43.81	38.56	0.75	13.83	13.83	1,181,176.99	13.15	65.79	1,181,255.94	1,186,635.44
902	CAT.CRACKER STARTUP HEATER (STARTUP USE ONLY)	Stationary_Combustion	-	-	-	0.00	0.00	0.00	63.43	0.00	0.00	63.43	63.69
904	No. 6 Boilerhouse	Stationary_Combustion	174.46	164.34	10.58	39.22	197.52	197.52	919,915.92	10.08	50.58	919,976.58	924,102.83
908	No. 3 Crude Heater	Stationary_Combustion	24.43	72.12	2.05	1.98	24.23	24.23	380,447.06	4.23	21.15	380,472.43	382,201.36
909	No. 1 Feed Prep Heater (F9)	Stationary_Combustion	149.24	28.39	2.22	0.83	9.27	9.27	145,746.01	1.62	8.09	145,755.72	146,416.97
912	No. 1 Feed Prep Heater (F12)	Stationary_Combustion	40.52	40.82	47.60	5.12	13.50	13.50	211,824.91	2.35	11.77	211,839.04	212,801.65
913	No. 2 Feed Prep Heater (F13)	Stationary_Combustion	15.42	15.22	3.39	0.10	4.71	4.71	82,187.87	0.91	4.57	82,193.36	82,566.87
915	Platformer Intermediate Heater (F15)	Stationary_Combustion	12.29	2.53	1.19	0.59	0.82	0.82	13,860.42	0.15	0.76	13,861.33	13,923.50
916	No. 1 HDS Heater (F16)	Stationary_Combustion	41.22	13.15	1.36	0.24	4.19	4.19	70,339.39	0.78	3.91	70,344.08	70,663.67
917	No. 1 HDS Prefract Reboiler (F17)	Stationary_Combustion	12.46	4.53	2.00	1.04	1.44	1.44	24,142.26	0.27	1.34	24,143.87	24,253.58
921	No. 2 HDS Heater (F21)	Stationary_Combustion	-	-	-	-	-	-	4,886.82	0.05	0.27	4,887.15	4,909.44
922	No. 5 Gas Plant Debutanizer Reboiler	Stationary_Combustion	66.59	31.15	11.19	55.27	10.09	10.09	169,304.54	1.88	9.41	169,315.82	170,084.92
926	No. 2 Reformer Splitter Reboiler (F26)	Stationary_Combustion	18.58	15.80	77.93	9.17	5.08	5.08	102,867.05	1.14	5.70	102,873.89	103,339.83
935	Hydrocracker Splitter Reboiler (F35)	Stationary_Combustion	61.98	28.61	6.74	0.65	9.35	9.35	210,432.61	2.34	11.71	210,446.67	211,404.22
950	No. 50 Unit Crude Feed Heater (F50)	Stationary_Combustion	61.09	126.85	5.00	2.46	41.03	41.03	698,981.41	7.78	38.90	699,028.09	702,208.70
951	No. 2 Reformer Aux Reheater (F51)	Stationary_Combustion	-	-	-	-	-	-	-	-	-	-	-
955	NO. 4 GAS PLANT COMPRESSOR NO. 4064	Stationary_Combustion	3.59	0.25	237.26	16.12	1.46	1.46	17,021.33	0.03	0.32	17,021.68	17,038.04
956	NO. 4 GAS PLANT COMPRESSOR NO. 4065	Stationary_Combustion	6.16	0.23	209.47	15.96	1.35	1.35	15,733.68	0.03	0.30	15,734.00	15,749.12
957	NO. 4 GAS PLANT COMPRESSOR NO. 4066	Stationary_Combustion	3.28	0.21	229.82	14.19	1.20	1.20	13,957.29	0.03	0.26	13,957.58	13,970.99
958	NO. 4 GAS PLANT COMPRESSOR NO. 4067	Stationary_Combustion	6.41	0.23	197.79	12.29	1.29	1.29	14,999.60	0.03	0.28	14,999.91	15,014.32
959	NO. 4 GAS PLANT COMPRESSOR NO. 4068	Stationary_Combustion	3.48	0.24	223.84	17.20	1.46	1.46	16,951.63	0.03	0.32	16,951.98	16,968.27
960	NO. 4 GAS PLANT COMPRESSOR NO. 4096	Stationary_Combustion	5.37	0.18	139.60	10.59	0.90	0.90	10,286.28	0.02	0.19	10,286.50	10,296.38
971	No. 3 Reformer Feed Preheater (F53)	Stationary_Combustion	49.36	6.09	12.83	1.29	3.06	3.06	405,069.07	0.76	7.65	405,077.49	405,466.76
972	No. 3 Reformer Debutanizer Reboiler (F54)	Stationary_Combustion	7.23	0.87	1.75	0.28	0.64	0.64	63,732.69	0.12	1.20	63,734.01	63,795.26
974	No. 3 HDS Fractionator Feed Heater (F56)	Stationary_Combustion	5.49	20.43	0.56	0.27	6.53	6.53	107,601.95	1.19	5.98	107,609.12	108,097.79
975	NO. 4 GAS PLANT COOLING TOWER	Cooling_Towers	-	-	-	20.99	178.72	170.90	-	-	-	-	-
977	NO. 3 CRUDE UNIT COOLING TOWER	Cooling_Towers	-	-	-	3.80	53.02	47.74	-	-	-	-	-
979	NO. 2 FEED PREP. COOLING TOWER	Cooling_Towers	-	-	-	4.16	18.03	17.17	-	-	-	-	-
983	ALKY AND NO. 2 REFORMER COOLING TOWER	Cooling_Towers	-	-	-	24.78	137.49	132.16	-	-	-	-	-
987	NO. 50 UNIT COOLING TOWER	Cooling_Towers	-	-	-	5.60	63.46	61.34	-	-	-	-	-
988	#3 REFORM COOLING TOWER	Cooling_Towers	-	-	-	2.79	23.87	23.13	-	-	-	-	-
990	HC Separator Tank #749	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
1001	No 50 Crude Unit	Equipment_Leaks	-	-	-	10.55	-	-	-	-	2.61	2.61	54.80
1004	NO. 2 CAT. REFORMER	Catalytic_Reforming_Unit	-	-	-	-	-	-	-	-	-	-	-
1006	NO. 1 HDA Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	8.15	-	-	-	-	2.01	2.01	42.28
1020	#3 UOP REFORMER	Catalytic_Reforming_Unit	-	-	-	3.73	-	-	593.81	0.00	0.02	593.83	595.25
1038	Benzene Saturation/Pentane-Hexane Isomerization	Equipment_Leaks	-	-	-	0.80	-	-	-	-	0.20	0.20	4.14
1040	Butadiene Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
1105	No. 4 HDS Unit	Equipment_Leaks	-	-	-	8.57	-	-	-	-	2.12	2.12	44.48
1106	FU72, No. 4 HDS Reactor Feed Heater	Stationary_Combustion	0.96	0.60	2.50	0.27	1.33	1.33	42,675.60	0.08	0.81	42,676.48	42,717.48
1401	SRU (3-Stage)	Sulfur_Recovery_Unit	10.94	164.62	613.77	5.76	-	-	42,164.89	-	-	42,164.89	42,164.89
1401c	SRU (3-Stage)	Stationary_Combustion	4.88	-	4.10	0.27	0.37	0.37	1,761.67	0.00	0.03	1,761.71	1,763.40
1404	SULFUR STORAGE TANK	Fixed_Roof_Tank	-	6.74	-	-	-	-	-	-	-	-	-
1405	SULFUR COLLECTION PIT	Sulfur_Recovery_Unit	-	-	-	-	-	-	-	-	-	-	-
1418	Diethanolamine Storage Tank #750	Fixed_Roof_Tank	-	-	-	0.00	-	-	-	-	-	-	-
1422	Tank 782 Ammonia Recovery Unit Feed Tank	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-	-
1470	F-71, Vacuum Tower Feed Heater	Stationary_Combustion	3.81	0.95	0.30	0.33	3.99	3.99	62,423.10	0.12	1.18	62,424.40	62,484.38
1484	Oil Water Separator; Pressure Vessel	Wastewater	-	-	-	-	-	-	-	-	-	-	-
1510	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Delayed_Coker	-	-	-	22.16	0.04	0.01	-	-	25.87	25.87	543.30
1513	Coke Screen/Crusher	Fugitive_Dust	-	-	-	-	50.18	38.98	-	-	-	-	-

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table A.1-1b Pre-Project Criteria Pollutant Emission Summary (Affected Units) [lb/day]

Device ID	Description	Source Category	NO_X Emissions (lb/day)	SO_2 Emissions (lb/day)	CO Emissions (lb/day)	POC Emissions (lb/day)	PM_{10} Emissions (lb/day)	$PM_{2.5}$ Emissions (lb/day)	CO_2 Emissions (lb/day)	N_2O Emissions (lb/day)	CH_4 Emissions (lb/day)	GHG (mass) Emissions (lb/day)	GHG (CO2e) Emissions (lb/day)
1514	Coke Silo #1	Fugitive_Dust	-	-	-	-	9.08	7.36	-	-	-	-	-
1515	Coke Silo #2	Fugitive_Dust	-	-	-	-	9.08	7.36	-	-	-	-	-
1516	Coker Truck Loadout	Fugitive_Dust	-	-	-	-	11.14	8.57	-	-	-	-	-
1555	Reformate Splitter	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-	-
1571	SRU Sulfur Loading Dock	Loading_Operations	-	0.00	-	-	0.04	0.04	-	-	-	-	-
A001	Cat Cracker (A001)	Equipment_Leaks	-	-	-	6.67	-	-	-	-	-	-	-
A002	Fluid Coker (A002)	Equipment_Leaks	-	-	-	0.05	-	-	-	-	-	-	-
A006	No. 2 Reformer (A006)	Equipment_Leaks	-	-	-	5.33	-	-	-	-	-	-	-
A007	No.4 Gas Plant (A007)	Equipment_Leaks	-	-	-	7.37	-	-	-	-	-	-	-
A011	No.1 Feed Prep (A011)	Equipment_Leaks	-	-	-	6.95	-	-	-	-	-	-	-
A013	No.2 Feed Prep (A013)	Equipment_Leaks	-	-	-	5.12	-	-	-	-	-	-	-
A014	Cracking Plat. DEA (A014)	Equipment_Leaks	-	-	-	2.66	-	-	-	-	-	-	-
A016	Unit No. 50 (A016)	Equipment_Leaks	-	-	-	15.10	-	-	-	-	-	-	-
A031	Boiler House No. 6 (A031)	Equipment_Leaks	-	-	-	1.50	-	-	-	-	-	-	-
A044	FCCU #7 Boiler (A044)	Equipment_Leaks	-	-	-	1.37	-	-	-	-	-	-	-
A048	No. 3 Crude (A048)	Equipment_Leaks	-	-	-	4.02	-	-	-	-	-	-	-
A075	No. 3 Reformer (A075)	Equipment_Leaks	-	-	-	7.58	-	-	-	-	-	-	-
A078	Chemical Plant "Scot" (A078)	Equipment_Leaks	-	-	-	7.28	-	-	-	-	-	-	-
A080	Chemical Plant "Ammonia" (A080)	Equipment_Leaks	-	-	-	2.57	-	-	-	-	-	-	-
A081	Chemical Plant "Sulfur" (A081)	Equipment_Leaks	-	-	-	7.38	-	-	-	-	-	-	-
A083	Chemical Plant "DEA" (A083)	Equipment_Leaks	-	-	-	19.12	-	-	-	-	-	-	-
A090	M.T.B.E (A090)	Equipment_Leaks	-	-	-	3.04	-	-	-	-	-	-	-
A091	Benzene Saturation (A091)	Equipment_Leaks	-	-	-	2.52	-	-	-	-	-	-	-
A092	HDS Plant No. 4 (A092)	Equipment_Leaks	-	-	-	11.46	-	-	-	-	-	-	-
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks	-	-	-	-	-	-	-	-	110.97	110.97	2,330.32

Table A.1-2a Post-Project Criteria Pollutant Emission Summary

S-#	Source Description	Source Category	NOX Emissions (tpy)	SO2 Emissions (tpy)	CO Emissions (tpy)	POC Emissions (tpy)	PM10 Emissions (tpy)	PM2.5 Emissions (tpy)	CO2 Emissions (MT/yr)	CO2 Emissions (tpy)	CH4 Emissions (MT/yr)	CH4 Emissions (tpy)	N2O Emissions (MT/yr)	N2O Emissions (tpy)	GHG (mass) Emissions (MT/yr)	GHG (mass) Emissions (tpy)	GHG (CO2e) Emissions (MT/yr)	GHG (CO2e) Emissions (tpy)
55	Amorco Terminal (New Wharf), Crude Oil, Diesel, Gas Oil, Naphtha, Kerosene, Fuel Oils Unloading Only	Loading_Operations				3.72			-		-		-		-		-	
115	Bulk Plant (truck/rail); Caustic waste; Railcar loading rack north of water reservoir	Loading_Operations				0.00												
323	Tank A-323, White Fuel Oil, Jet 'A', Gasoline, Alkylate Gasoline Blending Components, A14 Vapor Recovery	Storage_Tanks				0.10			-		-		-		-		-	
432	Tank A-432, Ethyl Alcohol, Distillate Oil, Gasoline, Naphtha, A14 Vapor Recovery	Storage_Tanks				13.00			-		-		-		-		-	
517	Tank A-517	Storage_Tanks				1.57			-		-		-		-		-	
601	Tank A-601	Storage_Tanks				0.41			-		-		-		-		-	
620	Tank A-620	Storage_Tanks				1.58			-		-		-		-		-	
621	Tank A-621	Storage_Tanks				1.02			-		-		-		-		-	
622	Tank A-622	Storage_Tanks				2.36			-		-		-		-		-	
650	Tank A-650	Storage_Tanks				0.02			-		-		-		-		-	
651	Tank A-651, Oil/Water Mixture	Storage_Tanks				0.21			-		-		-		-		-	
656	Tank A-846	Storage_Tanks				0.01			-		-		-		-		-	
658	Tank A-847	Storage_Tanks				0.01			-		-		-		-		-	
692	Tank A-692, White, Gasoline	Storage_Tanks				1.52			-		-		-		-		-	
699	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery	Storage_Tanks				0.01			-		-		-		-		-	
700	Tank 2-A-700, Light grey, API Separator Sludge	Storage_Tanks				0.02			-		-		-		-		-	
711	Tank 80-A-711, Green, Crude Oil, Gasoline	Storage_Tanks				1.63			-		-		-		-		-	
819	API Oil-Water, Separator/Dissolved Nitrogen Flotation System, Abated by A-39 Thermal Oxidizer or A-14 Vapor Recovery	Wastewater				0.00												
830	Wastewater Surge Ponds	Wastewater				1.98			-		-		-		-		-	
831	Bio-Oxidation Pond, Open pond	Wastewater				0.04												
842	Wastewater Treatment Plant Clarifiers, filters, and granular activated carbon	Wastewater				0.00												
850	No. 3 HDS Unit	Equipment_Leaks				4.99			-		-		-		-		-	
872	Tank A-872	Storage_Tanks				0.19												
873	Tank A-895	Storage_Tanks				1.80			-		-		-		-		-	
919	No. 2 HDS Depent Reboiler (F19), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	3.79	2.28	28.54	2.28	1.57	1.57	23,701.63	26,126.57	1.50	1.65	0.30	0.33	23,703.43	26,128.56	23,825.98	26,263.64
920	No. 2 HDS Charge Heater (F20), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	5.28	0.85	10.70	0.85	0.59	0.59	8,888.11	9,797.47	0.56	0.62	0.11	0.12	8,888.79	9,798.21	8,934.74	9,848.87
928	HDN Reactor A Heater (F28), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.92	0.31	0.04	0.15	0.21	0.21	3,209.60	3,537.97	0.30	0.33	0.06	0.07	3,209.96	3,538.37	3,234.61	3,565.55
929	HDN Reactor B Heater (F29), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.61	0.31	0.04	0.15	0.21	0.21	3,209.60	3,537.97	0.30	0.33	0.06	0.07	3,209.96	3,538.37	3,234.61	3,565.55
930	HDN Reactor C Heater (F30), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.87	0.31	0.04	0.15	0.21	0.21	3,209.60	3,537.97	0.30	0.33	0.06	0.07	3,209.96	3,538.37	3,234.61	3,565.55
931	Hydrocracker Reactor 1 Heater (F31), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	3.08	0.66	0.09	0.33	0.45	0.45	6,863.60	7,565.82	0.64	0.71	0.13	0.14	6,864.37	7,566.67	6,917.09	7,624.78
932	Hydrocracker Reactor 2 Heater (F32), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	3.05	0.66	0.09	0.33	0.45	0.45	6,863.60	7,565.82	0.64	0.71	0.13	0.14	6,864.37	7,566.67	6,917.09	7,624.78
933	Hydrocracker Reactor 3 Heater (F33), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	3.91	0.66	0.09	0.33	0.45	0.45	6,863.60	7,565.82	0.64	0.71	0.13	0.14	6,864.37	7,566.67	6,917.09	7,624.78
934	Hydrocracker Stabilizer Reboiler (F34), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	13.69	4.51	1.01	0.11	3.11	3.11	47,008.23	51,817.70	4.41	4.87	0.88	0.97	47,013.53	51,823.54	47,374.58	52,221.54
937	Hydrogen Plant Heater (F37) Refinery Fuel Gas, Natural Gas	Stationary_Combustion	55.75	21.34	15.19	1.49	14.69	14.69	222,202.77	244,936.63	9.82	10.83	1.67	1.84	222,214.26	244,949.29	222,925.60	245,733.42
973	No. 3 HDS Recycle Gas Heater (F55), Refinery Fuel Gas, Natural Gas, Abated by A-31 SCR on combined stack (P79) with S-974	Stationary_Combustion	1.08	1.87	0.11	0.03	1.29	1.29	19,504.47	21,499.99	1.12	1.24	0.22	0.25	19,505.81	21,501.48	19,597.54	21,602.59
1002	No. 1 HDS Unit	Equipment_Leaks				1.26			-		-		-		-		-	
1003	No. 2 HDS Unit	Equipment_Leaks				5.85			-		-		-		-		-	
1005	No. 1 Hydrogen Plant	Hydrogen_Plant				7.60			374,392.33	412,696.90	-	-	-	-	374,392.33	412,696.90	374,392.33	412,696.90
1007	Hydrocracker Unit [Hydrocracker 2nd Stage]	Equipment_Leaks				5.47			-		-		-		-		-	
1008	Hydrocracker Unit [Hydrocracker 1st Stage]	Equipment_Leaks				2.18			-		-		-		-		-	
1009	ALKYLATION UNIT	Equipment_Leaks				-												
1025	Bulk Plant; Bottom Loading Facilities, Gasoline, Naphtha, Kerosene, Diesel, Fuel Oil, A-14 Vapor Recovery	Loading_Operations				11.62			-		-		-		-		-	
1026	DNF Effluent Air Stripper, Abated by A-39 Thermal Oxidizer	Wastewater				0.66												
1463	Tank A-867, Silver, Crude Oil, HDS Gas Oil	Storage_Tanks				0.36			-		-		-		-		-	
1464	Tank A-868, Off-white, Diesel, Jet A, Kerosene	Storage_Tanks				0.31			-		-		-		-		-	
1465	Tank A-869, Off-white, Jet A, Diesel, Kerosene	Storage_Tanks				0.31			-		-		-		-		-	
1496	Tank A-876, Heavy reformate with pentanes, straight run heavy naphtha, A-14 Vapor Recovery	Storage_Tanks				1.34			-		-		-		-		-	
1511	Delayed Coker Heater #1 (F78), Natural Gas, Refinery Fuel Gas, Abated by A-1511 SCR	Stationary_Combustion	1.12	1.43	0.22	0.07	5.87	5.87	77,715.57	85,666.75	1.57	1.74	0.16	0.17	77,717.30	85,668.66	77,797.45	85,757.01
1512	Delayed Coker Heater #2 (F79), Natural Gas, Refinery Fuel Gas, Abated by A-1512 SCR	Stationary_Combustion	0.09	0.12	0.06	0.01	0.49	0.49	6,476.30	7,138.90	0.13	0.14	0.01	0.01	6,476.44	7,139.05	6,483.12	7,146.42
1526	No. 5 Gas Plant	Equipment_Leaks				4.35			-		-		-		-		-	
1554	Tank A-943, High Sulfur Vacuum Gas Oil (HSVGO), Vacuum Gas Oil (VGO)	Storage_Tanks				0.07			-		-		-		-		-	
1560	Avon Wharf Berth No. 1A, Marine Bulk Plant with A1560 Vapor Recovery System , Loading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil, Unloading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil	Loading_Operations				0.60			-		-		-		-		-	
2018	Sulfuric Acid Tank	Wastewater				-			-		-		-		-		-	
2019	Primary DAF Coagulant Tank	Wastewater				-			-		-		-		-		-	
2003	Primary DAF Unit A	Wastewater				0.03			-		-		-		-		-	
2004	Primary DAF Unit B	Wastewater				0.03			-		-		-		-		-	
2006	DAF Residuals Storage Tank	Wastewater				-			-		-		-		-		-	
2010	Primary DAF Effluent Tank	Wastewater				0.91			-		-		-		-		-	
2022	Urea Storage Tank	Wastewater				-			-		-		-		-		-	
2023	Primary DAF Polymer Tank	Wastewater				0.02			-		-		-		-		-	
2024	Phosphoric Acid Tank	Wastewater				-			-		-		-		-		-	
TK-796	Neutralization Tank	Wastewater				1.06												
TK-797	Neutralization Tank	Wastewater				1.06												
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks				4.95			-		-		-		-		-	
656-658	Foul Water	Equipment_Leaks				1.29			-		-		-		-		-	
1560fug	Avon Wharf (A015)	Equipment_Leaks				2.28			-		-		-		-		-	
50024	No.1 Gas Plant (A034)	Equipment_Leaks				1.24			-		-		-		-		-	
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks				3.53			-		-		-		-		-	
55fug	Amorco Wharf (A026)	Equipment_Leaks				0.41			-		-		-		-		-	
A905	Tank A-905	Storage_Tanks				2.33			-		-		-		-		-	
2028	Tank A-932	Storage_Tanks				1.74			-		-		-		-		-	
A933	Tank A-933	Storage_Tanks				2.62			-		-		-		-		-	
MTK-10162	Tank MTK-10162	Storage_Tanks				0.01			-		-		-		-		-	
2011	Tank A-981	Storage_Tanks				0.01			-		-		-		-		-	
2012	Tank A-961	Storage_Tanks				0.01			-		-		-		-		-	
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks				-					17.10	18.85			17.10	18.85	359.10	395.84
2026	Weak Acid Tank No. 1	Wastewater				0.00			-		-		-		-		-	
2025	#1 Pre-Treatment Unit	Equipment_Leaks				2.09			-		-		-		-		-	
2001	#2 Wastewater Treatment Unit	Equipment_Leaks				2.04			-		-		-		-		-	
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	Stationary_Combustion	1.82	1.71	0.25	0.05	0.06	0.06	887.08	977.84	0.02	0.02	0.00	0.00	887.10	977.86	887.95	978.80

Table A.1-2b Post-Project Criteria Pollutant Emission Summary

S-#	Source Description	Source Category	NOX Emissions (lb/day)	SO2 Emissions (lb/day)	CO Emissions (lb/day)	POC Emissions (lb/day)	PM Emissions (lb/day)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/day)	CO2 Emissions (lb/day)	CH4 Emissions (lb/day)	N2O Emissions (lb/day)	GHG (mass) Emissions (lb/day)	GHG (CO2e) Emissions (lb/day)
55	Amorco Terminal (New Wharf), Crude Oil, Diesel, Gas Oil, Naphtha, Kerosene, Fuel Oils Unloading Only	Loading_Operations				94.34								
115	Bulk Plant (truck/rail); Caustic waste; Railcar loading rack north of water reservoir	Loading_Operations				0.92								
323	Tank A-323, White Fuel Oil, Jet 'A', Gasoline, Alkylate Gasoline Blending Components, A14 Vapor Recovery	Storage_Tanks				155.99								
432	Tank A-432, Ethyl Alcohol, Distillate Oil, Gasoline, Naphtha, A14 Vapor Recovery	Storage_Tanks				85.10								
517	Tank A-517	Storage_Tanks				119.36								
601	Tank A-601	Storage_Tanks				9.34								
620	Tank A-620	Storage_Tanks				157.56								
621	Tank A-621	Storage_Tanks				6.00								
622	Tank A-622	Storage_Tanks				203.18								
650	Tank A-650	Storage_Tanks				11.23								
651	Tank A-651, Oil/Water Mixture	Storage_Tanks				6.93								
656	Tank A-846	Storage_Tanks				0.17								
658	Tank A-847	Storage_Tanks				0.23								
692	Tank A-692, White, Gasoline	Storage_Tanks				28.34								
699	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery	Storage_Tanks				2.56								
700	Tank 2-A-700, Light grey, API Separator Sludge	Storage_Tanks				37.70								
711	Tank 80-A-711, Green, Crude Oil, Gasoline	Storage_Tanks				21.56								
819	API Oil-Water, Separator/Dissolved Nitrogen Flotation System, Abated by A-39 Thermal Oxidizer or A-14 Vapor Recovery	Wastewater				0.03								
830	Wastewater Surge Ponds	Wastewater				77.93								
831	Bio-Oxidation Pond, Open pond	Wastewater				5.19								
842	Wastewater Treatment Plant Clarifiers, filters, and granular activated carbon	Wastewater				0.82								
850	No. 3 HDS Unit	Equipment_Leaks				27.35								
872	Tank A-872	Storage_Tanks				14.01								
873	Tank A-895	Storage_Tanks				143.24								
919	No. 2 HDS Depent Reboiler (F19), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	194.47	70.20	361.64	28.83	4.96	19.85	19.85	369,751.20	20.66	4.13	369,775.99	371,466.13
920	No. 2 HDS Charge Heater (F20), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	110.38	39.84	205.25	16.37	2.82	11.27	11.27	209,858.79	11.73	2.35	209,872.86	210,832.13
928	HDN Reactor A Heater (F28), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.75	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
929	HDN Reactor B Heater (F29), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.71	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
930	HDN Reactor C Heater (F30), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.75	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
931	Hydrocracker Reactor 1 Heater (F31), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.67	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
932	Hydrocracker Reactor 2 Heater (F32), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.92	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
933	Hydrocracker Reactor 3 Heater (F33), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	76.80	12.65	0.85	2.59	0.89	3.58	3.58	66,621.84	3.72	0.74	66,626.30	66,930.83
934	Hydrocracker Stabilizer Reboiler (F34), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	236.52	85.38	2.59	0.82	6.04	24.14	24.14	449,697.40	25.13	5.03	449,727.56	451,783.13
937	Hydrogen Plant Heater (F37) Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1,301.74	469.90	2,420.70	13.48	33.22	132.87	132.87	2,475,001.25	138.30	27.66	2,475,167.21	2,486,480.47
973	No. 3 HDS Recycle Gas Heater (F55), Refinery Fuel Gas, Natural Gas, Abated by A-31 SCR on combined stack (P79) with S-974	Stationary_Combustion	144.65	77.79	2.31	0.49	5.50	22.00	22.00	409,724.30	22.90	4.58	409,751.77	411,624.63
1002	No. 1 HDS Unit	Equipment_Leaks				6.89								
1003	No. 2 HDS Unit	Equipment_Leaks				32.08								
1005	No. 1 Hydrogen Plant	Hydrogen_Plant	-	-	-	45.63	-	-	-	2,261,352.87	-	-	2,261,352.87	2,261,352.87
1007	Hydrocracker Unit [Hydrocracker 2nd Stage]	Equipment_Leaks				29.99								
1008	Hydrocracker Unit [Hydrocracker 1st Stage]	Equipment_Leaks				11.97								
1009	ALKYLATION UNIT	Equipment_Leaks				-								
1025	Bulk Plant; Bottom Loading Facilities, Gasoline, Naphtha, Kerosene, Diesel, Fuel Oil, A-14 Vapor Recovery	Loading_Operations				627.58								
1026	DNF Effluent Air Stripper, Abated by A-39 Thermal Oxidizer	Wastewater				10.66								
1463	Tank A-867, Silver, Crude Oil, HDS Gas Oil	Storage_Tanks				17.87								
1464	Tank A-868, Off-white, Diesel, Jet A, Kerosene	Storage_Tanks				5.06								
1465	Tank A-869, Off-white, Jet A, Diesel, Kerosene	Storage_Tanks				5.06								
1496	Tank A-876, Heavy reformate with pentanes, straight run heavy naphtha, A-14 Vapor Recovery	Storage_Tanks				7.34								
1511	Delayed Coker Heater #1 (F78), Natural Gas, Refinery Fuel Gas, Abated by A-1511 SCR	Stationary_Combustion	46.92	31.99	143.52	0.48	10.28	41.13	41.13	611,387.55	12.21	1.22	611,400.97	612,022.23
1512	Delayed Coker Heater #2 (F79), Natural Gas, Refinery Fuel Gas, Abated by A-1512 SCR	Stationary_Combustion	46.92	31.99	143.52	0.69	10.28	41.13	41.13	610,500.17	12.21	1.22	610,513.60	611,134.85
1526	No. 5 Gas Plant	Equipment_Leaks				23.81								
1554	Tank A-943, High Sulfur Vacuum Gas Oil (HSVGO), Vacuum Gas Oil (VGO)	Storage_Tanks				5.97								
1560	Avon Wharf Berth No. 1A, Marine Bulk Plant with A1560 Vapor Recovery System , Loading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil, Unloading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil	Loading_Operations				481.83								
2018	Sulfuric Acid Tank	Wastewater				-								
2019	Primary DAF Coagulant Tank	Wastewater				-								
2003	Primary DAF Unit A	Wastewater				0.17								
2004	Primary DAF Unit B	Wastewater				0.17								
2006	DAF Residuals Storage Tank	Wastewater				-								
2010	Primary DAF Effluent Tank	Wastewater				6.67								
2022	Urea Storage Tank	Wastewater				-								

Table A.1-2b Post-Project Criteria Pollutant Emission Summary

S-#	Source Description	Source Category	NOX Emissions (lb/day)	SO2 Emissions (lb/day)	CO Emissions (lb/day)	POC Emissions (lb/day)	PM Emissions (lb/day)	PM10 Emissions (lb/day)	PM2.5 Emissions (lb/day)	CO2 Emissions (lb/day)	CH4 Emissions (lb/day)	N2O Emissions (lb/day)	GHG (mass) Emissions (lb/day)	GHG (CO2e) Emissions (lb/day)
2023	Primary DAF Polymer Tank	Wastewater				0.06								
2024	Phosphoric Acid Tank	Wastewater				-								
TK-796	Neutralization Tank	Wastewater				5.80								
TK-797	Neutralization Tank	Wastewater				5.80								
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks				27.13								
656-658	Foul Water	Equipment_Leaks				7.05								
1560fug	Avon Wharf (A015)	Equipment_Leaks				12.51								
50024	No.1 Gas Plant (A034)	Equipment_Leaks				6.81								
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks				19.32								
55fug	Amorco Wharf (A026)	Equipment_Leaks				2.27								
A905	Tank A-905	Storage_Tanks				181.77								
2028	Tank A-932	Storage_Tanks				181.65								
A933	Tank A-933	Storage_Tanks				282.87								
MTK-10162	Tank MTK-10162	Storage_Tanks				0.04								
2011	Tank A-981	Storage_Tanks				6.00								
2012	Tank A-961	Storage_Tanks				6.00								
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks				-					103.29		103.29	2,168.99
2026	Weak Acid Tank No. 1	Wastewater				0.16								
2025	#1 Pre-Treatment Unit	Equipment_Leaks				11.44								
2001	#2 Wastewater Treatment Unit	Equipment_Leaks				11.19								
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	Stationary_Combustion	9.96	9.36	1.37	0.25	0.08	0.34	0.34	5,358.04	0.10	0.01	5,358.15	5,363.30

Notes:
This analysis includes calculations for stationary sources. An assessment of mobile source emissions is included in a separate analysis.

Table A.1-3 Project Impact Criteria Pollutant Daily Emission Summary

S-#	Source Description	Source Category	NOX	SO2	CO	POC	PM10	PM2.5
		Total (lb/day)	**-1783.52**	**-1390.40**	**-3354.26**	**-6944.86**	**-1212.46**	**-1173.07**
			Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)
55	Amorco Terminal (New Wharf), Crude Oil, Diesel, Gas Oil, Naphtha, Kerosene, Fuel Oils Unloading Only	Loading_Operations	-	-	-	94.34	-	-
115	Bulk Plant (truck/rail); Caustic waste; Railcar loading rack north of water reservoir	Loading_Operations	-	-	-	-	-	-
323	Tank A-323, White Fuel Oil, Jet 'A', Gasoline, Alkylate Gasoline Blending Components, A14 Vapor Recovery	Storage_Tanks	-	-	-	(76.17)	-	-
432	Tank A-432, Ethyl Alcohol, Distillate Oil, Gasoline, Naphtha, A14 Vapor Recovery	Storage_Tanks	-	-	-	(2,210.04)	-	-
517	Tank A-517	Storage_Tanks	-	-	-	(2,323.66)	-	-
601	Tank A-601	Storage_Tanks	-	-	-	-	-	-
620	Tank A-620	Storage_Tanks	-	-	-	(852.35)	-	-
621	Tank A-621	Storage_Tanks	-	-	-	(7.52)	-	-
622	Tank A-622	Storage_Tanks	-	-	-	(237.24)	-	-
650	Tank A-650	Storage_Tanks	-	-	-	-	-	-
651	Tank A-651, Oil/Water Mixture	Storage_Tanks	-	-	-	-	-	-
656	Tank A-846	Storage_Tanks	-	-	-	-	-	-
658	Tank A-847	Storage_Tanks	-	-	-	-	-	-
692	Tank A-692, White, Gasoline	Storage_Tanks	-	-	-	(8.86)	-	-
699	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery	Storage_Tanks	-	-	-	-	-	-
700	Tank 2-A-700, Light grey, API Separator Sludge	Storage_Tanks	-	-	-	-	-	-
711	Tank 80-A-711, Green, Crude Oil, Gasoline	Storage_Tanks	-	-	-	(0.60)	-	-
819	API Oil-Water, Separator/Dissolved Nitrogen Flotation System, Abated by A-39 Thermal Oxidizer or A-14 Vapor Recovery	Wastewater	-	-	-	-	-	-
830	Wastewater Surge Ponds	Wastewater	-	-	-	-	-	-
831	Bio-Oxidation Pond, Open pond	Wastewater	-	-	-	-	-	-
842	Wastewater Treatment Plant Clarifiers, filters, and granular activated carbon	Wastewater	-	-	-	-	-	-
850	No. 3 HDS Unit	Equipment_Leaks	-	-	-	(5.90)	-	-
872	Tank A-872	Storage_Tanks	-	-	-	(1.46)	-	-
873	Tank A-895	Storage_Tanks	-	-	-	(466.43)	-	-
919	No. 2 HDS Depent Reboiler (F19), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(1.26)	-	-	-	-
920	No. 2 HDS Charge Heater (F20), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.71)	-	-	-	-
928	HDN Reactor A Heater (F28), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
929	HDN Reactor B Heater (F29), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
930	HDN Reactor C Heater (F30), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
931	Hydrocracker Reactor 1 Heater (F31), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
932	Hydrocracker Reactor 2 Heater (F32), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
933	Hydrocracker Reactor 3 Heater (F33), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(0.23)	-	-	-	-
934	Hydrocracker Stabilizer Reboiler (F34), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(1.53)	-	-	-	-
937	Hydrogen Plant Heater (F37) Refinery Fuel Gas, Natural Gas	Stationary_Combustion	-	(8.41)	-	-	-	-
973	No. 3 HDS Recycle Gas Heater (F55), Refinery Fuel Gas, Natural Gas, Abated by A-31 SCR on combined stack (P79) with S-974	Stationary_Combustion	-	(1.39)	-	-	-	-
1002	No. 1 HDS Unit	Equipment_Leaks	-	-	-	(22.47)	-	-
1003	No. 2 HDS Unit	Equipment_Leaks	-	-	-	0.94	-	-
1005	No. 1 Hydrogen Plant	Hydrogen_Plant	-	-	-	-	-	-
1007	Hydrocracker Unit [Hydrocracker 2nd Stage]	Equipment_Leaks	-	-	-	(6.91)	-	-
1008	Hydrocracker Unit [Hydrocracker 1st Stage]	Equipment_Leaks	-	-	-	0.99	-	-

Table A.1-3 Project Impact Criteria Pollutant Daily Emission Summary

S-#	Source Description	Source Category	NOX Emissions Impact (lb/day)	SO2 Emissions Impact (lb/day)	CO Emissions Impact (lb/day)	POC Emissions Impact (lb/day)	PM10 Emissions Impact (lb/day)	PM2.5 Emissions Impact (lb/day)
		Total (lb/day)	**-1783.52**	**-1390.40**	**-3354.26**	**-6944.86**	**-1212.46**	**-1173.07**
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	(8.15)	-	-
1025	Bulk Plant; Bottom Loading Facilities, Gasoline, Naphtha, Kerosene, Diesel, Fuel Oil, A-14 Vapor Recovery	Loading_Operations	-	-	-	-	-	-
1026	DNF Effluent Air Stripper, Abated by A-39 Thermal Oxidizer	Wastewater	-	-	-	-	-	-
1463	Tank A-867, Silver, Crude Oil, HDS Gas Oil	Storage_Tanks	-	-	-	(60.03)	-	-
1464	Tank A-868, Off-white, Diesel, Jet A, Kerosene	Storage_Tanks	-	-	-	(4.95)	-	-
1465	Tank A-869, Off-white, Jet A, Diesel, Kerosene	Storage_Tanks	-	-	-	(4.95)	-	-
1496	Tank A-876, Heavy reformate with pentanes, straight run heavy naphtha, A-14 Vapor Recovery	Storage_Tanks	-	-	-	(355.69)	-	-
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks	-	-	-	(27.02)	-	-
1511	Delayed Coker Heater #1 (F78), Natural Gas, Refinery Fuel Gas, Abated by A-1511 SCR	Stationary_Combustion	-	-	-	-	-	-
1512	Delayed Coker Heater #2 (F79), Natural Gas, Refinery Fuel Gas, Abated by A-1512 SCR	Stationary_Combustion	-	-	-	-	-	-
1526	No. 5 Gas Plant	Equipment_Leaks	-	-	-	(28.05)	-	-
1554	Tank A-943, High Sulfur Vacuum Gas Oil (HSVGO), Vacuum Gas Oil (VGO)	Storage_Tanks	-	-	-	(32.18)	-	-
1560	Avon Wharf Berth No. 1A, Marine Bulk Plant with A1560 Vapor Recovery System , Loading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil, Unloading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil	Loading_Operations	-	-	-	164.56	-	-
2018	Sulfuric Acid Tank	Wastewater	-	-	-	-	-	-
2019	Primary DAF Coagulant Tank	Wastewater	-	-	-	-	-	-
2003	Primary DAF Unit A	Wastewater	-	-	-	0.17	-	-
2004	Primary DAF Unit B	Wastewater	-	-	-	0.17	-	-
2006	DAF Residuals Storage Tank	Wastewater	-	-	-	-	-	-
2010	Primary DAF Effluent Tank	Wastewater	-	-	-	6.67	-	-
2022	Urea Storage Tank	Wastewater	-	-	-	-	-	-
2023	Primary DAF Polymer Tank	Wastewater	-	-	-	0.06	-	-
2024	Phosphoric Acid Tank	Wastewater	-	-	-	-	-	-
TK-796	Neutralization Tank	Wastewater	-	-	-	5.80	-	-
TK-797	Neutralization Tank	Wastewater	-	-	-	5.80	-	-
656-658	Foul Water	Equipment_Leaks	-	-	-	(3.03)	-	-
1560fug	Avon Wharf (A015)	Equipment_Leaks	-	-	-	-	-	-
50024	No.1 Gas Plant (A034)	Equipment_Leaks	-	-	-	-	-	-
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks	-	-	-	-	-	-
55fug	Amorco Wharf (A026)	Equipment_Leaks	-	-	-	-	-	-
A905	Tank A-905	Storage_Tanks	-	-	-	-	-	-
2028	Tank A-932	Storage_Tanks	-	-	-	(27.09)	-	-
A933	Tank A-933	Storage_Tanks	-	-	-	-	-	-
MTK-10162	Tank MTK-10162	Storage_Tanks	-	-	-	0.04	-	-
2011	Tank A-981	Storage_Tanks	-	-	-	6.00	-	-
2012	Tank A-961	Storage_Tanks	-	-	-	6.00	-	-
2026	Weak Acid Tank No. 1	Wastewater	-	-	-	0.16	-	-
2025	#1 Pre-Treatment Unit	Equipment_Leaks	-	-	-	11.44	-	-
2001	#2 Wastewater Treatment Unit	Equipment_Leaks	-	-	-	11.19	-	-
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	Stationary_Combustion	9.96	9.36	1.37	0.25	0.34	0.34
97	CATALYST FINES HOPPER WITH ZURN IND #310A BLOWER	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-
98	EAST CATALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-
99	WEST CAYALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-
515	Tank A-515	Fixed_Roof_Tank	-	-	-	-	-	-
516	Tank A-516	Fixed_Roof_Tank	-	-	-	-	-	-
554	TANK A-554	Fixed_Roof_Tank	-	-	-	-	-	-
572	TANK A-572	Fixed_Roof_Tank	-	-	-	-	-	-

Table A.1-3 Project Impact Criteria Pollutant Daily Emission Summary

		Total (lb/day)	**-1783.52**	**-1390.40**	**-3354.26**	**-6944.86**	**-1212.46**	**-1173.07**
			NOX	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**
S-#	**Source Description**	**Source Category**	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)	Emissions Impact (lb/day)
585	TANK A-585	Fixed_Roof_Tank	-	-	-	(4.76)	-	-
590	DEA Flash Drum, V010	Equipment_Leaks	-	-	-	-	-	-
598	TANK A-598	Fixed_Roof_Tank	-	-	-	-	-	-
599	Tank A-599	Fixed_Roof_Tank	-	-	-	-	-	-
606	WASTEWATER AIR STRIPPER A FOR NO. 50 UNIT	Wastewater	-	(22.54)	-	(0.24)	-	-
607	WASTEWATER AIR STRIPPER B FOR NO. 50 UNIT	Wastewater	-	(22.54)	-	(0.24)	-	-
618	Tank A-618	Fixed_Roof_Tank	-	-	-	-	-	-
638	TANK A-638	External_Floating_Roof_Tank	-	-	-	-	-	-
639	Tank A-639	External_Floating_Roof_Tank	-	-	-	(7.96)	-	-
640	TANK A-640	External_Floating_Roof_Tank	-	-	-	(4.72)	-	-
641	TANK A-641	External_Floating_Roof_Tank	-	-	-	(5.12)	-	-
714	Spent Acid at Alkylation Unit	Fixed_Roof_Tank	-	-	-	(2.73)	-	-
771	DEA TANK 2-A-713	External_Floating_Roof_Tank	-	-	-	(0.00)	-	-
795	No. 3 Reformer Chloriding Agent Perchloroethylene Tank	Fixed_Roof_Tank	-	-	-	(0.09)	-	-
802	FCCU	Fluid_Catalytic_Cracking_Unit	(929.90)	(551.07)	(1,272.23)	(9.64)	(288.21)	(288.21)
802TorchOil	FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	(0.06)	(11.81)	(11.81)
815	NO. 1 FEED PREP. UNIT	Equipment_Leaks	-	-	-	(1.84)	-	-
816	NO. 2 FEED PREP. UNIT	Equipment_Leaks	-	-	-	(3.19)	-	-
817	No 3 Crude Unit	Equipment_Leaks	-	-	-	(2.56)	-	-
821	COKE STORAGE PILE	Fugitive_Dust	-	-	-	-	-	-
825	DEA System for H2S Recovery	Equipment_Leaks	-	-	-	-	-	-
834	NO. 50 CRUDE UNIT BLOWDOWN DRUM	Fixed_Roof_Tank	-	-	-	-	-	-
851	Ammonia Recovery Unit	Equipment_Leaks	-	-	-	(0.14)	-	-
853	FCCU Feed Surge Drum	Equipment_Leaks	-	-	-	-	-	-
856	Spare DEA Stripper	Equipment_Leaks	-	-	-	-	-	-
901	FCCU CO Boiler	Stationary_Combustion	(74.34)	(43.81)	(38.56)	(0.75)	(13.83)	(13.83)
902	CAT.CRACKER STARTUP HEATER (STARTUP USE ONLY)	Stationary_Combustion	-	-	-	(0.00)	(0.00)	(0.00)
904	No. 6 Boilerhouse	Stationary_Combustion	(174.46)	(164.34)	(10.58)	(39.22)	(197.52)	(197.52)
908	No. 3 Crude Heater	Stationary_Combustion	(24.43)	(72.12)	(2.05)	(1.98)	(24.23)	(24.23)
909	No. 1 Feed Prep Heater (F9)	Stationary_Combustion	(149.24)	(28.39)	(2.22)	(0.83)	(9.27)	(9.27)
912	No. 1 Feed Prep Heater (F12)	Stationary_Combustion	(40.52)	(40.82)	(47.60)	(5.12)	(13.50)	(13.50)
913	No. 2 Feed Prep Heater (F13)	Stationary_Combustion	(15.42)	(15.22)	(3.39)	(0.10)	(4.71)	(4.71)
915	Platformer Intermediate Heater (F15)	Stationary_Combustion	(12.29)	(2.53)	(1.19)	(0.59)	(0.82)	(0.82)
916	No. 1 HDS Heater (F16)	Stationary_Combustion	(41.22)	(13.15)	(1.36)	(0.24)	(4.19)	(4.19)
917	No. 1 HDS Prefract Reboiler (F17)	Stationary_Combustion	(12.46)	(4.53)	(2.00)	(1.04)	(1.44)	(1.44)
921	No. 2 HDS Heater (F21)	Stationary_Combustion	-	-	-	-	-	-
922	No. 5 Gas Plant Debutanizer Reboiler	Stationary_Combustion	(66.59)	(31.15)	(11.19)	(55.27)	(10.09)	(10.09)
926	No. 2 Reformer Splitter Reboiler (F26)	Stationary_Combustion	(18.58)	(15.80)	(77.93)	(9.17)	(5.08)	(5.08)
935	Hydrocracker Splitter Reboiler (F35)	Stationary_Combustion	(61.98)	(28.61)	(6.74)	(0.65)	(9.35)	(9.35)
950	No. 50 Unit Crude Feed Heater (F50)	Stationary_Combustion	(61.09)	(126.85)	(5.00)	(2.46)	(41.03)	(41.03)
951	No. 2 Reformer Aux Reheater (F51)	Stationary_Combustion	-	-	-	-	-	-
955	NO. 4 GAS PLANT COMPRESSOR NO. 4064	Stationary_Combustion	(3.59)	(0.25)	(237.26)	(16.12)	(1.46)	(1.46)
956	NO. 4 GAS PLANT COMPRESSOR NO. 4065	Stationary_Combustion	(6.16)	(0.23)	(209.47)	(15.96)	(1.35)	(1.35)
957	NO. 4 GAS PLANT COMPRESSOR NO. 4066	Stationary_Combustion	(3.28)	(0.21)	(229.82)	(14.19)	(1.20)	(1.20)
958	NO. 4 GAS PLANT COMPRESSOR NO. 4067	Stationary_Combustion	(6.41)	(0.23)	(197.79)	(12.29)	(1.29)	(1.29)
959	NO. 4 GAS PLANT COMPRESSOR NO. 4068	Stationary_Combustion	(3.48)	(0.24)	(223.84)	(17.20)	(1.46)	(1.46)
960	NO. 4 GAS PLANT COMPRESSOR NO. 4096	Stationary_Combustion	(5.37)	(0.18)	(139.60)	(10.59)	(0.90)	(0.90)
971	No. 3 Reformer Feed Preheater (F53)	Stationary_Combustion	(49.36)	(6.09)	(12.83)	(1.29)	(3.06)	(3.06)
972	No. 3 Reformer Debutanizer Reboiler (F54)	Stationary_Combustion	(7.23)	(0.87)	(1.75)	(0.28)	(0.64)	(0.64)
974	No. 3 HDS Fractionator Feed Heater (F56)	Stationary_Combustion	(5.49)	(20.43)	(0.56)	(0.27)	(6.53)	(6.53)
975	NO. 4 GAS PLANT COOLING TOWER	Cooling_Towers	-	-	-	(20.99)	(178.72)	(170.90)
977	NO. 3 CRUDE UNIT COOLING TOWER	Cooling_Towers	-	-	-	(3.80)	(53.02)	(47.74)
979	NO. 2 FEED PREP. COOLING TOWER	Cooling_Towers	-	-	-	(4.16)	(18.03)	(17.17)
983	ALKY AND NO. 2 REFORMER COOLING TOWER	Cooling_Towers	-	-	-	(24.78)	(137.49)	(132.16)

Table A.1-3 Project Impact Criteria Pollutant Daily Emission Summary

S-#	Source Description	Source Category	NOX Emissions Impact (lb/day)	SO2 Emissions Impact (lb/day)	CO Emissions Impact (lb/day)	POC Emissions Impact (lb/day)	PM10 Emissions Impact (lb/day)	PM2.5 Emissions Impact (lb/day)
		Total (lb/day)	**-1783.52**	**-1390.40**	**-3354.26**	**-6944.86**	**-1212.46**	**-1173.07**
987	NO. 50 UNIT COOLING TOWER	Cooling_Towers	-	-	-	(5.60)	(63.46)	(61.34)
988	#3 REFORM COOLING TOWER	Cooling_Towers	-	-	-	(2.79)	(23.87)	(23.13)
990	HC Separator Tank #749	Fixed_Roof_Tank	-	-	-	(0.00)	-	-
1001	No 50 Crude Unit	Equipment_Leaks	-	-	-	(10.55)	-	-
1004	NO. 2 CAT. REFORMER	Catalytic_Reforming_Unit	-	-	-	-	-	-
1006	NO. 1 HDA Unit	Equipment_Leaks	-	-	-	-	-	-
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	(8.15)	-	-
1020	#3 UOP REFORMER	Catalytic_Reforming_Unit	-	-	-	(3.73)	-	-
1038	Benzene Saturation/Pentane-Hexane Isomerization	Equipment_Leaks	-	-	-	(0.80)	-	-
1040	Butadiene Unit	Equipment_Leaks	-	-	-	-	-	-
1105	No. 4 HDS Unit	Equipment_Leaks	-	-	-	(8.57)	-	-
1106	FU72, No. 4 HDS Reactor Feed Heater	Stationary_Combustion	(0.96)	(0.60)	(2.50)	(0.27)	(1.33)	(1.33)
1401	SRU (3-Stage)	Sulfur_Recovery_Unit	(10.94)	(164.62)	(613.77)	(5.76)	-	-
1401c	SRU (3-Stage)	Stationary_Combustion	(4.88)	-	(4.10)	(0.27)	(0.37)	(0.37)
1404	SULFUR STORAGE TANK	Fixed_Roof_Tank	-	(6.74)	-	-	-	-
1405	SULFUR COLLECTION PIT	Sulfur_Recovery_Unit	-	-	-	-	-	-
1418	Diethanolamine Storage Tank #750	Fixed_Roof_Tank	-	-	-	(0.00)	-	-
1422	Tank 782 Ammonia Recovery Unit Feed Tank	Fixed_Roof_Tank	-	-	-	-	-	-
1470	F-71, Vacuum Tower Feed Heater	Stationary_Combustion	(3.81)	(0.95)	(0.30)	(0.33)	(3.99)	(3.99)
1484	Oil Water Separator; Pressure Vessel	Wastewater	-	-	-	-	-	-
1510	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Delayed_Coker	-	-	-	(22.16)	(0.04)	(0.01)
1513	Coke Screen/Crusher	Fugitive_Dust	-	-	-	-	(50.18)	(38.98)
1514	Coke Silo #1	Fugitive_Dust	-	-	-	-	(9.08)	(7.36)
1515	Coke Silo #2	Fugitive_Dust	-	-	-	-	(9.08)	(7.36)
1516	Coker Truck Loadout	Fugitive_Dust	-	-	-	-	(11.14)	(8.57)
1555	Reformate Splitter	Equipment_Leaks	-	-	-	-	-	-
1571	SRU Sulfur Loading Dock	Loading_Operations	-	(0.00)	-	-	(0.04)	(0.04)
A001	Cat Cracker (A001)	Equipment_Leaks	-	-	-	(6.67)	-	-
A002	Fluid Coker (A002)	Equipment_Leaks	-	-	-	(0.05)	-	-
A006	No. 2 Reformer (A006)	Equipment_Leaks	-	-	-	(5.33)	-	-
A007	No.4 Gas Plant (A007)	Equipment_Leaks	-	-	-	(7.37)	-	-
A011	No.1 Feed Prep (A011)	Equipment_Leaks	-	-	-	(6.95)	-	-
A013	No.2 Feed Prep (A013)	Equipment_Leaks	-	-	-	(5.12)	-	-
A014	Cracking Plat. DEA (A014)	Equipment_Leaks	-	-	-	(2.66)	-	-
A016	Unit No. 50 (A016)	Equipment_Leaks	-	-	-	(15.10)	-	-
A031	Boiler House No. 6 (A031)	Equipment_Leaks	-	-	-	(1.50)	-	-
A044	FCCU #7 Boiler (A044)	Equipment_Leaks	-	-	-	(1.37)	-	-
A048	No. 3 Crude (A048)	Equipment_Leaks	-	-	-	(4.02)	-	-
A075	No. 3 Reformer (A075)	Equipment_Leaks	-	-	-	(7.58)	-	-
A078	Chemical Plant "Scot" (A078)	Equipment_Leaks	-	-	-	(7.28)	-	-
A080	Chemical Plant "Ammonia" (A080)	Equipment_Leaks	-	-	-	(2.57)	-	-
A081	Chemical Plant "Sulfur" (A081)	Equipment_Leaks	-	-	-	(7.38)	-	-
A083	Chemical Plant "DEA" (A083)	Equipment_Leaks	-	-	-	(19.12)	-	-
A090	M.T.B.E (A090)	Equipment_Leaks	-	-	-	(3.04)	-	-
A091	Benzene Saturation (A091)	Equipment_Leaks	-	-	-	(2.52)	-	-
A092	HDS Plant No. 4 (A092)	Equipment_Leaks	-	-	-	(11.46)	-	-
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks	-	-	-	-	-	-

Table A.1-4 Project Impact Criteria Pollutant Annual Emission Summary

S-#	Source Description	Source Category	NOX	SO2	CO	POC	PM10	PM2.5	CO2	CH4	N2O	GHG (CO2e)
		Total (Ton/Year, MT/Year)	-304.42	-253.97	-592.66	-77.33	-218.21	-211.02	-1,178,230	-57	-9	-1,182,352
			Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)
55	Amorco Terminal (New Wharf), Crude Oil, Diesel, Gas Oil, Naphtha, Kerosene, Fuel Oils Unloading Only	Loading_Operations	-	-	-	3.72	-	-	-	-	-	-
115	Bulk Plant (truck/rail); Caustic waste; Railcar loading rack north of water reservoir	Loading_Operations	-	-	-	(0.00)	-	-	-	-	-	-
323	Tank A-323, White Fuel Oil, Jet 'A', Gasoline, Alkylate Gasoline Blending Components, A14 Vapor Recovery	Storage_Tanks	-	-	-	0.09	-	-	-	-	-	-
432	Tank A-432, Ethyl Alcohol, Distillate Oil, Gasoline, Naphtha, A14 Vapor Recovery	Storage_Tanks	-	-	-	8.69	-	-	-	-	-	-
517	Tank A-517	Storage_Tanks	-	-	-	(4.52)	-	-	-	-	-	-
601	Tank A-601	Storage_Tanks	-	-	-	(0.05)	-	-	-	-	-	-
620	Tank A-620	Storage_Tanks	-	-	-	(1.79)	-	-	-	-	-	-
621	Tank A-621	Storage_Tanks	-	-	-	0.99	-	-	-	-	-	-
622	Tank A-622	Storage_Tanks	-	-	-	1.58	-	-	-	-	-	-
650	Tank A-650	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
651	Tank A-651, Oil/Water Mixture	Storage_Tanks	-	-	-	(0.01)	-	-	-	-	-	-
656	Tank A-846	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
658	Tank A-847	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
692	Tank A-692, White, Gasoline	Storage_Tanks	-	-	-	(0.43)	-	-	-	-	-	-
699	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery	Storage_Tanks	-	-	-	(0.01)	-	-	-	-	-	-
700	Tank 2-A-700, Light grey, API Separator Sludge	Storage_Tanks	-	-	-	(0.03)	-	-	-	-	-	-
711	Tank 80-A-711, Green, Crude Oil, Gasoline	Storage_Tanks	-	-	-	(0.51)	-	-	-	-	-	-
819	API Oil-Water, Separator/Dissolved Nitrogen Flotation System, Abated by A-39 Thermal Oxidizer or A-14 Vapor Recovery	Wastewater	-	-	(0.02)	0.00	-	-	-	-	-	-
830	Wastewater Surge Ponds	Wastewater	-	-	-	(2.23)	-	-	-	-	-	-
831	Bio-Oxidation Pond, Open pond	Wastewater	-	-	-	(17.85)	-	-	-	-	-	-
842	Wastewater Treatment Plant Clarifiers, filters, and granular activated carbon	Wastewater	-	-	-	0.00	-	-	-	-	-	-
850	No. 3 HDS Unit	Equipment_Leaks	-	-	-	3.97	-	-	-	(0.23)	-	(4.83)
872	Tank A-872	Storage_Tanks	-	-	-	0.03	-	-	-	-	-	-
873	Tank A-895	Storage_Tanks	-	-	-	0.83	-	-	-	-	-	-
919	No. 2 HDS Depent Reboiler (F19), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	0.78	(0.03)	19.03	1.22	0.82	0.82	11,667.84	0.83	0.17	11,736.89
920	No. 2 HDS Charge Heater (F20), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.08	(2.27)	(0.20)	(0.58)	(0.43)	(0.43)	(7,435.46)	(0.35)	(0.07)	(7,464.13)
928	HDN Reactor A Heater (F28), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	(0.10)	(0.60)	(0.02)	(0.06)	(0.09)	(0.09)	(2,473.75)	(0.01)	(0.00)	(2,474.94)
929	HDN Reactor B Heater (F29), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	0.12	(0.48)	(0.01)	(0.03)	(0.05)	(0.05)	(1,813.14)	0.02	0.00	(1,811.29)
930	HDN Reactor C Heater (F30), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	0.07	(0.57)	(0.02)	(0.06)	(0.08)	(0.08)	(2,377.38)	(0.01)	(0.00)	(2,378.14)
931	Hydrocracker Reactor 1 Heater (F31), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.55	(0.21)	0.03	0.12	0.17	0.17	1,287.65	0.33	0.07	1,315.42
932	Hydrocracker Reactor 2 Heater (F32), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.38	(0.30)	0.03	0.10	0.14	0.14	708.29	0.30	0.06	733.37
933	Hydrocracker Reactor 3 Heater (F33), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	1.61	(0.44)	0.01	0.07	0.09	0.09	83.39	0.27	0.05	105.59
934	Hydrocracker Stabilizer Reboiler (F34), Refinery Fuel Gas, Natural Gas	Stationary_Combustion	3.31	(0.27)	(0.06)	0.00	1.55	1.55	14,669.59	2.61	0.52	14,886.61
937	Hydrogen Plant Heater (F37) Refinery Fuel Gas, Natural Gas	Stationary_Combustion	11.44	4.91	1.06	0.02	4.31	4.31	44,002.89	3.63	0.62	44,270.25
973	No. 3 HDS Recycle Gas Heater (F55), Refinery Fuel Gas, Natural Gas, Abated by A-31 SCR on combined stack (P79) with S-974	Stationary_Combustion	0.02	(1.91)	(0.02)	(0.01)	0.10	0.10	2,256.51	0.16	0.03	2,270.00
1002	No. 1 HDS Unit	Equipment_Leaks	-	-	-	(0.24)	-	-	-	(0.33)	-	(7.03)
1003	No. 2 HDS Unit	Equipment_Leaks	-	-	-	4.96	-	-	-	(0.20)	-	(4.23)
1005	No. 1 Hydrogen Plant	Hydrogen_Plant	-	-	-	2.27	-	-	104,085.68	-	-	104,085.68
1007	Hydrocracker Unit [Hydrocracker 2nd Stage]	Equipment_Leaks	-	-	-	4.31	-	-	-	(0.26)	-	(5.49)
1008	Hydrocracker Unit [Hydrocracker 1st Stage]	Equipment_Leaks	-	-	-	2.01	-	-	-	(0.04)	-	(0.86)
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	(1.49)	-	-	-	(0.33)	-	(7.00)
1025	Bulk Plant; Bottom Loading Facilities, Gasoline, Naphtha, Kerosene, Diesel, Fuel Oil, A-14 Vapor Recovery	Loading_Operations	-	-	-	(5.27)	-	-	-	-	-	-
1026	DNF Effluent Air Stripper, Abated by A-39 Thermal Oxidizer	Wastewater	-	-	(0.00)	0.66	-	-	-	-	-	-
1463	Tank A-867, Silver, Crude Oil, HDS Gas Oil	Storage_Tanks	-	-	-	(0.07)	-	-	-	-	-	-
1464	Tank A-868, Off-white, Diesel, Jet A, Kerosene	Storage_Tanks	-	-	-	0.28	-	-	-	-	-	-
1465	Tank A-869, Off-white, Jet A, Diesel, Kerosene	Storage_Tanks	-	-	-	0.29	-	-	-	-	-	-
1496	Tank A-876, Heavy reformate with pentanes, straight run heavy naphtha, A-14 Vapor Recovery	Storage_Tanks	-	-	-	(2.04)	-	-	-	-	-	-
1510fug	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Equipment_Leaks	-	-	-	1.99	-	-	-	-	-	-
1511	Delayed Coker Heater #1 (F78), Natural Gas, Refinery Fuel Gas, Abated by A-1511 SCR	Stationary_Combustion	0.42	0.26	0.08	(0.15)	0.87	0.87	6,469.09	0.23	0.02	6,481.04
1512	Delayed Coker Heater #2 (F79), Natural Gas, Refinery Fuel Gas, Abated by A-1512 SCR	Stationary_Combustion	(0.61)	(1.01)	(0.39)	(0.22)	(4.34)	(4.34)	(62,379.50)	(1.17)	(0.12)	(62,440.26)
1526	No. 5 Gas Plant	Equipment_Leaks	-	-	-	3.93	-	-	-	(0.09)	-	(1.97)
1554	Tank A-943, High Sulfur Vacuum Gas Oil (HSVGO), Vacuum Gas Oil (VGO)	Storage_Tanks	-	-	-	(3.06)	-	-	-	-	-	-

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table A.1-4 Project Impact Criteria Pollutant Annual Emission Summary

S-#	Source Description	Source Category	NOX Emissions Impact (tpy)	SO2 Emissions Impact (tpy)	CO Emissions Impact (tpy)	POC Emissions Impact (tpy)	PM10 Emissions Impact (tpy)	PM2.5 Emissions Impact (tpy)	CO2 Emissions Impact (MT/yr)	CH4 Emissions Impact (MT/yr)	N2O Emissions Impact (MT/yr)	GHG (CO2e) Emissions Impact (MT/yr)
		Total (Ton/Year, MT/Year)	**-304.42**	**-253.97**	**-592.66**	**-77.33**	**-218.21**	**-211.02**	**-1,178,230**	**-57**	**-9**	**-1,182,352**
1560	Avon Wharf Berth No. 1A, Marine Bulk Plant with A1560 Vapor Recovery System , Loading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil, Unloading: Gasoline, Blendstocks, Diesel, Distillate and Residual Oil	Loading_Operations	-	-	-	(1.13)	-	-	-	-	-	-
2018	Sulfuric Acid Tank	Wastewater	-	-	-	-	-	-	-	-	-	-
2019	Primary DAF Coagulant Tank	Wastewater	-	-	-	-	-	-	-	-	-	-
2003	Primary DAF Unit A	Wastewater	-	-	-	0.03	-	-	-	-	-	-
2004	Primary DAF Unit B	Wastewater	-	-	-	0.03	-	-	-	-	-	-
2006	DAF Residuals Storage Tank	Wastewater	-	-	-	-	-	-	-	-	-	-
2010	Primary DAF Effluent Tank	Wastewater	-	-	-	0.91	-	-	-	-	-	-
2022	Urea Storage Tank	Wastewater	-	-	-	-	-	-	-	-	-	-
2023	Primary DAF Polymer Tank	Wastewater	-	-	-	0.02	-	-	-	-	-	-
2024	Phosphoric Acid Tank	Wastewater	-	-	-	-	-	-	-	-	-	-
TK-796	Neutralization Tank	Wastewater	-	-	-	1.06	-	-	-	-	-	-
TK-797	Neutralization Tank	Wastewater	-	-	-	1.06	-	-	-	-	-	-
656-658	Foul Water	Equipment_Leaks	-	-	-	0.26	-	-	-	-	-	-
1560fug	Avon Wharf (A015)	Equipment_Leaks	-	-	-	0.69	-	-	-	-	-	-
50024	No.1 Gas Plant (A034)	Equipment_Leaks	-	-	-	1.03	-	-	-	-	-	-
A071	TRACT No. 6 Gasoline Blending (A071)	Equipment_Leaks	-	-	-	2.86	-	-	-	-	-	-
55fug	Amorco Wharf (A026)	Equipment_Leaks	-	-	-	(0.57)	-	-	-	-	-	-
A905	Tank A-905	Storage_Tanks	-	-	-	(0.36)	-	-	-	-	-	-
2028	Tank A-932	Storage_Tanks	-	-	-	0.69	-	-	-	-	-	-
A933	Tank A-933	Storage_Tanks	-	-	-	(0.31)	-	-	-	-	-	-
MTK-10162	Tank MTK-10162	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
2011	Tank A-981	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
2012	Tank A-961	Storage_Tanks	-	-	-	0.01	-	-	-	-	-	-
2026	Weak Acid Tank No. 1	Wastewater	-	-	-	0.00	-	-	-	-	-	-
2025	#1 Pre-Treatment Unit	Equipment_Leaks	-	-	-	2.09	-	-	-	-	-	-
2001	#2 Wastewater Treatment Unit	Equipment_Leaks	-	-	-	2.04	-	-	-	-	-	-
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	Stationary_Combustion	1.82	1.71	0.25	0.05	0.06	0.06	887.08	0.02	0.00	887.95
97	CATALYST FINES HOPPER WITH ZURN IND #310A BLOWER	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-
98	EAST CATALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-
99	WEST CAYALYST HOPPER AT FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	-	-	-	-	-	-	-
515	Tank A-515	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
516	Tank A-516	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
554	TANK A-554	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
572	TANK A-572	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
585	TANK A-585	Fixed_Roof_Tank	-	-	-	(0.87)	-	-	-	-	-	-
590	DEA Flash Drum, V010	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
598	TANK A-598	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
599	Tank A-599	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
606	WASTEWATER AIR STRIPPER A FOR NO. 50 UNIT	Wastewater	-	(4.11)	-	(0.04)	-	-	-	-	-	-
607	WASTEWATER AIR STRIPPER B FOR NO. 50 UNIT	Wastewater	-	(4.11)	-	(0.04)	-	-	-	-	-	-
618	Tank A-618	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
638	TANK A-638	External_Floating_Roof_Tank	-	-	-	-	-	-	-	-	-	-
639	Tank A-639	External_Floating_Roof_Tank	-	-	-	(1.45)	-	-	-	-	-	-
640	TANK A-640	External_Floating_Roof_Tank	-	-	-	(0.86)	-	-	-	-	-	-
641	TANK A-641	External_Floating_Roof_Tank	-	-	-	(0.93)	-	-	-	-	-	-
714	Spent Acid at Alkylation Unit	Fixed_Roof_Tank	-	-	-	(0.50)	-	-	-	-	-	-
771	DEA TANK 2-A-713	External_Floating_Roof_Tank	-	-	-	(0.00)	-	-	-	-	-	-
795	No. 3 Reformer Chloriding Agent Perchloroethylene Tank	Fixed_Roof_Tank	-	-	-	(0.02)	-	-	-	-	-	-
802	FCCU	Fluid_Catalytic_Cracking_Unit	(169.71)	(100.57)	(232.18)	(1.76)	(52.60)	(52.60)	(454,500.48)	(13.31)	(2.66)	(455,605.28)
802TorchOil	FCCU	Fluid_Catalytic_Cracking_Unit	-	-	-	(0.01)	(2.16)	(2.16)	(373.05)	(0.02)	(0.00)	(374.37)
815	NO. 1 FEED PREP. UNIT	Equipment_Leaks	-	-	-	(0.34)	-	-	-	(0.08)	-	(1.59)
816	NO. 2 FEED PREP. UNIT	Equipment_Leaks	-	-	-	(0.58)	-	-	-	(0.13)	-	(2.74)
817	No 3 Crude Unit	Equipment_Leaks	-	-	-	(0.47)	-	-	-	(0.10)	-	(2.20)
821	COKE STORAGE PILE	Fugitive_Dust	-	-	-	-	-	-	-	-	-	-
825	DEA System for H2S Recovery	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
834	NO. 50 CRUDE UNIT BLOWDOWN DRUM	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
851	Ammonia Recovery Unit	Equipment_Leaks	-	-	-	(0.03)	-	-	(32.38)	(0.01)	-	(32.50)
853	FCCU Feed Surge Drum	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
856	Spare DEA Stripper	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
901	FCCU CO Boiler	Stationary_Combustion	(13.57)	(7.99)	(7.04)	(0.14)	(2.52)	(2.52)	(195,557.10)	(10.89)	(2.18)	(196,460.81)
902	CAT.CRACKER STARTUP HEATER (STARTUP USE ONLY)	Stationary_Combustion	-	-	-	(0.00)	(0.00)	(0.00)	(10.50)	(0.00)	(0.00)	(10.55)
904	No. 6 Boilerhouse	Stationary_Combustion	(31.84)	(29.99)	(1.93)	(7.16)	(36.05)	(36.05)	(152,302.40)	(8.37)	(1.67)	(152,995.59)
908	No. 3 Crude Heater	Stationary_Combustion	(4.46)	(13.16)	(0.38)	(0.36)	(4.42)	(4.42)	(62,987.28)	(3.50)	(0.70)	(63,277.72)
909	No. 1 Feed Prep Heater (F9)	Stationary_Combustion	(27.24)	(5.18)	(0.41)	(0.15)	(1.69)	(1.69)	(24,129.89)	(1.34)	(0.27)	(24,240.97)
912	No. 1 Feed Prep Heater (F12)	Stationary_Combustion	(7.39)	(7.45)	(8.69)	(0.93)	(2.46)	(2.46)	(35,069.99)	(1.95)	(0.39)	(35,231.70)
913	No. 2 Feed Prep Heater (F13)	Stationary_Combustion	(2.81)	(2.78)	(0.62)	(0.02)	(0.86)	(0.86)	(13,607.12)	(0.76)	(0.15)	(13,669.87)
915	Platformer Intermediate Heater (F15)	Stationary_Combustion	(2.24)	(0.46)	(0.22)	(0.11)	(0.15)	(0.15)	(2,294.75)	(0.13)	(0.03)	(2,305.19)
916	No. 1 HDS Heater (F16)	Stationary_Combustion	(7.52)	(2.40)	(0.25)	(0.04)	(0.76)	(0.76)	(11,645.47)	(0.65)	(0.13)	(11,699.16)

Table A.1-4 Project Impact Criteria Pollutant Annual Emission Summary

		Total (Ton/Year, MT/Year)	**-304.42**	**-253.97**	**-592.66**	**-77.33**	**-218.21**	**-211.02**	**-1,178,230**	**-57**	**-9**	**-1,182,352**
			NOX	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**GHG (CO2e)**
S-#	**Source Description**	**Source Category**	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (tpy)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)	Emissions Impact (MT/yr)
917	No. 1 HDS Prefract Reboiler (F17)	Stationary_Combustion	(2.27)	(0.83)	(0.36)	(0.19)	(0.26)	(0.26)	(3,997.02)	(0.22)	(0.04)	(4,015.45)
921	No. 2 HDS Heater (F21)	Stationary_Combustion	-	-	-	-	-	-	(809.07)	(0.05)	(0.01)	(812.81)
922	No. 5 Gas Plant Debutanizer Reboiler	Stationary_Combustion	(12.15)	(5.68)	(2.04)	(10.09)	(1.84)	(1.84)	(28,030.26)	(1.56)	(0.31)	(28,159.47)
926	No. 2 Reformer Splitter Reboiler (F26)	Stationary_Combustion	(3.39)	(2.88)	(14.22)	(1.67)	(0.93)	(0.93)	(17,030.79)	(0.94)	(0.19)	(17,109.07)
935	Hydrocracker Splitter Reboiler (F35)	Stationary_Combustion	(11.31)	(5.22)	(1.23)	(0.12)	(1.71)	(1.71)	(34,839.48)	(1.94)	(0.39)	(35,000.34)
950	No. 50 Unit Crude Feed Heater (F50)	Stationary_Combustion	(11.15)	(23.15)	(0.91)	(0.45)	(7.49)	(7.49)	(115,724.21)	(6.44)	(1.29)	(116,258.53)
951	No. 2 Reformer Aux Reheater (F51)	Stationary_Combustion	-	-	-	-	-	-	-	-	-	-
955	NO. 4 GAS PLANT COMPRESSOR NO. 4064	Stationary_Combustion	(0.65)	(0.04)	(43.30)	(2.94)	(0.27)	(0.27)	(2,818.07)	(0.05)	(0.01)	(2,820.84)
956	NO. 4 GAS PLANT COMPRESSOR NO. 4065	Stationary_Combustion	(1.12)	(0.04)	(38.23)	(2.91)	(0.25)	(0.25)	(2,604.89)	(0.05)	(0.00)	(2,607.44)
957	NO. 4 GAS PLANT COMPRESSOR NO. 4066	Stationary_Combustion	(0.60)	(0.04)	(41.94)	(2.59)	(0.22)	(0.22)	(2,310.79)	(0.04)	(0.00)	(2,313.05)
958	NO. 4 GAS PLANT COMPRESSOR NO. 4067	Stationary_Combustion	(1.17)	(0.04)	(36.10)	(2.24)	(0.23)	(0.23)	(2,483.35)	(0.05)	(0.00)	(2,485.79)
959	NO. 4 GAS PLANT COMPRESSOR NO. 4068	Stationary_Combustion	(0.64)	(0.04)	(40.85)	(3.14)	(0.27)	(0.27)	(2,806.53)	(0.05)	(0.01)	(2,809.29)
960	NO. 4 GAS PLANT COMPRESSOR NO. 4096	Stationary_Combustion	(0.98)	(0.03)	(25.48)	(1.93)	(0.16)	(0.16)	(1,703.01)	(0.03)	(0.00)	(1,704.68)
971	No. 3 Reformer Feed Preheater (F53)	Stationary_Combustion	(9.01)	(1.11)	(2.34)	(0.24)	(0.56)	(0.56)	(67,063.73)	(1.27)	(0.13)	(67,129.57)
972	No. 3 Reformer Debutanizer Reboiler (F54)	Stationary_Combustion	(1.32)	(0.16)	(0.32)	(0.05)	(0.12)	(0.12)	(10,551.66)	(0.20)	(0.02)	(10,562.02)
974	No. 3 HDS Fractionator Feed Heater (F56)	Stationary_Combustion	(1.00)	(3.73)	(0.10)	(0.05)	(1.19)	(1.19)	(17,814.71)	(0.99)	(0.20)	(17,896.80)
975	NO. 4 GAS PLANT COOLING TOWER	Cooling_Towers	-	-	-	(3.83)	(32.62)	(31.19)	-	-	-	-
977	NO. 3 CRUDE UNIT COOLING TOWER	Cooling_Towers	-	-	-	(0.69)	(9.68)	(8.71)	-	-	-	-
979	NO. 2 FEED PREP. COOLING TOWER	Cooling_Towers	-	-	-	(0.76)	(3.29)	(3.13)	-	-	-	-
983	ALKY AND NO. 2 REFORMER COOLING TOWER	Cooling_Towers	-	-	-	(4.52)	(25.09)	(24.12)	-	-	-	-
987	NO. 50 UNIT COOLING TOWER	Cooling_Towers	-	-	-	(1.02)	(11.58)	(11.19)	-	-	-	-
988	#3 REFORM COOLING TOWER	Cooling_Towers	-	-	-	(0.51)	(4.36)	(4.22)	-	-	-	-
990	HC Separator Tank #749	Fixed_Roof_Tank	-	-	-	(0.00)	-	-	-	-	-	-
1001	No 50 Crude Unit	Equipment_Leaks	-	-	-	(1.92)	-	-	-	(0.43)	-	(9.07)
1004	NO. 2 CAT. REFORMER	Catalytic_Reforming_Unit	-	-	-	-	-	-	-	-	-	-
1006	NO. 1 HDA Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
1009	ALKYLATION UNIT	Equipment_Leaks	-	-	-	(1.49)	-	-	-	(0.33)	-	(7.00)
1020	#3 UOP REFORMER	Catalytic_Reforming_Unit	-	-	-	(0.68)	-	-	(98.31)	(0.00)	(0.00)	(98.55)
1038	Benzene Saturation/Pentane-Hexane Isomerization	Equipment_Leaks	-	-	-	(0.15)	-	-	-	(0.03)	-	(0.69)
1040	Butadiene Unit	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
1105	No. 4 HDS Unit	Equipment_Leaks	-	-	-	(1.56)	-	-	-	(0.35)	-	(7.36)
1106	FU72, No. 4 HDS Reactor Feed Heater	Stationary_Combustion	(0.18)	(0.11)	(0.46)	(0.05)	(0.24)	(0.24)	(7,065.42)	(0.13)	(0.01)	(7,072.36)
1401	SRU (3-Stage)	Sulfur_Recovery_Unit	(2.00)	(30.04)	(112.01)	(1.05)	-	-	(6,980.87)	-	-	(6,980.87)
1401c	SRU (3-Stage)	Stationary_Combustion	(0.89)	-	(0.75)	(0.05)	(0.07)	(0.07)	(291.66)	(0.01)	(0.00)	(291.95)
1404	SULFUR STORAGE TANK	Fixed_Roof_Tank	-	(1.23)	-	-	-	-	-	-	-	-
1405	SULFUR COLLECTION PIT	Sulfur_Recovery_Unit	-	-	-	-	-	-	-	-	-	-
1418	Diethanolamine Storage Tank #750	Fixed_Roof_Tank	-	-	-	(0.00)	-	-	-	-	-	-
1422	Tank 782 Ammonia Recovery Unit Feed Tank	Fixed_Roof_Tank	-	-	-	-	-	-	-	-	-	-
1470	F-71, Vacuum Tower Feed Heater	Stationary_Combustion	(0.70)	(0.17)	(0.06)	(0.06)	(0.73)	(0.73)	(10,334.84)	(0.20)	(0.02)	(10,344.99)
1484	Oil Water Separator; Pressure Vessel	Wastewater	-	-	-	-	-	-	-	-	-	-
1510	Delayed Coker with 4 Coke Drums and Assoc. Equipment	Delayed_Coker	-	-	-	(4.04)	(0.01)	(0.00)	-	(4.28)	-	(89.95)
1513	Coke Screen/Crusher	Fugitive_Dust	-	-	-	-	(9.16)	(7.11)	-	-	-	-
1514	Coke Silo #1	Fugitive_Dust	-	-	-	-	(1.66)	(1.34)	-	-	-	-
1515	Coke Silo #2	Fugitive_Dust	-	-	-	-	(1.66)	(1.34)	-	-	-	-
1516	Coker Truck Loadout	Fugitive_Dust	-	-	-	-	(2.03)	(1.56)	-	-	-	-
1555	Reformate Splitter	Equipment_Leaks	-	-	-	-	-	-	-	-	-	-
1571	SRU Sulfur Loading Dock	Loading_Operations	-	(0.00)	-	-	(0.01)	(0.01)	-	-	-	-
A001	Cat Cracker (A001)	Equipment_Leaks	-	-	-	(1.22)	-	-	-	-	-	-
A002	Fluid Coker (A002)	Equipment_Leaks	-	-	-	(0.01)	-	-	-	-	-	-
A006	No. 2 Reformer (A006)	Equipment_Leaks	-	-	-	(0.97)	-	-	-	-	-	-
A007	No.4 Gas Plant (A007)	Equipment_Leaks	-	-	-	(1.34)	-	-	-	-	-	-
A011	No.1 Feed Prep (A011)	Equipment_Leaks	-	-	-	(1.27)	-	-	-	-	-	-
A013	No.2 Feed Prep (A013)	Equipment_Leaks	-	-	-	(0.93)	-	-	-	-	-	-
A014	Cracking Plat. DEA (A014)	Equipment_Leaks	-	-	-	(0.49)	-	-	-	-	-	-
A016	Unit No. 50 (A016)	Equipment_Leaks	-	-	-	(2.76)	-	-	-	-	-	-
A031	Boiler House No. 6 (A031)	Equipment_Leaks	-	-	-	(0.27)	-	-	-	-	-	-
A044	FCCU #7 Boiler (A044)	Equipment_Leaks	-	-	-	(0.25)	-	-	-	-	-	-
A048	No. 3 Crude (A048)	Equipment_Leaks	-	-	-	(0.73)	-	-	-	-	-	-
A075	No. 3 Reformer (A075)	Equipment_Leaks	-	-	-	(1.38)	-	-	-	-	-	-
A078	Chemical Plant "Scot" (A078)	Equipment_Leaks	-	-	-	(1.33)	-	-	-	-	-	-
A080	Chemical Plant "Ammonia" (A080)	Equipment_Leaks	-	-	-	(0.47)	-	-	-	-	-	-
A081	Chemical Plant "Sulfur" (A081)	Equipment_Leaks	-	-	-	(1.35)	-	-	-	-	-	-
A083	Chemical Plant "DEA" (A083)	Equipment_Leaks	-	-	-	(3.49)	-	-	-	-	-	-
A090	M.T.B.E (A090)	Equipment_Leaks	-	-	-	(0.56)	-	-	-	-	-	-
A091	Benzene Saturation (A091)	Equipment_Leaks	-	-	-	(0.46)	-	-	-	-	-	-
A092	HDS Plant No. 4 (A092)	Equipment_Leaks	-	-	-	(2.09)	-	-	-	-	-	-
FUG GHG	GHG Fugitive Emissions	Equipment_Leaks	-	-	-	-	-	-	-	(1.27)	-	(26.71)

Table A.1-5 Stage 1 Wastewater Treatment Unit Daily Emissions

Air Effluent Summary (lb/day)

	Caprylic Acid	Capric Acid	Lauric Acid	Myristic Acid	Palmitic Acid	Stearic Acid	Arachidic Acid	Behenic Acid	Lignoceric Acid	Oleic Acid	Linoleic Acid	alpha-Linoleic Acid
Neutralization Tank Air Emissions	-	-	-	-	-	-	-	-	-	-	-	-
API Air Emissions	-	0.000004	0.000009	0.000123	0.000666	0.000508	-	-	-	0.002393	0.000075	0.000023
TK-876 Air Emissions	-	0.000223	0.000533	0.006852	0.036072	0.026927	-	-	-	0.128421	0.004018	0.001232
PS6 Air Emissions	-	0.000031	0.000077	0.001022	0.005541	0.004222	-	-	-	0.019902	0.000621	0.000190
DNF WWTP2 Air Emissions	-	0.000000	0.000000	0.000002	0.000009	0.000007	-	-	-	0.000031	0.000001	0.000000
Tank A-699/Tank A-700 Air Emissions	-	0.000001	0.000001	0.000017	0.000090	0.000068	-	-	-	0.000322	0.000010	0.000003
DNF/Neutr. Tk Effluent Channel Air Stripper Emissions	-	0.000775	0.001920	0.025564	0.138564	0.105573	-	-	-	0.497961	0.015541	0.004756
Tank A-323 (S-323) Air Emissions	-	0.000004	0.000011	0.000141	0.000762	0.000580	-	-	-	0.002738	0.000085	0.000026
Surge Pond No. 1 Air Emissions	-	0.002516	0.005971	0.076473	0.400894	0.298234	-	-	-	1.423490	0.044596	0.013668
NTK-0106 Primary DAF Unit Air Emissions	-	0.000028	0.000070	0.000928	0.005031	0.003833	-	-	-	0.018091	0.000564	0.000173
Surge Pond No. 2 Air Emissions	-	0.000003	0.000008	0.000100	0.000524	0.000390	-	-	-	0.001860	0.000058	0.000018
NTK-0108 Primary DAF Effluent Tank Air Emissions	-	0.000424	0.001052	0.013987	0.075791	0.057745	-	-	-	0.272537	0.008501	0.002602
3rd Party Three-Phase Centrifuge Air Emissions	-	0.000000	0.000000	0.000002	0.000009	0.000006	-	-	-	0.000031	0.000001	0.000000
Oxidation Pond Air Emissions	-	0.000006	0.000015	0.000193	0.001028	0.000773	-	-	-	0.003662	0.000115	0.000035
Clarifier 1 Air Emissions	-	0.000000	0.000000	0.000001	0.000003	0.000002	-	-	-	0.000010	0.000000	0.000000
TK-432 MBBR Tank Air Emissions	-	0.020669	0.051515	0.689294	3.750880	2.865480	-	-	-	13.497300	0.421085	0.128821
Clarifier 2 Air Emissions	-	0.000000	0.000000	0.000000	0.000001	0.000001	-	-	-	0.000004	0.000000	0.000000
3rd Party Two-Phase Centrifuge Air Emissions	-	-	-	-	-	-	-	-	-	0.000000	-	-
Filtering Air Emissions	-	-	-	-	0.000000	0.000000	-	-	-	0.000000	-	-
Coke Runoff Storage Pond Air Emissions	-	0.000001	0.000002	0.000022	0.000120	0.000090	-	-	-	0.000426	0.000013	0.000004

Table A.1-5 Stage 1 Wastewater Treatment Unit Daily Emissions

Air Effluent Summary (lb/day)

	Toluene	Ethanol	Methanol	Propylene Glycol	Ethylene Glycol Monopropyl Ether	Triethylene Glycol	Ethylene Glycol	Ammonia	Aluminum	Cadium	Chromium	Copper
Neutralization Tank Air Emissions	0.523298	-	-	-	-	-	-	0.000201	-	-	-	-
API Air Emissions	0.084614	0.000609	0.000210	0.000034	0.000001	0.000003	0.000000	0.000031	-	-	-	-
TK-876 Air Emissions	0.001433	4.988180	1.779520	0.298903	0.010150	0.008863	0.000382	0.001544	-	-	-	-
PS6 Air Emissions	0.048062	0.004917	0.001697	0.000275	0.000011	0.000021	0.000000	0.000452	-	-	-	-
DNF WWTP2 Air Emissions	0.001323	0.000008	0.000003	0.000000	0.000000	0.000000	0.000000	0.000000	-	-	-	-
Tank A-699/Tank A-700 Air Emissions	0.012772	0.000082	0.000028	0.000005	0.000000	0.000000	0.000000	0.000004	-	-	-	-
DNF/Neutr. Tk Effluent Channel Air Stripper Emissions	8.414330	0.125415	0.043307	0.007039	0.000282	0.000534	0.000008	0.011453	-	-	-	-
Tank A-323 (S-323) Air Emissions	0.018003	0.015007	0.005195	0.000839	0.000030	0.000032	0.000001	0.000016	-	-	-	-
Surge Pond No. 1 Air Emissions	0.032483	0.956509	0.027418	2.745210	0.014011	0.014754	0.006756	0.005777	-	-	-	-
NTK-0106 Primary DAF Unit Air Emissions	0.000336	0.206351	0.071801	0.011561	0.000387	0.000327	0.000014	0.000063	-	-	-	-
Surge Pond No. 2 Air Emissions	0.000012	0.000801	0.000004	0.023665	0.000036	0.000023	0.000087	0.000001	-	-	-	-
NTK-0108 Primary DAF Effluent Tank Air Emissions	0.004331	3.101360	1.079560	0.174080	0.005835	0.004933	0.000211	0.000948	-	-	-	-
3rd Party Three-Phase Centrifuge Air Emissions	0.000201	0.000168	0.000058	0.000009	0.000000	0.000000	0.000000	0.000000	-	-	-	-
Oxidation Pond Air Emissions	0.000002	0.001553	0.000008	0.115976	0.000260	0.000350	0.000882	0.000005	-	-	-	-
Clarifier 1 Air Emissions	0.000000	0.000002	0.000000	0.000149	0.000000	0.000000	0.000001	0.000000	-	-	-	-
TK-432 MBBR Tank Air Emissions	0.024231	36.060400	5.303440	7.407120	0.136491	0.134648	0.011157	0.003540	-	-	-	-
Clarifier 2 Air Emissions	0.000000	0.000001	0.000000	0.000111	0.000000	0.000000	0.000001	0.000000	-	-	-	-
3rd Party Two-Phase Centrifuge Air Emissions	-	-	-	-	-	-	-	-	-	-	-	-
Filtering Air Emissions	-	-	-	0.000000	-	-	-	-	-	-	-	-
Coke Runoff Storage Pond Air Emissions	0.000000	0.000125	0.000001	0.011895	0.000028	0.000041	0.000101	0.000001	-	-	-	-

Table A.1-5 Stage 1 Wastewater Treatment Unit Daily Emissions

Air Effluent Summary (lb/day)

	Lead	Nickel	Zinc	Benzene	Ethylbenzene	Xylene	Naphthalene	Phenanthrene	Diethyl Phthalate	Cumene (Isopropylbenzene)	Cyclohexane	Diethanolamine
Neutralization Tank Air Emissions	-	-	-	0.831369	0.158414	0.260666	0.000001	0.001358	-	0.001002	7.110230	-
API Air Emissions	-	-	-	0.034729	0.015779	0.063266	0.003620	0.000086	0.000000	0.010725	0.000716	-
TK-876 Air Emissions	-	-	-	0.012622	0.003892	0.017828	0.000981	0.000011	0.000005	-	-	-
PS6 Air Emissions	-	-	-	0.058622	0.005746	0.054471	0.022455	0.001962	0.000000	0.000806	0.000004	0.000000
DNF WWTP2 Air Emissions	-	-	-	0.000527	0.000263	0.000963	0.000048	0.000001	-	0.000203	0.000061	-
Tank A-699/Tank A-700 Air Emissions	-	-	-	0.005044	0.002514	0.009485	0.000492	0.000012	0.000000	0.001894	0.000247	-
DNF/Neutr. Tk Effluent Channel Air Stripper Emissions	-	-	-	8.252760	1.614400	6.490160	0.640921	0.049720	0.000001	0.434773	1.757260	0.000000
Tank A-323 (S-323) Air Emissions	-	-	-	0.008196	0.005446	0.018801	0.000899	0.000017	0.000000	0.003189	0.000144	-
Surge Pond No. 1 Air Emissions	-	-	-	0.024877	0.001602	0.083874	0.104496	0.052854	0.000009	0.000104	0.000000	0.000000
NTK-0106 Primary DAF Unit Air Emissions	-	-	-	0.002652	0.003282	0.009993	0.000093	0.000001	0.000000	-	-	-
Surge Pond No. 2 Air Emissions	-	-	-	0.000003	0.000000	0.000099	0.000072	0.000420	0.000000	0.000000	0.000000	0.000000
NTK-0108 Primary DAF Effluent Tank Air Emissions	-	-	-	0.030384	0.037162	0.122888	0.001388	0.000009	0.000003	-	-	-
3rd Party Three-Phase Centrifuge Air Emissions	-	-	-	0.000092	0.000061	0.000210	0.000010	0.000000	0.000000	0.000036	0.000002	-
Oxidation Pond Air Emissions	-	-	-	0.000000	0.000000	0.000028	0.000042	0.002466	0.000000	0.000000	-	0.000000
Clarifier 1 Air Emissions	-	-	-	0.000000	0.000000	0.000000	0.000000	0.000004	0.000000	-	-	-
TK-432 MBBR Tank Air Emissions	-	-	-	0.087364	0.104249	0.504739	0.033498	0.000463	0.000114	-	-	-
Clarifier 2 Air Emissions	-	-	-	0.000000	0.000000	0.000000	0.000000	0.000002	-	-	-	-
3rd Party Two-Phase Centrifuge Air Emissions	-	-	-	-	-	-	-	-	-	-	-	-
Filtering Air Emissions	-	-	-	-	-	-	-	-	-	-	-	-
Coke Runoff Storage Pond Air Emissions	-	-	-	0.000000	0.000000	0.000002	0.000004	0.000277	0.000000	0.000000	-	0.000000

Table A.1-5 Stage 1 Wastewater Treatment Unit Daily Emissions

Air Effluent Summary (lb/day)

	Hexane(-N)	Trimethylbenzene,1,2,4-	Hydrogen Sulfide	Acenaphthene	Chloroform (Trichloromethane)	Cresol	Dimethylphenol,2,4-	Ethanolamine(Mono-)	Fluorene	Methyl Tert-Butyl Ether
Neutralization Tank Air Emissions	-	0.001839	-	-	0.004107	0.002325	2.674790	-	-	0.000337
API Air Emissions	0.009754	0.000212	0.115123	0.000188	0.003492	0.000015	0.052433	0.000000	0.000117	0.000167
TK-876 Air Emissions	-	-	-	-	-	-	-	-	-	-
PS6 Air Emissions	0.000000	0.000986	0.056681	0.001374	0.002671	0.002481	0.436270	0.000001	0.000924	0.001198
DNF WWTP2 Air Emissions	0.001940	0.000003	0.001776	0.000002	0.000052	0.000000	0.000756	0.000000	0.000002	0.000002
Tank A-699/Tank A-700 Air Emissions	0.005504	0.000030	0.016609	0.000025	0.000498	0.000002	0.007474	0.000000	0.000016	0.000023
DNF/Neutr. Tk Effluent Channel Air Stripper Emissions	0.086195	0.049239	7.732580	0.036310	0.288220	0.063464	31.913800	0.000013	0.023689	0.035636
Tank A-323 (S-323) Air Emissions	0.001230	0.000053	0.034469	0.000042	0.001152	0.000005	0.002588	0.000000	0.000025	0.000053
Surge Pond No. 1 Air Emissions	0.000000	0.001157	0.201842	0.015059	0.015565	0.006363	0.378817	0.000389	0.011020	0.021798
NTK-0106 Primary DAF Unit Air Emissions	-	-	-	-	-	-	-	-	-	-
Surge Pond No. 2 Air Emissions	-	0.000001	0.000260	0.000037	0.000040	0.000000	0.000083	0.000004	0.000033	0.000022
NTK-0108 Primary DAF Effluent Tank Air Emissions	-	-	-	-	-	-	-	-	-	-
3rd Party Three-Phase Centrifuge Air Emissions	0.000010	0.000001	0.000385	0.000000	0.000013	0.000000	0.000029	0.000000	0.000000	0.000001
Oxidation Pond Air Emissions	-	0.000000	0.000024	0.000054	0.000004	0.000002	0.000013	0.000045	0.000089	0.000004
Clarifier 1 Air Emissions	-	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
TK-432 MBBR Tank Air Emissions	-	-	-	-	-	-	-	-	-	-
Clarifier 2 Air Emissions	-	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3rd Party Two-Phase Centrifuge Air Emissions	-	-	-	-	-	-	-	-	-	-
Filtering Air Emissions	-	-	-	-	-	-	-	-	-	-
Coke Runoff Storage Pond Air Emissions	-	0.000000	0.000002	0.000006	0.000000	0.000000	0.000001	0.000005	0.000010	0.000000

Table A.1-5 Stage 1 Wastewater Treatment Unit Daily Emissions

Air Effluent Summary (lb/day)

	Methyl Chloride (Chloromethane)	Methylnaphthalene,2-	Phenol	Dichloropropene(1,3)
Neutralization Tank Air Emissions	0.018032	-	0.001030	0.002226
API Air Emissions	0.001864	0.010992	0.000035	0.000781
TK-876 Air Emissions	-	-	-	-
PS6 Air Emissions	0.000422	0.070303	0.001337	0.001115
DNF WWTP2 Air Emissions	0.000030	0.000146	0.000000	0.000011
Tank A-699/Tank A-700 Air Emissions	0.000259	0.001496	0.000005	0.000110
DNF/Neutr. Tk Effluent Channel Air Stripper Emissions	0.166641	1.983630	0.034197	0.088548
Tank A-323 (S-323) Air Emissions	0.000445	0.002506	0.000012	0.000237
Surge Pond No. 1 Air Emissions	0.000814	3.714590	0.004774	0.004259
NTK-0106 Primary DAF Unit Air Emissions	-	-	-	-
Surge Pond No. 2 Air Emissions	0.000001	0.087774	0.000000	0.000004
NTK-0108 Primary DAF Effluent Tank Air Emissions	-	-	-	-
3rd Party Three-Phase Centrifuge Air Emissions	0.000005	0.000028	0.000000	0.000003
Oxidation Pond Air Emissions	0.000000	0.084268	0.000002	0.000000
Clarifier 1 Air Emissions	0.000000	0.000294	0.000000	0.000000
TK-432 MBBR Tank Air Emissions	-	-	-	-
Clarifier 2 Air Emissions	-	0.000093	0.000000	0.000000
3rd Party Two-Phase Centrifuge Air Emissions	-	0.000000	-	-
Filtering Air Emissions	-	0.000000	-	-
Coke Runoff Storage Pond Air Emissions	0.000000	0.008604	0.000000	0.000000

Table A.2-1 Offsite Heater Emission Calculations

Quantity	Value	Units	Reference
Max Firing Rate:	10.00	MMBtu/hr	Engineering estimate
Fuel HHV:	959	Btu/scf	Engineering estimate
Fuel sulfur:	162	ppm S	NSPS Subpart J Limit
MVC	387	scf @70 degF/lb-mol	BAAQMD Guidance, Table 5.4-1
CO2 emission factor:	63	kg/MMBtu	Engineering estimate
Hours of Operation:	24	hr/day	
	8760	hr/yr	

Pollutant	Emission Factor	Units	Potential Emissions (lb/day) [1]	Potential Emissions (tpy) [2]	Emission Factor Reference
PM	1.86E-03	lb/MMBtu	0.45	8.16E-02	AP-42 Section 1.4
PM_{10}	7.45E-03	lb/MMBtu	1.79	0.33	AP-42 Section 1.4
$PM_{2.5}$	7.45E-03	lb/MMBtu	1.79	0.33	AP-42 Section 1.4
NO_X	1.21E-02	lb/MMBtu	2.90	0.53	Assume 10 ppmv NOx limit, BACT
CO	2.26E-01	lb/MMBtu	54.28	9.91	Assume 50 ppmv CO Limit, BACT
SO_2	2.80E-02	lb/MMBtu	6.71	1.23	Eng. Estimate [3]
H_2SO_4	2.95E-05	lb/MMBtu	7.08E-03	0.00	Eng. Estimate
POC	6.86E-03	lb/MMBtu	1.65	0.30	AP-42 Section 1.4
CO_2	138.83	lb/MMBtu	33,320	6,081	CARB report (CC,MW)
CH_4	7.76E-03	lb/MMBtu	1.86	0.34	CARB report (default EF)
N_2O	1.55E-03	lb/MMBtu	0.37	6.79E-02	CARB report (default EF)
GHG (mass)	138.84	lb/MMBtu	33,322	6,081	Calculated
GHG (CO_2e)	139.48	lb/MMBtu	33,474	6,109	CARB GWP Factors

Notes:
Emissions for potential offsite heater have been estimated based on AP-42, BACT and engineering estimates, consistent with the approach described in the permit applicationfor the Martinez Renewable Fuels Project.

[1] Potential Emissions (lb/day) = Emission Factor (lb/MMBtu) x Max Firing Rate (MMBtu/hr) x Hours of Operation (hr/day)
[2] Potential Emissions (tpy) = Emission Factor (lb/MMBtu) x Max Firing Rate (MMBtu/hr) x Hours of Operation (hr/yr) / 2000 lb/ton
[3] SO2 lb/MMBtu = Total S ppm x MW SO2 lb/lb-mol / MVC scf/lb-mol / HHV Btu/scf
[4] NOx lb/MMBtu = Total NOx ppm / 1000000 x MW NO2 lb/lb-mol / MVC scf/lb-mol x Fd x 20.9/(20.9-%O2)

[1] Potential Emissions (lb/hr) = Emission Factor (lb/MMscf) / Fuel HHV (Btu/scf) x Max Firing Rate (MMBtu/hr)
[2] Potential Emissions (lb/yr) = Potential Emissions (lb/hr) x Hours of Operation (hr/yr)

Table A.2-2 - Offsite Renewable Feedstock Storage Tank Emission Calculations

Tank Number	Tank Type	Month	Working Volume (bbl)	Stored Liquid	Vapor Pressure at Average Liquid Surface Temperature (psia)	Throughput, bbl/Month	Turnovers	Fixed Roof Tanks: Total Routine Losses For Fixed Roof Tanks (lbs/month)	Fixed Roof Tanks: Total Standing Losses for Fixed Roof Tanks (lbs/month)	Fixed Roof Tanks: Working Loss (lb/month)	Total VOC (lb/month)
Offsite Tank	Vertical Fixed Roof Tank	January	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	February	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	March	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	April	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	May	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	June	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	July	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	August	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	September	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	October	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	November	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Offsite Tank	Vertical Fixed Roof Tank	December	30,000	Renewable Feedstock	0.0040	203,157	6.77	110.06	--	110.06	110.06
Annual Total:											**1,320.69**

Notes:

Emissions for offsite tank have been estimated based on the renewable feedstock properties defined for the Martinez Renewable Fuels Project feedstock tanks. Throughput is estimated based on the average turnovers expected by the Martinez RFP tanks, for the proposed 30,000 bbl offsite tank.

Table A.2-3 Offsite Renewable Feedstock Loading Emission Calculations

Source ID	Source Description	Vessel Type	Material	Potential Loaded bbl/yr	S	P (psia)	MWv (lb/lb-mol)	T (degF)	Uncontrolled EF (lb/Mgal)	Control Eff	Collection Eff.	Controlled EF (lb/Mgal)	EF Basis	PTE POC lb/yr
	SJVAPCD Terminal	Barge	Renewable Feedstock	9,672,500	0.5	0.0040001	285	140	1.184E-02	0.00%	0.0%	0.012	AP-42 Eqn 5.2 (1)	4,809
													Tons/year:	2.40

Notes:
No capture or control require for loading renewable feedstock.
- AP-42 Eqn 5.2(1) emission factors calculated as follows:

Loading loss equation -

$$L_L = 12.46 \frac{SPM}{T}\left(1 - \frac{eff}{100}\right)$$

where:

S = saturation factor (see Table 5.2-1) - 1.00
P = true vapor pressure of gasoline = 6.6 psia
M = molecular weight of gasoline vapors = 66
T = temperature of gasoline = 540°R
eff = overall reduction efficiency (95 percent control x 98.7 percent collection) = 94 percent

- Renewable feedstock vapor pressure and vapor molecular weight based on values used for tank emissions.
-Volume of renewable feedstock transported by barge as estimated in Appendix B of the CEQA Air Technical Study.

Table A.2-4 Offsite Emissions - Fugitive Component Estimate from Feedstock Tanks to Wharf Loading

% POC: **85.96%**

Fugitive Emission Source Count Summary

	Estimate
Valves:	
Gas / Vapor	
Light Liquid	
Heavy Liquid	715
Equipment:	
Flanges/Connectors	2138
PSV's	35
Compressors	0
Pumps (Light Liquids)	8
Pumps (Heavy Liquids)	10
Process Drains	0

Emission Factors[1]

Type	Service	Screening Value[2] (ppm)	Component Type by Table IV-3a Definition	Correlation Equation Constant	Correlation Equation Exponent	Correlation Equation (kg/hr)
Compressor	Gas / Vapor	500	Other	8.69E-06	0.642	4.70E-04
Connector	Gas / Vapor	100	Connector	1.53E-06	0.736	4.54E-05
Connector	Light Liquid	100	Connector	1.53E-06	0.736	4.54E-05
Connector	Heavy Liquid	100	Connector	1.53E-06	0.736	4.54E-05
Flange	Gas / Vapor	100	Flange	4.53E-06	0.706	1.17E-04
Flange	Light Liquid	100	Flange	4.53E-06	0.706	1.17E-04
Flange	Heavy Liquid	100	Flange	4.53E-06	0.706	1.17E-04
Pressure Relief Valve	Gas / Vapor	500	Other	8.69E-06	0.642	4.70E-04
Pressure Relief Valve	Light Liquid	500	Other	8.69E-06	0.642	4.70E-04
Pressure Relief Valve	Heavy Liquid	500	Other	8.69E-06	0.642	4.70E-04
Pump	Light Liquid	500	Pump Seal	5.07E-05	0.622	2.42E-03
Pump	Heavy Liquid	500	Pump Seal	5.07E-05	0.622	2.42E-03
Valve	Gas / Vapor	100	Valve	2.27E-06	0.747	7.08E-05
Valve	Light Liquid	100	Valve	2.27E-06	0.747	7.08E-05
Valve	Heavy Liquid	100	Valve	2.27E-06	0.747	7.08E-05
Drain	All	100	Other	8.69E-06	0.642	1.67E-04
Other	All	100	Other	8.69E-06	0.642	1.67E-04

[1]*California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks* Table IV-3a CAPCOA - Revised 1995 EPA Correlation Equations and Factors for Refineries
[2]Screening values reflect leak thresholds defined in BAAQMD Regulation 8-18: Equipment Leaks.

Fugitive VOC Emission Summary

	Potential Emission Factor (kg/hour/source)	VOC Total: (lb/hr)	VOC Total: (lb/day)	VOC Total: (lb/year)	VOC Total: (tpy)	POC Total: (tpy)
Valves:						
Gas/Vapor	7.08E-05	0.000	0.000	0.000	0.000	0.000
Light Liquid	7.08E-05	0.000	0.000	0.000	0.000	0.000
Heavy Liquid	7.08E-05	0.112	2.678	977.610	0.489	0.420
Equipment:						
Connectors	4.54E-05	0.214	5.131	1872.980	0.936	0.805
PSV's	4.70E-04	0.036	0.870	317.439	0.159	0.136
Compressors	4.70E-04	0.000	0.000	0.000	0.000	0.000
Pumps (Light Liquids)	2.42E-03	0.043	1.024	373.845	0.187	0.161
Pumps (Heavy Liquids)	2.42E-03	0.053	1.280	467.306	0.234	0.201
Process Drains	1.67E-04	0.000	0.000	0.000	0.000	0.000
Totals		**0.458**	**10.984**	**4009.180**	**2.005**	**1.723**

[3] Effective weight fraction calculated based upon current speciation of all components within existing process unit. This speciation is expected to be conservative due to lower TAC presence in renewable feedstock and processing compared to crude oil processing.
[4]Estimated component count based on piping connections at the Avon Wharf.
[5]Assume renewable feedstock is in heavy liquid service for purposes of emission estimation.

Table A.2-5 - Offsite Emissions - Potential Actual Emissions Calculations for Air Products Reformer Furnace

Quantity	Value	Units	Reference
Natural gas combustion:	2,202,454	MMBtu/yr	Engineering estimate
Hours of Operation:	8760	hr/yr	

Pollutant	Emission Factor	Units	Projected Actual Emissions (tpy) [1]	Emission Factor Reference
PM	3.00E-04	lb/MMBtu	0.33	Same as PM10
PM_{10}	3.00E-04	lb/MMBtu	0.33	2013 Source Test
$PM_{2.5}$	3.00E-04	lb/MMBtu	0.33	Same as PM10
NO_X	8.77E-03	lb/MMBtu	9.66	CEMS
CO	1.75E-03	lb/MMBtu	1.93	CEMS
SO_2	2.80E-03	lb/MMBtu	3.08	PG&E contract max fuel sulfur 1 gr S/100 scf
H_2SO_4	2.96E-06	lb/MMBtu	3.26E-03	Eng. Estimate
POC	1.10E-04	lb/MMBtu	0.12	2013 Source Test
CO_2	275.98	lb/MMBtu	303,918.22	CEMS
CH_4	2.20E-03	lb/MMBtu	2.43	Default EF
N_2O	2.20E-04	lb/MMBtu	0.24	Default EF
GHG (mass)	275.98	lb/MMBtu	303,920.89	Calculated
GHG (CO_2e)	276.10	lb/MMBtu	304,044.47	CARB GWP Factors

[1] Potential Emissions (tpy) = Emission Factor (lb/MMBtu) x Max Firing Rate (MMBtu/hr) x Hours of Operation (hr/yr) / 2000 lb/ton

Appendix B

Mobile Source Emissions Summaries

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Table B-1 Mobile Source - Truck Transport Project Summary
Project Summary

Daily Emissions

				Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
Scenario	**Region**	**Average Daily Number of Trucks**	**Average Daily Miles Travelled**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	205	10,668	65.48	0.30	16.62	1.60	6.36	1.57				
	On-Site		692	14.12	0.04	12.39	0.90	10.49	1.62	(Not Applicable)			
	Total BAAQMD			*79.60*	*0.34*	*29.01*	*2.49*	*16.86*	*3.18*				
Post-Project	BAAQMD	181	13,081	76.65	0.37	16.21	1.66	7.80	1.92				
	On-Site		602	12.40	0.03	10.91	0.79	9.13	1.41	(Not Applicable)			
	Total BAAQMD			*89.05*	*0.40*	*27.12*	*2.46*	*16.93*	*3.32*				
Delta:	BAAQMD	**-24**	**2,413**	**11.17**	**0.06**	**-0.41**	**0.07**	**1.44**	**0.35**				
	On-Site		**-90**	**-1.72**	**0.00**	**-1.48**	**-0.11**	**-1.37**	**-0.21**	(Not Applicable)			
	Total BAAQMD			*9.45*	*0.06*	*(1.89)*	*(0.04)*	*0.07*	*0.14*				

Annual Emissions

				Criteria Pollutant Emissions (Tons/Yr)						GHG Emissions (Metric Tons/Yr)			
Scenario	**Region**	**Total Number of Trucks**	**Total Miles Travelled**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	74,784	3,893,730	11.95	0.06	3.03	0.29	1.16	0.29				
	On-Site		252,629	2.58	0.01	2.26	0.16	1.92	0.30				
	Total BAAQMD		4,146,359	*14.53*	*0.06*	*5.29*	*0.46*	*3.08*	*0.58*				
	California									7,213.36	0.02	1.13	7,565.30
Post-Project	BAAQMD	65,894	4,774,525	13.99	0.07	2.96	0.30	1.42	0.35				
	On-Site		219,720	2.26	0.01	1.99	0.14	1.67	0.26				
	Total BAAQMD			*16.25*	*0.07*	*4.95*	*0.45*	*3.09*	*0.61*				
	California									14,444.83	0.03	2.27	15,149.33
Delta:	BAAQMD	**-8,890**	**880,795**	**2.04**	**0.01**	**-0.08**	**0.01**	**0.26**	**0.06**				
	On-Site		**-32,910**	**-0.31**	**0.00**	**-0.27**	**-0.02**	**-0.25**	**-0.04**				
	Total BAAQMD			*1.73*	*0.01*	*(0.35)*	*(0.01)*	*0.01*	*0.03*				
	California									**7,231.47**	**0.01**	**1.14**	**7,584.03**

Notes:
1. Criteria Pollutant Emissions based on travel within Bay Area Air Quality Management District (BAAQMD).
2. Greenhouse Gas (GHG) Emissions based on statewide travel.
3. Pre-Project Average Annual emissions have been adjusted based on truck activity from October 2015 - September 2020.
4. Pre-Project and post-project emissions are based on 2022 - 2024 average emission factors.
5. Region-based subtotals: "BAAQMD" represents the total travel and associated emissions within BAAQMD, but off-site from the facility.

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Table B-2a Mobile Source - Truck Transport Pre-Project Product Transportation Estimates

Operating Year: Pre-Project Average October 2015 - September 2020

Truck Transportation

	Receipt by Route		Deliveries by Route					Miles/Round Trip											
Commodity	**Volume/ Day**	**Volume/ Year**	**Volume/ Day**	**Volume/ Year**	**Units**	**Fraction of Trips on Route**	**Truck Route**	**California**	**BAAQMD**	**Butte**	**Feather River**	**Mojave Desert**	**Monterey Bay**	**Northern Sierra**	**Placer**	**Sacramento**	**San Joaquin Valley**	**South Coast**	**Yolo-Solano**
Gasoline	-	-	11	3,872	kbbl	0.9	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Gasoline	-	-	1	430	kbbl	0.1	San Jose	120	120	-	-	-	-	-	-	-	-	-	-
Bio Diesel	0.0	18	-	-	kbbl	1	Richmond	48	48	-	-	-	-	-	-	-	-	-	-
Diesel	-	-	3	991	kbbl	1	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Propane	-	-	1	262	kbbl	0.3	Fairfield	46	46	-	-	-	-	-	-	-	-	-	-
Propane	-	-	0.2	87	kbbl	0.1	Fairfield	46	46	-	-	-	-	-	-	-	-	-	-
Propane	-	-	0.2	87	kbbl	0.1	Elk Grove Terminal	152	54	-	-	-	-	-	-	30	-	-	68
Propane	-	-	0.2	87	kbbl	0.1	Rocklin Terminal	169	54	-	-	-	-	-	13	34	-	-	68
Propane	-	-	0.2	87	kbbl	0.1	Salinas Terminal	226	188	-	-	-	38	-	-	-	-	-	-
Propane	-	-	0.2	87	kbbl	0.1	Watsonville Terminal	200	140	-	-	-	60	-	-	-	-	-	-
Propane	-	-	0.2	87	kbbl	0.1	Modesto Terminal	162	94	-	-	-	-	-	-	-	68	-	-
Propane	-	-	0.2	87	kbbl	0.1	Oroville Terminal	256	54	30	82	-	-	-	-	22	-	-	68
Ethanol	1.2	430	-	-	kbbl	1	Richmond	48	48	-	-	-	-	-	-	-	-	-	-
Miscellaneous	4.9	1,784	-	-	kbbl	0.9	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Miscellaneous	0.5	198	-	-	kbbl	0.1	San Jose	120	120	-	-	-	-	-	-	-	-	-	-
Ammonia	-	-	32.2	11,749	Tons	1	Fresno	356	70	-	-	-	-	-	-	-	286	-	-
Petroleum Coke	-	-	1825	666,025	MT	1	Pittsburg	30	30	-	-	-	-	-	-	-	-	-	-
Molten Sulfur	-	-	85	30,984	LT	0.67	Stockton	106	70	-	-	-	-	-	-	-	36	-	-
Molten Sulfur	-	-	42	15,261	LT	0.33	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Sulfuric Acid	-	-	101	36,784	tons	1	Wyoming	358	50	-	-	-	-	70	140	32	-	-	66
Total Miles/ Round Trip:								**2,684**	**1,472**	**30**	**82**	**-**	**98**	**70**	**153**	**118**	**390**	**-**	**271**

	Truck Capacity		Number Trucks					Annual Total Trucks											
Commodity	**(Unit/ Truck)**	**Units**	**Annual**	**Onsite Location**			**Truck Route**	**California**	**BAAQMD**	**Butte**	**Feather River**	**Mojave Desert**	**Monterey Bay**	**Northern Sierra**	**Placer**	**Sacramento**	**San Joaquin Valley**	**South Coast**	**Yolo-Solano**
Gasoline	200	bbl	19,359	Gasoline LR			East Bay	19,359	19,359	-	-	-	-	-	-	-	-	-	-
Gasoline	200	bbl	2,151	Gasoline LR			San Jose	2,151	2,151	-	-	-	-	-	-	-	-	-	-
Bio Diesel	200	bbl	89	Gasoline LR			Richmond	89	89	-	-	-	-	-	-	-	-	-	-
Diesel	200	bbl	4,957	Gasoline LR			East Bay	4,957	4,957	-	-	-	-	-	-	-	-	-	-
Propane	200	bbl	1,309	LNG LR			Fairfield	1,309	1,309	-	-	-	-	-	-	-	-	-	-
Propane	200	bbl	437	LNG LR			Fairfield	437	437	-	-	-	-	-	-	-	-	-	-
Propane	200	bbl	437	LNG LR			Elk Grove Terminal	437	437	-	-	-	-	-	-	437	-	-	437
Propane	200	bbl	437	LNG LR			Rocklin Terminal	437	437	-	-	-	-	-	437	437	-	-	437
Propane	200	bbl	437	LNG LR			Salinas Terminal	437	437	-	-	-	437	-	-	-	-	-	-
Propane	200	bbl	437	LNG LR			Watsonville Terminal	437	437	-	-	-	437	-	-	-	-	-	-
Propane	200	bbl	437	LNG LR			Modesto Terminal	437	437	-	-	-	-	-	-	-	437	-	-
Propane	200	bbl	437	LNG LR			Oroville Terminal	437	437	437	437	-	-	-	-	437	-	-	437
Ethanol	200	bbl	2,148	Gasoline LR			Richmond	2,148	2,148	-	-	-	-	-	-	-	-	-	-
Miscellaneous	200	bbl	8,923	Misc			East Bay	8,923	8,923	-	-	-	-	-	-	-	-	-	-
Miscellaneous	200	bbl	992	Misc			San Jose	992	992	-	-	-	-	-	-	-	-	-	-
Ammonia	25	Tons	470	Chem Plant			Fresno	470	470	-	-	-	-	-	-	-	470	-	-
Petroleum Coke	24	MT	27,752	Misc			Pittsburg	27,752	27,752	-	-	-	-	-	-	-	-	-	-
Molten Sulfur	22	LT	1,409	Chem Plant			Stockton	1,409	1,409	-	-	-	-	-	-	-	1,409	-	-
Molten Sulfur	22	LT	694	Chem Plant			East Bay	694	694	-	-	-	-	-	-	-	-	-	-
Sulfuric Acid	25	tons	1,472	Chem Plant			Wyoming	1,472	1,472	-	-	-	-	1,472	1,472	1,472	-	-	1,472
Total Annual Trips:			**74,784**					**74,784**	**74,784**	**437**	**437**	**-**	**874**	**1,472**	**1,909**	**2,783**	**2,316**	**-**	**2,783**

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Table B-2a Mobile Source - Truck Transport Pre-Project Product Transportation Estimates

Operating Year: Pre-Project Average October 2015 - September 2020

Truck Transportation

Commodity		Onsite Miles	Onsite Entrance	Onsite Location	Onsite		Truck Route	Annual Total Miles California	BAAQMD	Butte	Feather River	Mojave Desert	Monterey Bay	Northern Sierra	Placer	Sacramento	San Joaquin Valley	South Coast	Yolo-Solano
Gasoline		5.2	Both	Gasoline LR	62,259		East Bay	1,161,540	1,161,540	-	-	-	-	-	-	-	-	-	-
Gasoline		5.2	Both	Gasoline LR	6,918		San Jose	258,120	258,120	-	-	-	-	-	-	-	-	-	-
Bio Diesel		5.2	Both	Gasoline LR	286		Richmond	4,272	4,272	-	-	-	-	-	-	-	-	-	-
Diesel		5.2	Both	Gasoline LR	15,942		East Bay	297,420	297,420	-	-	-	-	-	-	-	-	-	-
Propane		0.6	North	LNG LR	785		Fairfield	60,214	60,214	-	-	-	-	-	-	-	-	-	-
Propane		0.6	North	LNG LR	262		Fairfield	20,102	20,102	-	-	-	-	-	-	-	-	-	-
Propane		0.6	North	LNG LR	262		Elk Grove Terminal	66,511	23,598	-	-	-	-	-	-	13,110	-	-	29,803
Propane		0.6	North	LNG LR	262		Rocklin Terminal	74,028	23,598	-	-	-	-	-	5,768	14,858	-	-	29,803
Propane		0.6	North	LNG LR	262		Salinas Terminal	98,762	82,156	-	-	-	16,606	-	-	-	-	-	-
Propane		0.6	North	LNG LR	262		Watsonville Terminal	87,400	61,180	-	-	-	26,220	-	-	-	-	-	-
Propane		0.6	North	LNG LR	262		Modesto Terminal	70,794	41,078	-	-	-	-	-	-	-	29,716	-	-
Propane		0.6	North	LNG LR	262		Oroville Terminal	111,959	23,598	13,110	35,834	-	-	-	-	9,614	-	-	29,803
Ethanol		5.2	Both	Gasoline LR	6,908		Richmond	103,104	103,104	-	-	-	-	-	-	-	-	-	-
Miscellaneous		3.8	South	Misc	33,907		East Bay	535,380	535,380	-	-	-	-	-	-	-	-	-	-
Miscellaneous		3.8	South	Misc	3,770		San Jose	119,040	119,040	-	-	-	-	-	-	-	-	-	-
Ammonia		3.6	South	Chem Plant	1,692		Fresno	167,320	32,900	-	-	-	-	-	-	-	134,420	-	-
Petroleum Coke		3.8	South	Misc	105,458		Pittsburg	832,560	832,560	-	-	-	-	-	-	-	-	-	-
Molten Sulfur		3.6	South	Chem Plant	5,072		Stockton	149,354	98,630	-	-	-	-	-	-	-	50,724	-	-
Molten Sulfur		3.6	South	Chem Plant	2,498		East Bay	41,640	41,640	-	-	-	-	-	-	-	-	-	-
Sulfuric Acid		3.6	South	Chem Plant	5,299		Wyoming	526,976	73,600	-	-	-	-	103,040	206,080	47,104	-	-	97,152
Total Annual Miles:					**252,629**			**4,786,497**	**3,893,730**	**13,110**	**35,834**	**-**	**42,826**	**103,040**	**211,848**	**84,686**	**214,860**	**-**	**186,562**

Notes:

1. Fraction of Trips on Route as estimated by the facility. These fractions represent the portion of each commodity that is received from, or delivered to multiple locations, in order to account for the truck mileage associated with the different routes traveled.
2. Onsite Entrance and Onsite Miles - identifies the area of the facility that trucks will enter, and the estimated onsite miles traveled to the intended loading/unloading rack. The facility has a north and south entrance which may be used by trucks. As noted in the table above, some commodities will be brought in via either entrance; as such the onsite mileage has been adjusted accordingly assuming 40% exit through the north and 60% exit through the south gate.
3. Trips are assumed to haved occured daily, 365 days per year.
4. Baseline assumptions: used annual trucking data from 2015 - 2020, assuming the baseline begins in the quarter of 2015 (October 2015) and ends in the third quarter of 2020 (September 2020).

Baseline Assumptions:

2015	0.25
2016	1
2017	1
2018	1
2019	1
2020	0.75

Table B-2b Mobile Source - Truck Transport Pre-Project Emissions

Operating Year: Pre-Project Average October 2015 - September 2020

Daily Emissions

Region	Road Type	Daily Average Trips:	Daily Average Miles:	Criteria Pollutant Emissions (Pounds/Day) POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	GHG Emissions (Pounds/Day) CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	205	10,668	1.60	0.30	65.48	16.62	6.36	1.57				
On-Site	Local	205	692	0.90	0.04	14.12	12.39	10.49	1.62				
Butte	Freeway	1	36	0.01	0.00	0.25	0.09	0.02	0.01				
Feather River	Freeway	1	98	0.01	0.00	0.57	0.11	0.06	0.01				
Mojave Desert	Freeway	-	-	--	--	--	--	--	--				
Monterey Bay	Freeway	2	117	0.02	0.00	0.73	0.19	0.07	0.02				
Northern Sierra	Freeway	4	282	0.04	0.01	1.66	0.36	0.17	0.04				
Placer	Freeway	5	580	0.06	0.02	3.26	0.55	0.35	0.09				
Sacramento	Freeway	8	232	0.05	0.01	1.59	0.55	0.14	0.03				
San Joaquin Valley	Freeway	6	589	0.07	0.02	3.36	0.62	0.35	0.09				
South Coast	Freeway	-	-	--	--	--	--	--	--				
Yolo-Solano	Freeway	8	511	0.07	0.01	3.02	0.67	0.30	0.07				
Total Daily:				**2.81**	**0.41**	**94.03**	**32.15**	**18.32**	**3.54**	**Not Applicable**			
Total BAAQMD:				**1.60**	**0.30**	**65.48**	**16.62**	**6.36**	**1.57**				

Annual Emissions

Region	Type	Total Annual Trips:	Total Annual Miles:	Criteria Pollutant Emissions (Tons/Yr) POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	GHG Emissions (Metric Tons/Yr) CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	74,784	3,893,730	0.29	0.06	11.95	3.03	1.16	0.29	5,335.29	0.01	0.84	5,596
On-Site	Local	74,784	252,629	0.16	0.01	2.58	2.26	1.92	0.30	674.17	0.01	0.11	707
Butte	Freeway	437	13,110	0.00	0.00	0.05	0.02	0.00	0.00	18.83	0.00	0.00	20
Feather River	Freeway	437	35,834	0.00	0.00	0.10	0.02	0.01	0.00	47.92	0.00	0.01	50
Mojave Desert	Freeway	-	-	--	--	--	--	--	--	--	--	--	0
Monterey Bay	Freeway	874	42,826	0.00	0.00	0.13	0.03	0.01	0.00	58.92	0.00	0.01	62
Northern Sierra	Freeway	1,472	103,040	0.01	0.00	0.30	0.07	0.03	0.01	138.81	0.00	0.02	146
Placer	Freeway	1,909	211,848	0.01	0.00	0.59	0.10	0.06	0.02	280.15	0.00	0.04	294
Sacramento	Freeway	2,783	84,686	0.01	0.00	0.29	0.10	0.03	0.01	121.46	0.00	0.02	127
San Joaquin Valley	Freeway	2,316	214,860	0.01	0.00	0.61	0.11	0.06	0.02	285.91	0.00	0.04	300
South Coast	Freeway	-	-	--	--	--	--	--	--	--	--	--	0
Yolo-Solano	Freeway	2,783	186,562	0.01	0.00	0.55	0.12	0.06	0.01	251.88	0.00	0.04	264
Total Annual:				**0.51**	**0.08**	**17.16**	**5.87**	**3.34**	**0.65**	**7,213.36**	**0.02**	**1.13**	**7,565.30**
Total BAAQMD:				**0.29**	**0.06**	**11.95**	**3.03**	**1.16**	**0.29**	**5335.29**	**0.01**	**0.84**	**5595.53**

T7 Tractor Diesel Truck Emission Factors (EMFAC2017).

Exhaust Source	**Road Type**		**Units**	Emission Factors **POC**	**NOx**	PM_{10}	$PM_{2.5}$	**CO**	SO_2	CO_2	CH_4	N_2O
Running Exhaust			lb/mile	0.00007	0.00515	0.00007	0.00007	0.00042	0.00003	2.82224	0.00000	0.00044
Idle Exhaust			lb/vehicle/day	0.00415	0.05150	0.00002	0.00002	0.05904	0.00010	10.34072	0.00019	0.00163

Table B-2b Mobile Source - Truck Transport Pre-Project Emissions

Operating Year: Pre-Project Average October 2015 - September 2020

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	Road Type	ADT	Reference	Symbol	Value	Unit	PM_{10}	$PM_{2.5}$
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM Data	W	10.41	tons		

Paved Road Dust Entrainment

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

Notes:

1. Trip distances assume:
   a. Estimated distances to various locations of commodity transport with estimated percentage of total commodity transport to each location.
   b. Onsite distances estimated based on locations products are delivered to within the facility.

2. EMFAC2017 criteria pollutant and GHG emission factors for T7 Tractor engines are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed September 24, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

   a. Vehicle Category based on EMFAC2011 vehicle definitions, applied the T7 Tractor vehicle type.
   b. Criteria pollutant emission factors include total emissions for each pollutant. In addition to running exhaust emissions, emission factors include idle exhaust emissions. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.
   c. PM_{10} and $PM_{2.5}$ from on-road vehicle paved road dust entrainment emission factors are included in the total emissions for the each trip segmented as documented above.
   d. Vehicle emissions based on the reported "emission rate" data for the specified vehicle category. This data is reported in terms of g/mile (running exhaust) and g/vehicle/day (idle exhaust). Note that emissions data for running exhaust is based on individual vehicle speeds, grouped by "Road Type". Idle Exhuast data is only reported by CARB for aggregated vehicle speeds, so each Road Type/Vehicle speed is assumed to have the same idle exhaust value.

3. Fleet size is estimated based on actual volumes of each commodity transported or based on available data on actual truck trips from the baseline period between 2015 and 2020.

4. Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.*
   a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* .
   b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

5. Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

6. Conversion factors:
Global warming potential for methane: 21
Global warming potential for nitrous oxide: 310
2,000 pounds/ton
0.45359 kilograms/pound)
1,000 kilograms/metric ton

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Table B-3a Mobile Source - Truck Transport Post-Project Product Transportation Estimates

Truck Transportation

	Receipt by Route		Deliveries by Route					Miles/Round Trip											
Commodity	**Volume/ Day**	**Volume/ Year**	**Volume/ Day**	**Volume/ Year**	**Units**	**Fraction of Trips on Route**	**Truck Route**	**California**	**BAAQMD**	**Butte**	**Feather River**	**Mojave Desert**	**Monterey Bay**	**Northern Sierra**	**Placer**	**Sacramento**	**San Joaquin Valley**	**South Coast**	**Yolo-Solano**
Gasoline	-	-	7	2,628	kbbl	0.9	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Gasoline	-	-	1	292	kbbl	0.1	San Jose	120	120	-	-	-	-	-	-	-	-	-	-
Renewable Diesel	-	-	2	548	kbbl	0.075	Chico Terminal	277	55	63	75	-	-	-	-	-	-	-	83
Renewable Diesel	-	-	2	548	kbbl	0.075	Bradshaw Terminal	145	53	-	-	-	-	-	-	22	-	-	69
Renewable Diesel	-	-	5	1,643	kbbl	0.225	Stockton Terminal	101	76	-	-	-	-	-	-	-	25	-	-
Renewable Diesel	-	-	2	548	kbbl	0.075	San Jose Terminal	103	103	-	-	-	-	-	-	-	-	-	-
Renewable Diesel	-	-	8	2,920	kbbl	0.4	Fresno Terminal	362	91	-	-	-	-	-	-	-	271	-	-
Renewable Diesel	-	-	3	1,095	kbbl	0.15	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Bio Diesel	0.1	37	-	-	kbbl	1	Richmond	48	48	-	-	-	-	-	-	-	-	-	-
Diesel	0.2	73	-	-	kbbl	1	Richmond	48	48	-	-	-	-	-	-	-	-	-	-
Ethanol	0.8	292	-	-	kbbl	1	Richmond	48	48	-	-	-	-	-	-	-	-	-	-
WWT Solids	-	-	62	22,594	yd^3	1	Buttonwillow	520	70	-	-	-	-	-	-	-	450	-	-
DMDS	605	220,752	-	-	gal	1	Texas	1,172	96	-	-	60	-	-	-	-	500	516	-
Citric Acid	0.36	130	-	-	kbbl	1	Fresno	356	70	-	-	-	-	-	-	-	286	-	-
Miscellaneous	5	1,971	-	-	kbbl	0.9	East Bay	60	60	-	-	-	-	-	-	-	-	-	-
Miscellaneous	1	219	-	-	kbbl	0.1	San Jose	120	120	-	-	-	-	-	-	-	-	-	-
Total Miles/ Round Trip:								**3,601**	**1,179**	**63**	**75**	**60**	**-**	**-**	**-**	**22**	**1,532**	**516**	**153**

	Truck Capacity							Annual Total Trucks											
Commodity	**(Unit/Truck)**	**Units**	**# Trucks/ Year**	**Onsite Location**			**Truck Route**	**California**	**BAAQMD**	**Butte**	**Feather River**	**Mojave Desert**	**Monterey Bay**	**Northern Sierra**	**Placer**	**Sacramento**	**San Joaquin Valley**	**South Coast**	**Yolo-Solano**
Gasoline	200	bbl	13,140	Gasoline LR			East Bay	13,140	13,140	-	-	-	-	-	-	-	-	-	-
Gasoline	200	bbl	1,460	Gasoline LR			San Jose	1,460	1,460	-	-	-	-	-	-	-	-	-	-
Renewable Diesel	200	bbl	2,738	Gasoline LR			Chico Terminal	2,738	2,738	2,738	2,738	-	-	-	-	-	-	-	2,738
Renewable Diesel	200	bbl	2,738	Gasoline LR			Bradshaw Terminal	2,738	2,738	-	-	-	-	-	-	2,738	-	-	2,738
Renewable Diesel	200	bbl	8,213	Gasoline LR			Stockton Terminal	8,213	8,213	-	-	-	-	-	-	-	8,213	-	-
Renewable Diesel	200	bbl	2,738	Gasoline LR			San Jose Terminal	2,738	2,738	-	-	-	-	-	-	-	-	-	-
Renewable Diesel	200	bbl	14,600	Gasoline LR			Fresno Terminal	14,600	14,600	-	-	-	-	-	-	-	14,600	-	-
Renewable Diesel	200	bbl	5,475	Gasoline LR			East Bay	5,475	5,475	-	-	-	-	-	-	-	-	-	-
Bio Diesel	200	bbl	183	Gasoline LR			Richmond	183	183	-	-	-	-	-	-	-	-	-	-
Diesel	200	bbl	365	Gasoline LR			Richmond	365	365	-	-	-	-	-	-	-	-	-	-
Ethanol	200	bbl	1,460	Gasoline LR			Richmond	1,460	1,460	-	-	-	-	-	-	-	-	-	-
WWT Solids	45	yd^3	503	WWT			Buttonwillow	503	503	-	-	-	-	-	-	-	503	-	-
DMDS	5,000	gal	45	DMDS			Texas	45	45	-	-	45	-	-	-	-	45	45	-
Citric Acid	101	bbl	1,286	Misc			Fresno	1,286	1,286	-	-	-	-	-	-	-	1,286	-	-
Miscellaneous	200	bbl	9,855	Misc			East Bay	9,855	9,855	-	-	-	-	-	-	-	-	-	-
Miscellaneous	200	bbl	1,095	Misc			San Jose	1,095	1,095	-	-	-	-	-	-	-	-	-	-
Total Annual Trips:								**65,894**	**65,894**	**2,738**	**2,738**	**45**	**-**	**-**	**-**	**2,738**	**24,647**	**45**	**5,476**

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Commodity		Onsite Miles	Onsite Entrance	Onsite Location	Onsite		Truck Route	Annual Total Miles											
								California	BAAQMD	Butte	Feather River	Mojave Desert	Monterey Bay	Northern Sierra	Placer	Sacramento	San Joaquin Valley	South Coast	Yolo-Solano
Gasoline		5.2	Both	Gasoline LR	42,258		East Bay	788,400	788,400	-	-	-	-	-	-	-	-	-	-
Gasoline		5.2	Both	Gasoline LR	4,695		San Jose	175,200	175,200	-	-	-	-	-	-	-	-	-	-
Renewable Diesel		5.2	Both	Gasoline LR	8,805		Chico Terminal	758,426	150,042	173,589	206,445	-	-	-	-	-	-	-	228,349
Renewable Diesel		5.2	Both	Gasoline LR	8,805		Bradshaw Terminal	397,558	146,209	-	-	-	-	-	-	61,331	-	-	190,017
Renewable Diesel		5.2	Both	Gasoline LR	26,413		Stockton Terminal	832,798	625,831	-	-	-	-	-	-	-	206,968	-	-
Renewable Diesel		5.2	Both	Gasoline LR	8,805		San Jose Terminal	283,109	283,109	-	-	-	-	-	-	-	-	-	-
Renewable Diesel		5.2	Both	Gasoline LR	46,954		Fresno Terminal	5,285,200	1,328,600	-	-	-	-	-	-	-	3,956,600	-	-
Renewable Diesel		5.2	Both	Gasoline LR	17,608		East Bay	328,500	328,500	-	-	-	-	-	-	-	-	-	-
Bio Diesel		5.2	Both	Gasoline LR	589		Richmond	8,784	8,784	-	-	-	-	-	-	-	-	-	-
Diesel		5.2	Both	Gasoline LR	1,174		Richmond	17,520	17,520	-	-	-	-	-	-	-	-	-	-
Ethanol		5.2	South	Gasoline LR	4,695		Richmond	70,080	70,080	-	-	-	-	-	-	-	-	-	-
WWT Solids		4.5	South	WWT	2,264		Buttonwillow	261,560	35,210	-	-	-	-	-	-	-	226,350	-	-
DMDS		3.5	South	DMDS	158		Texas	52,740	4,320	-	-	2,700	-	-	-	-	22,500	23,220	-
Citric Acid		3.8	South	Misc	4,887		Fresno	457,816	90,020	-	-	-	-	-	-	-	367,796	-	-
Miscellaneous		3.8	South	Misc	37,449		East Bay	591,300	591,300	-	-	-	-	-	-	-	-	-	-
Miscellaneous		3.8	South	Misc	4,161		San Jose	131,400	131,400	-	-	-	-	-	-	-	-	-	-
Total Annual Miles:					**219,720**			**10,440,391**	**4,774,525**	**173,589**	**206,445**	**2,700**	**-**	**-**	**-**	**61,331**	**4,780,214**	**23,220**	**418,366**

Notes:

1. Fraction of Trips on Route as estimated by the facility. These fractions represent the portion of each commodity that is received from, or delivered to multiple locations, in order to account for the truck mileage associated with the different routes traveled.
2. Onsite Entrance and Onsite Miles - identifies the area of the facility that trucks will enter, and the estimated onsite miles traveled to the intended loading/unloading rack. The facility has a north and south entrance which may be used by trucks. As noted in the table above, some commodities will be brought in via either entrance; as such the onsite mileage has been adjusted accordingly assuming 40% exit through the north and 60% exit through the south gate.
3. Trips are assumed to occur daily, 365 days per year.

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Table B-3b Mobile Source - Truck Transport Post-Project Emissions

Daily Emissions				Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
Region	Road Type	Daily Average Trips:	Daily Average Miles:	POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	181	13,081	1.66	0.37	76.65	16.21	7.80	1.92				
On-Site	Local	181	602	0.79	0.03	12.40	10.91	9.13	1.41				
Butte	Freeway	8	476	0.06	0.01	2.84	0.64	0.28	0.07				
Feather River	Freeway	8	566	0.07	0.02	3.30	0.68	0.34	0.08				
Mojave Desert	Freeway	0.1	7	0.00	0.00	0.04	0.01	0.00	0.00				
Monterey Bay	Freeway	-	-	--	--	--	--	--	--				
Northern Sierra	Freeway	-	-	--	--	--	--	--	--				
Placer	Freeway	-	-	--	--	--	--	--	--				
Sacramento	Freeway	8	168	0.04	0.01	1.25	0.51	0.10	0.02				
San Joaquin Valley	Freeway	68	13,096	1.20	0.36	70.91	9.54	7.81	1.92				
South Coast	Freeway	0.1	64	0.00	0.00	0.33	0.03	0.04	0.01				
Yolo-Solano	Freeway	15	1,146	0.14	0.03	6.67	1.37	0.68	0.17				
Total Daily:				**3.98**	**0.82**	**174.40**	**39.92**	**26.19**	**5.60**	**Not Applicable**			

Total BAAQMD:				**1.66**	**0.37**	**76.65**	**16.21**	**7.80**	**1.92**	

Annual Emissions				Criteria Pollutant Emissions (Tons/Yr)						GHG Emissions (Metric Tons/Yr)			
Region	Road Type	Total Annual Trips:	Total Annual Miles:	POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	65,894	4,774,525	0.30	0.07	13.99	2.96	1.42	0.35	6,421.14	0.01	1.01	6,734
On-Site	Local	65,894	219,720	0.14	0.01	2.26	1.99	1.67	0.26	590.34	0.01	0.09	619
Butte	Freeway	2,738	173,589	0.01	0.00	0.52	0.12	0.05	0.01	235.06	0.00	0.04	247
Feather River	Freeway	2,738	206,445	0.01	0.00	0.60	0.12	0.06	0.02	277.12	0.00	0.04	291
Mojave Desert	Freeway	45	2,700	0.00	0.00	0.01	0.00	0.00	0.00	3.67	0.00	0.00	4
Monterey Bay	Freeway	-	-	--	--	--	--	--	--	--	--	--	0
Northern Sierra	Freeway	-	-	--	--	--	--	--	--	--	--	--	0
Placer	Freeway	-	-	--	--	--	--	--	--	--	--	--	0
Sacramento	Freeway	2,738	61,331	0.01	0.00	0.23	0.09	0.02	0.00	91.36	0.00	0.01	96
San Joaquin Valley	Freeway	24,647	4,780,214	0.22	0.06	12.94	1.74	1.43	0.35	6,234.95	0.01	0.98	6,539
South Coast	Freeway	45	23,220	0.00	0.00	0.06	0.01	0.01	0.00	29.94	0.00	0.00	31
Yolo-Solano	Freeway	5,476	418,366	0.03	0.01	1.22	0.25	0.12	0.03	561.25	0.00	0.09	589
Total Annual:				0.73	0.15	31.83	7.29	4.78	1.02	14,444.83	0.03	2.27	15,149

Total BAAQMD:				**0.30**	**0.07**	**13.99**	**2.96**	**1.42**	**0.35**	**6421.14**	**0.01**	**1.01**	**6734.29**

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Table B-3b Mobile Source - Truck Transport Post-Project Emissions

T7 Tractor Diesel Truck Emission Factors (EMFAC2017).				Emission Factors								
Exhaust Source	**Road Type**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running Exhaust			lb/mile	0.00007	0.00515	0.00007	0.00007	0.00042	0.00003	2.82224	0.00000	0.00044
Idle Exhaust			lb/vehicle/day	0.00415	0.05150	0.00002	0.00002	0.05904	0.00010	10.34072	0.00019	0.00163

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):								
Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM Data	W	10.41	tons		
Paved Road Dust Entrainment								

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

Table B-3b Mobile Source - Truck Transport Post-Project Emissions

<u>Notes</u>:

1. Trip distances assume:
   a. Estimated distances to various locations of commodity transport with estimated percentage of total commodity transport to each location.
   b. Onsite distances estimated based on locations products are delivered to within the facility.

2. EMFAC2017 criteria pollutant and GHG emission factors for T7 Tractor engines are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed September 24, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

   a. Vehicle Category based on EMFAC2011 vehicle definitions, applied the T7 Tractor vehicle type.
   b. Criteria pollutant emission factors include total emissions for each pollutant. In addition to running exhaust emissions, emission factors include idle exhaust emissions. PM10 and
   c. PM_{10} and $PM_{2.5}$ from on-road vehicle paved road dust entrainment emission factors are included in the total emissions for the each trip segmented as documented above.
   d. Vehicle emissions based on the reported "emission rate" data for the specified vehicle category. This data is reported in terms of g/mile (running exhaust) and g/vehicle/day (idle exhaust). Note that emissions data for running exhaust is based on individual vehicle speeds, grouped by "Road Type". Idle Exhuast data is only reported by CARB for aggregated vehicle speeds, so each Road Type/Vehicle speed is assumed to have the same idle exhaust value.

3. Fleet size is estimated based on projected volumes of each commodity to be transported during post-project operations.

4. Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.*
   a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* .
   b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). <u>https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf</u>

5. Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

6. Conversion factors:

Global warming potential for methane: 21
Global warming potential for nitrous oxide: 310
2,000 pounds/ton
0.45359 kilograms/pound)
1,000 kilograms/metric ton

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Table B-4 Mobile Source - Rail Transport Project Summary

Project Summary

Daily Emissions													
				Criteria Pollutant Emissions (Pounds/Day)						**GHG Emissions (Pounds/Day)**			
Scenario	**Region**	**Daily Average Railcars**	**Daily Average bhp-hours**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	12	1,149	10.23	0.01	3.24	0.32	0.23	0.21				
	On-Site			0.32	0.00	0.11	0.01	0.01	0.01	(Not Applicable)			
	Total BAAQMD			*10.55*	*0.01*	*3.35*	*0.33*	*0.23*	*0.22*				
Post-Project	BAAQMD	17	909	8.10	0.01	2.57	0.25	0.18	0.17				
	On-Site			0.42	0.00	0.14	0.02	0.01	0.01	(Not Applicable)			
	Total BAAQMD			*8.52*	*0.01*	*2.71*	*0.27*	*0.19*	*0.17*				
Delta:	BAAQMD	**6**	**(240)**	**-2.13**	**0.00**	**-0.68**	**-0.07**	**-0.05**	**-0.04**				
	On-Site			**0.11**	**0.00**	**0.04**	**0.00**	**0.00**	**0.00**	(Not Applicable)			
	Total BAAQMD			*(2.03)*	*(0.00)*	*(0.64)*	*(0.06)*	*(0.05)*	*(0.04)*				

Annual Emissions													
				Criteria Pollutant Emissions (Tons/Yr)						**GHG Emissions (Metric Tons/Yr)**			
Scenario	**Region**	**Total Number of Railcars**	**Annual Total bhp-hours**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	4,256	419,462	1.87	0.00	0.59	0.06	0.04	0.04				
	On-Site			0.06	0.00	0.02	0.00	0.00	0.00				
	Total BAAQMD			*1.93*	*0.00*	*0.61*	*0.06*	*0.04*	*0.04*				
	California									989.46	0.08	0.02	998.69
Post-Project	BAAQMD	6,334	331,948	1.48	0.00	0.47	0.05	0.03	0.03				
	On-Site			0.08	0.00	0.03	0.00	0.00	0.00				
	Total BAAQMD			*1.55*	*0.00*	*0.49*	*0.05*	*0.03*	*0.03*				
	California									4,391.90	0.34	0.11	4,433.03
Delta:	BAAQMD	**2,078**	**(87,514)**	**-0.390**	**0.000**	**-0.123**	**-0.012**	**-0.009**	**-0.008**				
	On-Site			**0.019**	**0.000**	**0.006**	**0.001**	**0.000**	**0.000**				
	Total BAAQMD			*(0.37)*	*(0.00)*	*(0.12)*	*(0.01)*	*(0.01)*	*(0.01)*				
	California									**3,402.44**	**0.27**	**0.08**	**3,434.34**

Notes:

1. Criteria Pollutant Emissions based on rail travel within Bay Area Air Quality Management District (BAAQMD).
2. Greenhouse Gas (GHG) Emissions based on statewide rail travel.
3. Pre-Project Average Annual emissions have been adjusted based on rail activity from October 2015 - September 2020.
4. Pre-Project and post-project emissions are based on 2022 - 2024 average emission factors.
5. Region-based subtotals: "BAAQMD" represents the total travel and associated emissions within BAAQMD, but off-site from the facility.

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Table B-5a Mobile Source - Rail Transport Pre-Project Product Transportation Estimates

Operating Year: Pre-Project Average October 2015 - September 2020

Rail Transportation

		Throughput			Transportation Characteristics													
						Fraction of		Railcar Load	Train	Miles/Round Trip								
Commodity	**Track**	**Units / Day**	**Units / Year**	**Units**	**Receipt / Deliveries**	**Total Commodity**	**Railcars/ Year**	**(Unit/Railcar)**	**Routing**	**California**	**BAAQMD**	**Yolo-Solano**	**Sacramento**	**Placer**	**Northern Sierra**	**San Joaquin Valley**	**Mojave Desert**	**South Coast**
Bio Diesel	None	49	17,735	bbl	Receipt	1.00	25	720	OOS - Richmond	425	80	47	52	147	97	--	--	--
Ethanol	None	1,177	429,582	bbl	Receipt	1.00	632	680	OOS - Richmond	425	80	47	52	147	97	--	--	--
Propane	E/F	115	41,916	bbl	Deliveries	0.25	58	720	MTZ - Rocklin	231	60	--	87	19	--	65	--	--
Propane	E/F	345	125,748	bbl	Deliveries	0.75	175	720	MTZ - Bakersfield	557	250	--	--	--	--	307	--	--
Propylene	E/F	1,027	374,962	bbl	Deliveries	1.00	521	720	MTZ - LA	793	251	--	--	--	--	364	60	117
Butane/Mixed Butanes	E/F	1,548	564,973	bbl	Deliveries	1.00	785	720	OOS - MTZ - UP	456	61	--	84	149	97	65	--	--
Butane/Mixed Butanes	E/F	1,226	447,478	bbl	Receipt	1.00	621	720	OOS - MTZ - UP	456	61	--	84	149	97	65	--	--
Iso-Butane	E/F	709	258,909	bbl	Receipt	0.25	360	720	Rodeo - MTZ	31	31	--	--	--	--	--	--	--
Iso-Butane	E/F	2,128	776,727	bbl	Receipt	0.75	1,079	720	MTZ - LA	793	251	--	--	--	--	364	60	117

Notes:

1. Baseline assumptions for rail transport come from refinery records for October 2015 - September 2020.
2. For sources and destinations located within the Bay Area Air Quality Management District, Miles/Round Trip based on estimated round trip mileage within the air basin.
3. For sources and destinations outside California, Miles/Round Trip (Calif.) reflects round trip mileage within California only.
4. Fraction of Total Commodity represents that volume of each commodity that is received from, or delivered to multiple locations, in order to account for the rail mileage associated with the different train routes taken.
5. Trips are assumed to haved occured daily, 365 days per year.
6. Railcar Load represents the volume of commodity that can be transported in a single railcar.

Table B-5b Mobile Source - Rail Transport Pre-Project Operational Estimates - Process Rate Data

Operating Year: Pre-Project Average October 2015 - September 2020

Off-site Activity (Main Line).

Component	MTZ - Bakersfield	MTZ - Rocklin	MTZ - LA	OOS - MTZ - UP	OOS - Richmond	Rodeo - MTZ	Off-Site
Round Trip Miles[2]							
BAAQMD	250 miles	60 miles	251 miles	61 miles	80 miles	31 miles	
Yolo-Solano	0 miles	0 miles	0 miles	0 miles	47 miles	0 miles	
Sacramento	0 miles	87 miles	0 miles	84 miles	52 miles	0 miles	
Placer	0 miles	19 miles	0 miles	149 miles	147 miles	0 miles	
Northern Sierra	0 miles	0 miles	0 miles	97 miles	97 miles	0 miles	
San Joaquin Valley	307 miles	65 miles	364 miles	65 miles	0 miles	0 miles	
Mojave Desert	0 miles	0 miles	60 miles	0 miles	0 miles	0 miles	
South Coast	0 miles	0 miles	117 miles	0 miles	0 miles	0 miles	
California	557 miles	231 miles	793 miles	456 miles	425 miles	31 miles	
Average Travel Speed[3]							
BAAQMD	54.7 miles/hour	55.0 miles/hour	54.7 miles/hour	55.0 miles/hour	40.3 miles/hour	32.0 miles/hour	
Yolo-Solano	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	48.7 miles/hour	0.0 miles/hour	
Sacramento	0.0 miles/hour	47.3 miles/hour	0.0 miles/hour	48.0 miles/hour	40.4 miles/hour	0.0 miles/hour	
Placer	0.0 miles/hour	39.7 miles/hour	0.0 miles/hour	28.0 miles/hour	27.9 miles/hour	0.0 miles/hour	
Northern Sierra	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	28.8 miles/hour	28.8 miles/hour	0.0 miles/hour	
San Joaquin Valley	52.0 miles/hour	53.1 miles/hour	50.9 miles/hour	53.1 miles/hour	0.0 miles/hour	0.0 miles/hour	
Mojave Desert	0.0 miles/hour	0.0 miles/hour	32.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	
South Coast	0.0 miles/hour	0.0 miles/hour	48.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	
California	**53.2 miles/hour**	**49.9 miles/hour**	**49.3 miles/hour**	**35.7 miles/hour**	**32.9 miles/hour**	**32.0 miles/hour**	
Trip Travel Time:							
BAAQMD	4.6 hours	1.1 hours	4.6 hours	1.1 hours	2.0 hours	1.0 hours	
Yolo-Solano					1.0 hours		
Sacramento		1.8 hours		1.8 hours	1.3 hours		
Placer		0.5 hours		5.3 hours	5.3 hours		
Northern Sierra				3.4 hours	3.4 hours		
San Joaquin Valley	5.9 hours	1.2 hours	7.2 hours	1.2 hours			
Mojave Desert			1.9 hours				
South Coast			2.4 hours				
California	**10.5 hours**	**4.6 hours**	**16.1 hours**	**12.8 hours**	**12.9 hours**	**1.0 hours**	
Line Locomotives per Train[4]	4 locomotives	4 locomotives	4 locomotives	4 locomotives	4 locomotives	4 locomotives	
Engine Power per Locomotive[5]	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	
Engine Load Factor[6]	27.1%	27.1%	27.1%	27.1%	27.1%	27.1%	
Per Trip Line Haul Engine Power:							
BAAQMD	21,837 bhp-hours	5,186 bhp-hours	21,923 bhp-hours	5,273 bhp-hours	9,499 bhp-hours	4,657 bhp-hours	
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	4,645 bhp-hours	0 bhp-hours	
Sacramento	0 bhp-hours	8,764 bhp-hours	0 bhp-hours	8,355 bhp-hours	6,186 bhp-hours	0 bhp-hours	
Placer	0 bhp-hours	2,305 bhp-hours	0 bhp-hours	25,331 bhp-hours	25,140 bhp-hours	0 bhp-hours	
Northern Sierra	0 bhp-hours	0 bhp-hours	0 bhp-hours	16,117 bhp-hours	16,117 bhp-hours	0 bhp-hours	
San Joaquin Valley	28,142 bhp-hours	5,819 bhp-hours	34,166 bhp-hours	5,819 bhp-hours	0 bhp-hours	0 bhp-hours	
Mojave Desert	0 bhp-hours	0 bhp-hours	8,888 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	
South Coast	0 bhp-hours	0 bhp-hours	11,655 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	
California	49,979 bhp-hours	22,075 bhp-hours	76,633 bhp-hours	60,895 bhp-hours	61,587 bhp-hours	4,657 bhp-hours	
Unit Train Equivalents/Year[4]	**1 trains**	**0.4 trains**	**12 trains**	**11 trains**	**5 trains**	**3 trains**	
Total Annual Line Haul Engine Power:							**Off-Site**
BAAQMD	29,396 bhp-hours	2,314 bhp-hours	269,826 bhp-hours	57,025 bhp-hours	48,005 bhp-hours	12,896 bhp-hours	**419,462 bhp-hours**
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	23,477 bhp-hours	0 bhp-hours	**23,477 bhp-hours**
Sacramento	0 bhp-hours	3,910 bhp-hours	0 bhp-hours	90,363 bhp-hours	31,264 bhp-hours	0 bhp-hours	**125,537 bhp-hours**
Placer	0 bhp-hours	1,029 bhp-hours	0 bhp-hours	273,966 bhp-hours	127,055 bhp-hours	0 bhp-hours	**402,050 bhp-hours**
Northern Sierra	0 bhp-hours	0 bhp-hours	0 bhp-hours	174,308 bhp-hours	81,451 bhp-hours	0 bhp-hours	**255,760 bhp-hours**
San Joaquin Valley	37,884 bhp-hours	2,596 bhp-hours	420,509 bhp-hours	62,940 bhp-hours	0 bhp-hours	0 bhp-hours	**523,929 bhp-hours**
Mojave Desert	0 bhp-hours	0 bhp-hours	109,388 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**109,388 bhp-hours**
South Coast	0 bhp-hours	0 bhp-hours	143,450 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**143,450 bhp-hours**
California	67,279 bhp-hours	9,849 bhp-hours	943,174 bhp-hours	658,602 bhp-hours	311,253 bhp-hours	12,896 bhp-hours	**2,003,052 bhp-hours**

Table B-5b Mobile Source - Rail Transport Pre-Project Operational Estimates - Process Rate Data

Operating Year: Pre-Project Average October 2015 - September 2020

On-site Activity (Avon Tracks):

Component	MTZ - Bakersfield	MTZ - Rocklin	MTZ - LA	OOS - MTZ - UP	OOS - Richmond	Rodeo - MTZ	**On-Site**
Avon Track	E/F	E/F	E/F	E/F	None	E/F	
Line Haul Hours/Full Track[7]	1.52 hours	1.52 hours	1.52 hours	1.52 hours	0.00 hours	1.52 hours	
Line Haul Hours/Year[8]	29 hours	10 hours	269 hours	237 hours	0 hours	61 hours	
Line Locomotives per Train for Offloading	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	
Engine Power per Locomotive[5]	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	
Average Line Haul Load Factor	0.43%	0.43%	0.43%	0.43%	0.00%	0.43%	
Line Haul	553 bhp-hours	183 bhp-hours	5,055 bhp-hours	4,442 bhp-hours	0 bhp-hours	1,137 bhp-hours	**11,370 bhp-hours**
Switcher Hours/Full Track[7]	1.60 hours	1.60 hours	1.60 hours	1.60 hours	0.00 hours	1.60 hours	
Switcher Hours/Year[8]	31 hours	10 hours	284 hours	249 hours	0 hours	64 hours	
Switcher per Train for Offloading	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	
Engine Power per Locomotive[5]	204 horsepower	204 horsepower	204 horsepower	204 horsepower	0 horsepower	204 horsepower	
Average Switcher Load Factor	1.02%	1.02%	1.02%	1.02%	0.00%	1.02%	
Switcher	65 bhp-hours	21 bhp-hours	590 bhp-hours	519 bhp-hours	0 bhp-hours	133 bhp-hours	**1,328 bhp-hours**

Total Locomotive Engine Power:

Component	MTZ - Bakersfield	MTZ - Rocklin	MTZ - LA	OOS - MTZ - UP	OOS - Richmond	Rodeo - MTZ	**Total**
Annual Line Haul + Onsite							
BAAQMD	30,013 bhp-hours	2,518 bhp-hours	275,471 bhp-hours	61,986 bhp-hours	48,005 bhp-hours	14,166 bhp-hours	**432,159 bhp-hours**
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	23,477 bhp-hours	0 bhp-hours	**23,477 bhp-hours**
Sacramento	0 bhp-hours	3,910 bhp-hours	0 bhp-hours	90,363 bhp-hours	31,264 bhp-hours	0 bhp-hours	**125,537 bhp-hours**
Placer	0 bhp-hours	1,029 bhp-hours	0 bhp-hours	273,966 bhp-hours	127,055 bhp-hours	0 bhp-hours	**402,050 bhp-hours**
Northern Sierra	0 bhp-hours	0 bhp-hours	0 bhp-hours	174,308 bhp-hours	81,451 bhp-hours	0 bhp-hours	**255,760 bhp-hours**
San Joaquin Valley	37,884 bhp-hours	2,596 bhp-hours	420,509 bhp-hours	62,940 bhp-hours	0 bhp-hours	0 bhp-hours	**523,929 bhp-hours**
Mojave Desert	0 bhp-hours	0 bhp-hours	109,388 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**109,388 bhp-hours**
South Coast	0 bhp-hours	0 bhp-hours	143,450 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**143,450 bhp-hours**
California	**67,344 bhp-hours**	**9,870 bhp-hours**	**943,764 bhp-hours**	**659,121 bhp-hours**	**311,253 bhp-hours**	**13,029 bhp-hours**	**2,004,380 bhp-hours**

Notes:

1. Pre-Project Emissions estimated based on average volumes transported over the pre-project period of October 2015 - September 2020.
2. Source: Pre-Project Transportation Estimates, documented separately.
3. Source: Separate tables documenting maximum unit train travel distance and speed from specified routes.
4. Unit train locomotive power requirements for a 130-car unit train, per POLB 2013 Air Emissions Inventory.
5. Line Haul Locomotive: assumed to be 4,400 horsepower, similar to a GE AC4400CW or GE Dash 9-44CW.
   On-Site Switch Locomotive: one RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine
6. Source for EPA load factors by throttle notch:
   Locomotive Emission Standards Regulatory Support Document (Locomotive RSD), Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998, Table 5-2 - Typical Power Distribution by Notch, page 78, available at:
   https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-emission-standards-locomotives-and-locomotive,
7. Onsite Line Haul Hours/Train is estimated based on the movement of the line haul locomotive up to the Mainline Foul Point, an idle period to transition to the switcher, and then movement back to the Mainline.
   Onsite Switcher Hours/Train is estimated based on the movement of the switcher to the Mainline Foul Point to pick up the railcars, an idle period to transition the cars to the switcher, and then the movement of the railcars to the end of one of the Avon track sections.
8. Onsite Line Haul Hours/Year applies the Onsite Line Haul Hours/Train, where the "Train" is defined by the total number of railcars that one of the Avon track sections can accommodate in a given day, which is described in the Onsite Operating Period table.
   The Onsite Switcher Hours/Year assumes a "Train" is defined by the maximum number of railcars that one of the Avon track sections can accommodate, which is described in the Onsite Operating Period table.

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Table B-5c Mobile Source - Rail Transport Documentation of Onsite Locomotive Operations

Line Haul Parameters		**Notes**
Locomotive HP	4400	Assume that the trains will be moved onsite by one GE AC 4400CW 4,400 horsepower locomotive.
Haul Mode Load Factor:	8%	When entering or exiting the rail spur in Line Haul mode, locomotives are assumed to operate: 50% of the time at Throttle Notch 1 (4.5% of rated horsepower, and 50% of the time at Throttle Notch 2 (11.5% of rated horsepower per Locomotive RSD), which equates to an average of 8%
Haul Mode Speed (MPH):	5	Locomotive speeds are limited to 5 miles per hour when entering facility track areas.
Distance onsite per Full Track (ft):	200	Initial movement onto Avon track: ~200' length to Mainline Foul Point where line haul releases railcars for switcher
Onsite haul mode operating minutes per Full Track:	0.91	
Line Haul-Haul Mode bhp-hr	5.33	
Idle Mode per Pull (min.):	15	
Idle Mode Load Factor:	0.35%	Locomotives operated in idle mode are assumed to operate at 0.35% of rated horsepower, based on evaluation of emission tests of large BNSF and UP locomotives operating on various diesel fuels

Movement of Railcars onto Avon and Chemical Plant Tracks, Per Full Track:

On-Site Track Section:	**D**	**A/B/C**	**E/F**	**Chemical Plant**	**Notes**
Switcher HP	204	204	204	204	Assume rail cars are taken from spur to facility locations with a RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine.
Average Railcar Length	67.2	67.2	67.2	67.2	
# Railcars Per Full Track	12	14	9	3	Maximum number of railcars that can be maintained at a given time on the specified track
# Railcars Per Pull	1	4	3	3	Maximum number of railcars that the switcher can pull at once to the specified track
Distance to End of Track Section (ft)	1233	1582	1669	401.5	Estimated distance to the end of the specified track from the mainline foul point.
Distance to Start of Track Section (ft)	427	642	1065	200	Estimated distance from the mainline foul point to the location of the last railcar that can be sided on the track section.
Line Haul Idle Mode Minutes Per Full Track	360	105	90	30	
Line Haul-Idle Mode bhp-hr	92.4	26.95	23.1	7.7	
Line Haul Total Operating Minutes	**360.91**	**120.91**	**90.91**	**30.91**	
Line Haul Total bhp-hr per Full Track	**97.73**	**32.28**	**28.43**	**13.03**	
Average Line Haul Load Factor	**0.37%**	**0.36%**	**0.43%**	**0.58%**	
Switcher Push Mode Load Factor	11.5%	11.5%	11.5%	11.5%	No load data is available for switcher engines, applied EPA Line Haul factors. Per Roseville Study (Table C-19), push mode operations are maintained in Throttle Notch TN-2.
Push Mode Speed (MPH)	15	15	15	15	"On Rail" top speed per switcher manufacturer, and maximum Yard speed per Roseville Study.
Switcher Push Mode Operating Minutes Per Full Track	14.48	5.52	5.75	0.3	
Switcher Push Mode bhp-hr	5.66	2.16	2.25	0.12	
Switcher Idle Mode Load Factor	0.35%	0.35%	0.35%	0.35%	Idle mode load factor data is not provided by EPA. Applied load factor per SwRI, October 2000.
Switcher Idle Mode Speed (MPH)	0	0	0	0	
Switcher Idle Mode Operating Minutes Per Full Track	360	120	90	30	
Switcher Idle Mode bhp-hr	4.28	1.43	1.07	0.36	
Switcher Total Operating Minutes	**374.5**	**125.5**	**95.8**	**30.3**	
Switcher Total bhp-hr Per Full Track	**9.9**	**3.6**	**3.3**	**0.5**	
Average Switcher Load Factor	**0.78%**	**0.84%**	**1.02%**	**0.47%**	

Switcher Railcar Drop off Distances (ft)	**D**	**A/B/C**	**E/F**	**Chemical Plant**	**Notes**
1st Stop:	1166	1313	1468	200	The switcher travel path and number of stops is dictated by the length of each track section and the number of railcars that can be pulled by the switcher at a given time.
2nd Stop:	1099	1045	1266		
3rd Stop:	1032	776	1065		
4th Stop:	964	507			
5th Stop:	897				
6th Stop:	830				
7th Stop:	763				
8th Stop:	696				
9th Stop:	629				
10th Stop:	561				
11th Stop:	494				
12th Stop:	427				
Total Switcher Distance (ft):	19,114	7,283	7,596	400	
Total Switcher Distance (miles):	3.6201	1.3793	1.4386	0.0758	

Notes:

1. Line Haul Locomotive Assumptions:

a. Throttle Notch, Power Distribution (Load Factors):

Locomotive Emission Standards Regulatory Support Document (Locomotive RSD)Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998, Table 5-2 - Typical Power Distribution by Notch, page 78,

available at: www.epa.gov/otaq/locomotives.htm 1998 Locomotive Emissions Final Rule (published April 16, 1998) - Regulatory Support Document, accessed February 12,

b. Throttle notch operational assumptions for rail spur entry and exit movements are based on information from the Roseville Rail Yard Study, prepared by the California Air Resources Board.

Roseville Rail Yard Study, Californiia Air Resources Board, October 14, 2004, Appendix C (Train and Locomotive Activity and Assumptions), Table C-7 (Train and Locomotive Activity), and Table D-1 (Train or Locomotive Maximum Speed Limits)

available at https://ww2.arb.ca.gov/sites/default/files/classic//diesel/documents/rrstudy/rrstudy101404.pdf

c. Idle Mode Assumptions:

Diesel Fuel Effects on Locomotive Exhaust Emissions, Southwest Research Institute (for the California Air Resources Board), October 2000, Appendices A through F,

Table B-5c Mobile Source - Rail Transport Documentation of Onsite Locomotive Operations

available at https://ww3.arb.ca.gov/fuels/diesel/102000swri_dslemssn.pdf (accessed October 27, 2020).

2. **Switcher Locomotive Assumptions:**

a. Throttle Notch, Power Distribution (Load Factors):

Load factor data for the switchers is not available, load factors for the line haul duty cycle as described in Note 1.a were applied.

b. Maximum Yard Speed Assumptions.

Rail King 330-G4 Manufacturer Literature, available at: https://railking.net/models/rk330-g4/

Roseville Rail Yard Study, California Air Resources Board, October 14, 2004, Table D-1 (Train or Locomotive Maximum Speeds (mph))

c. Push Mode Assumptions:

Roseville Rail Yard Study, Californiia Air Resources Board, October 14, 2004, Appendix C (Train and Locomotive Activity and Assumptions), Table C-19

available at https://ww2.arb.ca.gov/sites/default/files/classic//diesel/documents/rrstudy/rrstudy101404.pdf

3. Conversion factors:

453.59 grams/pound

20.8 bhp-hr/gallon

Throttle Notch Position		EPA Load Factor by Notch	EPA Line-Haul Duty Cycle	EPA Switch Duty Cycle
DB-2		0.52%	12.5%	0.0%
Low Idle		0.30%	--	--
Idle		0.35%	38.0%	59.8%
N1		4.5%	6.5%	12.4%
N2		11.5%	6.5%	12.3%
N3		23.5%	5.2%	5.8%
N4		35.0%	4.4%	3.6%
N5		48.5%	3.8%	3.6%
N6		64.0%	3.9%	1.5%
N7		85.0%	3.0%	0.2%
N8		100%	16.2%	0.8%
Composite Load Factors:			**27.1%**	**8.5%**

1. Table 4-6 and Table 5-2 of Locomotive Emission Standards Regulatory Support Document (Locomotive RSD), Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998

2. Load factors for DB-2, Low Idle, and Idle modes are based on based on evaluation of emission tests of large BNSF and UP locomotives operating on various diesel fuels conducted for the California Air Resources Board in 1998 and 1999 (SwRI, October 2000).

2.a A total of 65 tests were conducted for three General Motors Electro-Motive Division (EMD) SD70MAC locomotives (nominal 4,200 HP) and three General Electric (GE) DASH9-44CW locomotives (nominal 4,500 HP). Average flywheel horsepower at idle ranged from 0.22% to 0.46% of maximum horsepower for the six locomotives.

Table B-5d Mobile Source - Rail Transport Pre-Project Emissions

Operating Year: Pre-Project Average October 2015 - September 2020

Daily Emissions

Region			Average Daily BHP-Hours	Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
				POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD		Off-Site	1,149	0.32	0.01	10.23	3.24	0.23	0.21				
	Delivery	On-Site	31	0.01	0.00	0.28	0.09	0.01	0.01				
	Switcher	On-Site	4	0.00	0.00	0.04	0.02	0.00	0.00				
Yolo-Solano		Off-Site	64	0.02	0.00	0.57	0.18	0.01	0.01				
Sacramento		Off-Site	344	0.10	0.00	3.06	0.97	0.07	0.06				
Placer		Off-Site	1,102	0.31	0.01	9.81	3.11	0.22	0.20				
Northern Sierra		Off-Site	701	0.20	0.01	6.24	1.98	0.14	0.13				
San Joaquin Valley		Off-Site	1,435	0.40	0.01	12.78	4.05	0.28	0.26				
Mojave Desert		Off-Site	300	0.08	0.00	2.67	0.85	0.06	0.05				
South Coast		Off-Site	393	0.11	0.00	3.50	1.11	0.08	0.07				
Total Daily				**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**Not Applicable**			
Total BAAQMD:			**1,184**	**0.33**	**0.01**	**10.55**	**3.35**	**0.23**	**0.22**	**Not Applicable**			

Annual Emissions

Region			Annual Total bhp-hours	Criteria Pollutant Emissions (TPY)						Emissions (Metric Tons/Year)			
				POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD		Off-Site	419,462	0.06	0.00	1.87	0.59	0.04	0.04	205.90	0.02	0.01	207.83
	Line Haul	On-Site	11,370	0.002	0.000	0.051	0.016	0.001	0.001	5.58	0.00	0.00	5.58
	Switcher	On-Site	1,328	0.001	0.000	0.007	0.004	0.000	0.000	0.65	0.00	0.00	0.65
Yolo-Solano		Off-Site	23,477	0.00	0.00	0.10	0.03	0.00	0.00	11.52	0.00	0.00	11.63
Sacramento		Off-Site	125,537	0.02	0.00	0.56	0.18	0.01	0.01	61.62	0.00	0.00	62.20
Placer		Off-Site	402,050	0.06	0.00	1.79	0.57	0.04	0.04	197.35	0.02	0.00	199.20
Northern Sierra		Off-Site	255,760	0.04	0.00	1.14	0.36	0.03	0.02	125.54	0.01	0.00	126.72
San Joaquin Valley		Off-Site	523,929	0.07	0.00	2.33	0.74	0.05	0.05	257.18	0.02	0.01	259.59
Mojave Desert		Off-Site	109,388	0.02	0.00	0.49	0.15	0.01	0.01	53.69	0.00	0.00	54.20
South Coast		Off-Site	143,450	0.02	0.00	0.64	0.20	0.01	0.01	70.41	0.01	0.00	71.08
Total Annual				**0.28**	**0.01**	**8.97**	**2.85**	**0.20**	**0.18**	**989.46**	**0.08**	**0.02**	**998.69**
Total BAAQMD:			**432,159**	**0.06**	**0.00**	**1.93**	**0.61**	**0.04**	**0.04**	**212.13**	**0.02**	**0.01**	**214.06**

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Table B-5d Mobile Source - Rail Transport Pre-Project Emissions

Locomotive Emission Factors

			Emission Factors									
	Basis	Unit	TOG	POC	SOx	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Switch	Tier 3	g/bhp-hr		0.60	0.00	5.00	2.40	0.10	0.09	490.87	0.038	0.012
Line Haul	2022-24 Avg	g/bhp-hr	0.14	0.13	0.005	4.04	1.28	0.09	0.08	490.87	0.038	0.012
Line Haul	2022	g/gal	3.20			89		2.00				
Line Haul	2023	g/gal	3.00			84		1.90		10,210	0.798	0.255
Line Haul	2024	g/gal	2.8	2.46		79		1.7				

Notes:

1. Rail transportation (locomotive) emission calculations are based on the following:
   a. Annual rail transportation (locomotive) brake horsepower-hours (Bhp-Hours) for the pre-project operations are based on volumes of commodity transported via rail in 2019.
   b. Average daily rail transportation bhp-hours for the pre-project operations assume operation 365 days per year.
   c. Rail transportation assumes two one-way trips per round trip.
   d. The incoming trip assumes full railcars, requiring 4 locomotives to haul the train. The outbound/return trip assumes empty railcars requiring 2 locomotives to haul the empty railcars.

2. Criteria pollutant emissions (ROG, NOx, PM_{10}, $PM_{2.5}$, CO, and SO_2) are calculated based on two-way rail travel within the specified air quality management districts.

3. Greenhouse gas emissions (CO_2, CH_4, N_2O, and CO_2e) are calculated based on two-way rail travel within California.

4. Line Haul Locomotive Emission Factors:
   a. Source for HC, NOx, and PM10 emission factors in grams/gallon: Emission Factors for Locomotives (Document No. EPA-420-F-09-025), U.S. Environmental Protection Agency, April 2009, Tables 5 to 7 (expected fleet average emission factors by calendar year for large line-haul locomotives). These factors are converted to grams/brake horsepower-hour (grams/bhp-hr) by dividing by the brake specific fuel consumption factor of 20.8 bhp-hr/gallon (source: Emission Factors for Locomotives). TOG is assumed to equal HC.

   b. The POC emission factor utilizes the California Air Resources Board's ROG weight fraction of 0.8785 X TOG (profile no. 818) for compression-ignition diesel-fired internal combustion engines. available at https://www.arb.ca.gov/ei/speciate/speciate.htm#specprof (accessed March 7, 2018).

   c. The $PM_{2.5}$ emission factor utilizes the California Air Resources Board's $PM_{2.5}$ weight fraction of 0.92 X PM and PM_{10} weight fraction of 1 X PM (profile no. 425) for diesel vehicle exhaust, available at diesel-fired internal combustion engines, available at https://www.arb.ca.gov/ei/speciate/speciate.htm#specprof (accessed March 7, 2018).

5. Onsite Switch Locomotive Emission Factors:
   Facility maintains a RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine. Emission factors applied are consistent with EPA Locomotive Exhaust Emission Standards for Switch Duty-Cycle engines. Found at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OA09.pdf

6. The CO emission factor of 1.28 grams/bhp-hr is from *Emission Factors for Locomotives* , Table 1 (Line-Haul Emission Factors, g/bhp-hr).

7. The SOx (as SO_2) emission factor is based on an assumed sulfur content of 15 parts per million diesel as follows:
   (15 lbs S/million lbs diesel) X (7.05 lb/gal diesel) X (1 gal diesel/20.8 bhp-hr) X (64 lb-mol SO_2/32 lb-mol S) X (453.59 g/lb) = 0.005 g SOx/bhp-hr.
   This assumes that California lower sulfur on-highway diesel fuel is used by locomotives. Source for locomotive brake specific fuel consumption factor of 20.8 bhp-hr/gallon: *Emission Factors for Locomotives* , Table 3 Factors, bhp-hr/gal), large line-haul and passenger locomotives.

Table B-5d Mobile Source - Rail Transport Pre-Project Emissions

8. Sources for CO_2 emission factors:
   The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.1 (US Default Factors for Calculating CO2 Emissions from Combustion of Transport Fuels)

9. Sources for CH_4, and N_2O emission factors:
   The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factor of 20.8 bhp-hr/gallon for large line-haul and passenger locomotives (source: Emission Factors for Locomotives).

10. Conversion factors:

20.8 bhp-hr/gallon	1,000,000 grams/metric ton
453.59 grams/pound	Global warming potential for methane: 21
2,000 pounds/ton	Global warming potential for nitrous oxide: 310

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Table B-6a Mobile Source - Rail Transport Post-Project Product Transportation Estimates

Rail Transportation

		Throughput			Transportation Characteristics														
						Fraction of		Railcar Load	Train	Miles/Round Trip									
Commodity	Track	Units / Day	Units / Year	Units	Receipt / Deliveries	Total Commodity	Railcars/ Year	(Bbls/Railcar)	Routing	California	BAAQMD	Yolo-Solano	Sacramento	Placer	Northern Sierra	San Joaquin	Mojave Desert	South Coast
RD Fd Stock	None	26,500	9,672,500	bbl	Receipt	0.80	15,857	610	OOS - Stock	362	--	--	84	149	97	32	--	--
RD Fd Stock	A/B/C	6,500	2,372,500	bbl	Receipt	0.20	3,889	610	OOS - MTZ - UP	456	61	--	84	149	97	65	--	--
Ethanol	None	800	292,000	bbl	Receipt	1.00	429	680	OOS - Richmond	425	80	47	52	147	97	--	--	--
Bio Diesel	None	100	36,500	bbl	Receipt	1.00	51	720	OOS - Richmond	425	80	47	52	147	97	--	--	--
Propane	E/F	138	50,400	bbl	Receipt	1.00	70	720	OOS - MTZ - UP	456	61	--	84	149	97	65	--	--
Propane	E/F	935	341,100	bbl	Deliveries	0.25	474	720	MTZ -	557	250	--	--	--	--	307	--	--
Propane	E/F	2,804	1,023,300	bbl	Deliveries	0.75	1,421	720	MTZ - Rocklin	231	60	--	87	19	--	65	--	--

Notes:
1. Source for RTP Project throughputs and feedstock/product sources/destinations: Marathon, RTP project application to the BAAQMD.
2. For sources and destinations located within the Bay Area Air Quality Management District, Miles/Round Trip based on estimated round trip mileage within the air basin.
3. For sources and destinations outside California, Miles/Round Trip (Calif.) reflects round trip mileage within California only.
4. Average Line-Haul train carries 130 railcars on a peak day. Port of Long Beach 2013 Air Emission Inventory.

130 Unit Train

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Table B-6b Mobile Source - Rail Transport Post-Project Operational Estimates - Process Rate Data

Post-Project Scenario[1]

Off-site Activity (Main Line).

Route	OOS - MTZ - UP	OOS - MTZ - UP	OOS - Stock	OOS - Richmond	MTZ - Bakersfield	MTZ - Rocklin	
Round Trip Miles[2]							
BAAQMD	61 miles	61 miles	0 miles	80 miles	250 miles	60 miles	
Yolo-Solano	0 miles	0 miles	0 miles	47 miles	0 miles	0 miles	
Sacramento	84 miles	84 miles	84 miles	52 miles	0 miles	87 miles	
Placer	149 miles	149 miles	149 miles	147 miles	0 miles	19 miles	
Northern Sierra	97 miles	97 miles	97 miles	97 miles	0 miles	0 miles	
San Joaquin Valley	65 miles	65 miles	32 miles	0 miles	307 miles	65 miles	
Mojave Desert	0 miles	0 miles	0 miles	0 miles	0 miles	0 miles	
South Coast	0 miles	0 miles	0 miles	0 miles	0 miles	0 miles	
California	**456 miles**	**456 miles**	**362 miles**	**425 miles**	**557 miles**	**231 miles**	
Average Travel Speed[3]							
BAAQMD	55.0 miles/hour	55.0 miles/hour	0.0 miles/hour	40.3 miles/hour	54.7 miles/hour	55.0 miles/hour	
Yolo-Solano	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	48.7 miles/hour	0.0 miles/hour	0.0 miles/hour	
Sacramento	48.0 miles/hour	48.0 miles/hour	48.0 miles/hour	40.4 miles/hour	0.0 miles/hour	47.3 miles/hour	
Placer	28.0 miles/hour	28.0 miles/hour	28.0 miles/hour	27.9 miles/hour	0.0 miles/hour	39.7 miles/hour	
Northern Sierra	28.8 miles/hour	28.8 miles/hour	28.8 miles/hour	28.8 miles/hour	0.0 miles/hour	0.0 miles/hour	
San Joaquin Valley	53.1 miles/hour	53.1 miles/hour	53.5 miles/hour	0.0 miles/hour	52.0 miles/hour	53.1 miles/hour	
Mojave Desert	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	
South Coast	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	0.0 miles/hour	
California	**35.7 miles/hour**	**35.7 miles/hour**	**32.8 miles/hour**	**32.9 miles/hour**	**53.2 miles/hour**	**49.9 miles/hour**	
Trip Travel Time:							
BAAQMD	1.1 hours	1.1 hours		2.0 hours	4.6 hours	1.1 hours	
Yolo-Solano				1.0 hours			
Sacramento	1.8 hours	1.8 hours	1.8 hours	1.3 hours		1.8 hours	
Placer	5.3 hours	5.3 hours	5.3 hours	5.3 hours		0.5 hours	
Northern Sierra	3.4 hours	3.4 hours	3.4 hours	3.4 hours			
San Joaquin Valley	1.2 hours	1.2 hours	0.6 hours		5.9 hours	1.2 hours	
Mojave Desert							
South Coast							
California	**12.8 hours**	**12.8 hours**	**11.0 hours**	**12.9 hours**	**10.5 hours**	**4.6 hours**	
Line Locomotives per Train[4]	4 locomotives	4 locomotives	4 locomotives	4 locomotives	4 locomotives	4 locomotives	
Engine Power per Locomotive[5]	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	
Engine Load Factor[6]	27.1%	27.1%	27.1%	27.1%	27.1%	27.1%	
Per Trip Line Haul Engine Power:							
BAAQMD	5,273 bhp-hours	5,273 bhp-hours	0 bhp-hours	9,499 bhp-hours	21,837 bhp-hours	5,186 bhp-hours	
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	4,645 bhp-hours	0 bhp-hours	0 bhp-hours	
Sacramento	8,355 bhp-hours	8,355 bhp-hours	8,355 bhp-hours	6,186 bhp-hours	0 bhp-hours	8,764 bhp-hours	
Placer	25,331 bhp-hours	25,331 bhp-hours	25,331 bhp-hours	25,140 bhp-hours	0 bhp-hours	2,305 bhp-hours	
Northern Sierra	16,117 bhp-hours	16,117 bhp-hours	16,117 bhp-hours	16,117 bhp-hours	0 bhp-hours	0 bhp-hours	
San Joaquin Valley	5,819 bhp-hours	5,819 bhp-hours	2,870 bhp-hours	0 bhp-hours	28,142 bhp-hours	5,819 bhp-hours	
Mojave Desert	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	
South Coast	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	
California	**60,895 bhp-hours**	**60,895 bhp-hours**	**52,673 bhp-hours**	**61,587 bhp-hours**	**49,979 bhp-hours**	**22,075 bhp-hours**	
Unit Train Equivalents/Year[4]	**30 trains**	**1 trains**	**122 trains**	**4 trains**	**4 trains**	**11 trains**	
Total Annual Line Haul Engine Power:							**Off-Site**
BAAQMD	157,731 bhp-hours	2,839 bhp-hours	0 bhp-hours	35,072 bhp-hours	79,620 bhp-hours	56,685 bhp-hours	**331,948 bhp-hours**
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	17,152 bhp-hours	0 bhp-hours	0 bhp-hours	**17,152 bhp-hours**
Sacramento	249,944 bhp-hours	4,499 bhp-hours	1,019,122 bhp-hours	22,842 bhp-hours	0 bhp-hours	95,796 bhp-hours	**1,392,202 bhp-hours**
Placer	757,790 bhp-hours	13,640 bhp-hours	3,089,812 bhp-hours	92,826 bhp-hours	0 bhp-hours	25,199 bhp-hours	**3,979,267 bhp-hours**
Northern Sierra	482,137 bhp-hours	8,678 bhp-hours	1,965,866 bhp-hours	59,508 bhp-hours	0 bhp-hours	0 bhp-hours	**2,516,190 bhp-hours**
San Joaquin Valley	174,092 bhp-hours	3,134 bhp-hours	350,126 bhp-hours	0 bhp-hours	102,611 bhp-hours	63,612 bhp-hours	**693,574 bhp-hours**
Mojave Desert	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**0 bhp-hours**
South Coast	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**0 bhp-hours**
California	**1,821,695 bhp-hours**	**32,790 bhp-hours**	**6,424,926 bhp-hours**	**227,399 bhp-hours**	**182,230 bhp-hours**	**241,291 bhp-hours**	**8,930,332 bhp-hours**

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Table B-6b Mobile Source - Rail Transport Post-Project Operational Estimates - Process Rate Data

Post-Project Scenario[1]

On-site Activity (Avon Tracks):

Component	OOS - MTZ - UP	OOS - MTZ - UP	OOS - Stock	OOS - Richmond	MTZ - Bakersfield	MTZ - Rocklin	**On-Site**
Avon Track	A/B/C	E/F	None	None	E/F	E/F	
Line Haul Hours/Full Track[7]	2.02 hours	1.52 hours	0.00 hours	0.00 hours	1.52 hours	1.52 hours	
Line Haul Hours/Year[8]	560 hours	12 hours	0 hours	0 hours	80 hours	239 hours	
Line Locomotives per Train for Offloading	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	
Engine Power per Locomotive[5]	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	4,400 horsepower	
Average Line Haul Load Factor	0.36%	0.43%	0.00%	0.00%	0.43%	0.43%	
Line Haul	8,968 bhp-hours	221 bhp-hours	0 bhp-hours	0 bhp-hours	1,497 bhp-hours	4,489 bhp-hours	**15,176 bhp-hours**
Switcher Hours/Full Track[7]	2.09 hours	1.60 hours	0.00 hours	0.00 hours	1.60 hours	1.60 hours	
Switcher Hours/Year[8]	581 hours	12 hours	0 hours	0 hours	84 hours	252 hours	
Switcher per Train for Offloading	1 locomotive	2 locomotive	1 locomotive	1 locomotive	1 locomotive	1 locomotive	
Engine Power per Locomotive[5]	204 horsepower	204 horsepower	0 horsepower	0 horsepower	204 horsepower	204 horsepower	
Average Switcher Load Factor	0.84%	1.02%	0.00%	0.00%	1.02%	1.02%	
Switcher	997 bhp-hours	52 bhp-hours	0 bhp-hours	0 bhp-hours	175 bhp-hours	524 bhp-hours	**1,748 bhp-hours**

Total Locomotive Engine Power:

Component	OOS - MTZ - UP	OOS - MTZ - UP	OOS - Stock	OOS - Richmond	MTZ - Bakersfield	MTZ - Rocklin	**Total**
Annual Line Haul + Onsite							
BAAQMD	167,696 bhp-hours	3,112 bhp-hours	0 bhp-hours	35,072 bhp-hours	81,292 bhp-hours	61,699 bhp-hours	**348,871 bhp-hours**
Yolo-Solano	0 bhp-hours	0 bhp-hours	0 bhp-hours	17,152 bhp-hours	0 bhp-hours	0 bhp-hours	**17,152 bhp-hours**
Sacramento	249,944 bhp-hours	4,499 bhp-hours	1,019,122 bhp-hours	22,842 bhp-hours	0 bhp-hours	95,796 bhp-hours	**1,392,202 bhp-hours**
Placer	757,790 bhp-hours	13,640 bhp-hours	3,089,812 bhp-hours	92,826 bhp-hours	0 bhp-hours	25,199 bhp-hours	**3,979,267 bhp-hours**
Northern Sierra	482,137 bhp-hours	8,678 bhp-hours	1,965,866 bhp-hours	59,508 bhp-hours	0 bhp-hours	0 bhp-hours	**2,516,190 bhp-hours**
San Joaquin Valley	174,092 bhp-hours	3,134 bhp-hours	350,126 bhp-hours	0 bhp-hours	102,611 bhp-hours	63,612 bhp-hours	**693,574 bhp-hours**
Mojave Desert	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**0 bhp-hours**
South Coast	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	0 bhp-hours	**0 bhp-hours**
California	**1,830,663 bhp-hours**	**33,011 bhp-hours**	**6,424,926 bhp-hours**	**227,399 bhp-hours**	**183,728 bhp-hours**	**245,781 bhp-hours**	**8,945,508 bhp-hours**

Notes:
1. Post-Project emissions estimated based on estimated production.
2. Source: Post-Project Transportation Estimates, documented separately. Noted that the "OOS - Stockton" and "OOS - Richmond" routes will not bring a products onsite to Martinez via rail, as such on-site rail emissions have not been included.
3. Source: Separate tables documenting maximum unit train travel distance and speed from specified routes.
4. Unit train locomotive power requirements for a 130-car unit train, per POLB 2013 Air Emissions Inventory.
5. Line Haul Locomotive: assumed to be 4,400 horsepower, similar to a GE AC4400CW or GE Dash 9-44CW.
   On-Site Switch Locomotive: one RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine
6. Source for EPA load factors by throttle notch:
   Locomotive Emission Standards Regulatory Support Document (Locomotive RSD), Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998, Table 5-2 - Typical Power Distribution by Notch, page 78, available at:
   https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-emission-standards-locomotives-and-locomotive
7. Onsite Line Haul Hours/Train assume is estimated based on the movement of the line haul locomotive up to the Mainline Foul Point, an idle period to transition to the switcher, and then movement back to the Mainline.
   Onsite Switcher Hours/Train is estimated based on the movement of the switcher to the Mainline Foul Point to pick up the railcars, an idle period to transition the cars to the switcher, and then the movement of the railcars to the end of one of the Avon track sections.
8. Onsite Line Haul Hours/Year applies the Onsite Line Haul Hours/Train, where the "Train" is defined by the total number railcars that one of the Avon track sections can accommodate in a given day, which is described in the Onsite Operating Period table.
   The Onsite Switcher Hours/Year assumes a "Train" is defined by the maximum number of railcars that one of the Avon track sections can accommodate, which is described in the Onsite Operating Period table.

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Table B-6c Mobile Source - Rail Transport Documentation of Onsite Locomotive Operations

Line Haul Parameters		Notes
Locomotive HP	4400	Assume that the trains will be moved onsite by one GE AC 4400CW 4,400 horsepower locomotive.
Haul Mode Load Factor:	8%	When entering or exiting the rail spur in Line Haul mode, locomotives are assumed to operate: 50% of the time at Throttle Notch 1 (4.5% of rated horsepower, and 50% of the time at Throttle Notch 2 (11.5% of rated horsepower per Locomotive RSD), which equates to an average of 8%
Haul Mode Speed (MPH):	5	Locomotive speeds are limited to 5 miles per hour when entering facility track areas.
Distance onsite per Full Track (ft):	200	Initial movement onto Avon track: ~200' length to Mainline Foul Point where line haul releases railcars for switcher movement.
Onsite haul mode operating minutes per Full Track:	0.91	
Line Haul-Haul Mode bhp-hr	5.33	
Idle Mode per Pull (min.):	15	
Idle Mode Load Factor:	0.35%	Locomotives operated in idle mode are assumed to operate at 0.35% of rated horsepower, based on evaluation of emission tests of large BNSF and UP locomotives operating on various diesel fuels

Movement of Railcars onto Avon and Chemical Plant Tracks, Per Full Track:

On-Site Track Section:	D	A/B/C	E/F	Chemical	Notes
Switcher HP	204	204	204	204	Assume rail cars are taken from spur to facility locations with a RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine.
Average Railcar Length	67.2	67.2	67.2	67.2	
# Railcars Per Full Track	12	14	9	3	Maximum number of railcars that can be maintained at a given time on the specified track
# Railcars Per Pull	1	4	3	3	Maximum number of railcars that the switcher can pull at once to the specified track
Distance to End of Track Section (ft)	1233	1582	1669	401.5	Estimated distance to the end of the specified track from the mainline foul point.
Distance to Start of Track Section (ft)	427	642	1065	200	Estimated distance from the mainline foul point to the location of the last railcar that can be sided on the track
Line Haul Idle Mode Minutes Per Full Track	360	105	90	30	
Line Haul-Idle Mode bhp-hr	92.4	26.95	23.1	7.7	
Line Haul Total Operating Minutes	**360.91**	**120.91**	**90.91**	**30.91**	
Line Haul Total bhp-hr per Full Track	**97.73**	**32.28**	**28.43**	**13.03**	
Average Line Haul Load Factor	**0.37%**	**0.36%**	**0.43%**	**0.58%**	
Switcher Push Mode Load Factor	11.5%	11.5%	11.5%	11.5%	No load data is available for switcher engines, applied EPA Line Haul factors. Per Roseville Study (Table C-19), push mode operations are maintained in Throttle Notch TN-2.
Push Mode Speed (MPH)	15	15	15	15	On Rail top speed per switcher manufacturer, and maximum Yard speed per Roseville Study.
Switcher Push Mode Operating Minutes Per Full Track	14.48	5.52	5.75	0.3	
Switcher Push Mode bhp-hr	5.66	2.16	2.25	0.12	
Switcher Idle Mode Load Factor	0.35%	0.35%	0.35%	0.35%	Idle mode load factor data is not provided by EPA. Applied load factor per SwRI, October 2000.
Switcher Idle Mode Speed (MPH)	0	0	0	0	
Switcher Idle Mode Operating Minutes Per Full Track	360	120	90	30	
Switcher Idle Mode bhp-hr	4.28	1.43	1.07	0.36	
Switcher Total Operating Minutes	374.5	125.5	95.8	30.3	
Switcher Total bhp-hr Per Full Track	9.9	3.6	3.3	0.5	
Average Switcher Load Factor	0.78%	0.84%	1.02%	0.47%	

Switcher Railcar Drop off Distances (ft	D	A/B/C	E/F	Chemical	Notes
1st Stop:	1166	1313	1468	200	The switcher travel path and number of stops is dictated by the length of each track section and the number of railcars that can be pulled by the switcher at a given time.
2nd Stop:	1099	1045	1266		
3rd Stop:	1032	776	1065		
4th Stop:	964	507			
5th Stop:	897				
6th Stop:	830				
7th Stop:	763				
8th Stop:	696				
9th Stop:	629				
10th Stop:	561				
11th Stop:	494				
12th Stop:	427				
Total Switcher Distance (ft):	19,114	7,283	7,596	400	
Total Switcher Distance (miles):	3.6201	1.3793	1.4386	0.0758	

Notes:

1. Line Haul Locomotive Assumptions:

a. Throttle Notch, Power Distribution (Load Factors):

Locomotive Emission Standards Regulatory Support Document (Locomotive RSD)Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998, Table 5-2 - Typical Power Distribution by Notch, page 78,

available at: www.epa.gov/otaq/locomotives.htm 1998 Locomotive Emissions Final Rule (published April 16, 1998) - Regulatory Support Document,

Table B-6c Mobile Source - Rail Transport Documentation of Onsite Locomotive Operations

b. Throttle notch operational assumptions for rail spur entry and exit movements are based on information from the Roseville Rail Yard Study, prepared by the California Air Resources Board.

Roseville Rail Yard Study, Californiia Air Resources Board, October 14, 2004, Appendix C (Train and Locomotive Activity and Assumptions), Table C-7 (Train and Locomotive Activity), and Table D-1 (Train or Locomotive Maximum Speed Limits)

available at https://ww2.arb.ca.gov/sites/default/files/classic//diesel/documents/rrstudy/rrstudy101404.pdf

c. Idle Mode Assumptions:

Diesel Fuel Effects on Locomotive Exhaust Emissions, Southwest Research Institute (for the California Air Resources Board), October 2000, Appendices A

available at https://ww3.arb.ca.gov/fuels/diesel/102000swri_dslemssn.pdf (accessed October 27, 2020).

2. **Switcher Locomotive Assumptions:**

a. Throttle Notch, Power Distribution (Load Factors):

Load factor data for the switchers is not available, load factors for the line haul duty cycle as described in Note 1.a were applied.

b. Maximum Yard Speed Assumptions.

Rail King 330-G4 Manufacturer Literature, available at: https://railking.net/models/rk330-g4/

Roseville Rail Yard Study, California Air Resources Board, October 14, 2004, Table D-1 (Train or Locomotive Maximum Speeds (mph))

c. Push Mode Assumptions:

Roseville Rail Yard Study, Californiia Air Resources Board, October 14, 2004, Appendix C (Train and Locomotive Activity and Assumptions), Table C-19

available at https://ww2.arb.ca.gov/sites/default/files/classic//diesel/documents/rrstudy/rrstudy101404.pdf

3. Conversion factors:

453.59 grams/pound

20.8 bhp-hr/gallon

Throttle Notch Position		EPA Load Factor by Notch	EPA Line-Haul Duty Cycle	EPA Switch Duty Cycle
DB-2		0.52%	12.5%	0.0%
Low Idle		0.30%	--	--
Idle		0.35%	38.0%	59.8%
N1		4.5%	6.5%	12.4%
N2		11.5%	6.5%	12.3%
N3		23.5%	5.2%	5.8%
N4		35.0%	4.4%	3.6%
N5		48.5%	3.8%	3.6%
N6		64.0%	3.9%	1.5%
N7		85.0%	3.0%	0.2%
N8		100%	16.2%	0.8%
Composite Load Factors:			**27.1%**	**8.5%**

1. Table 4-6 and Table 5-2 of Locomotive Emission Standards Regulatory Support Document (Locomotive RSD), Document No. EPA-420-R-98-101, U.S. Environmental Protection Agency, April 1998
2. Load factors for DB-2, Low Idle, and Idle modes are based on based on evaluation of emission tests of large BNSF and UP locomotives operating on various diesel fuels conducted for the California Air Resources Board in 1998 and 1999 (SwRI, October 2000).

2.a A total of 65 tests were conducted for three General Motors Electro-Motive Division (EMD) SD70MAC locomotives (nominal 4,200 HP) and three General Electric (GE) DASH9-44CW locomotives (nominal 4,500 HP). Average flywheel horsepower at idle ranged from 0.22% to 0.46% of maximum horsepower for the six locomotives.

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Table B-6d Mobile Source - Rail Transport Post-Project Emissions

Daily Emissions												
		Average Daily	**Criteria Pollutant Emissions (Pounds/Day)**						**GHG Emissions (Pounds/Day)**			
Region		**BHP-Hours**	**POC**	**SO_2**	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
BAAQMD	Off-Site	909	0.25	0.01	8.10	2.57	0.18	0.17				
Line Haul	On-Site	42	0.01	0.00	0.37	0.12	0.01	0.01				
Switcher	On-Site	5	0.01	0.00	0.05	0.03	0.00	0.00				
Yolo-Solano	Off-Site	47	0.01	0.00	0.42	0.13	0.01	0.01				
Sacramento	Off-Site	3,814	1.07	0.04	33.96	10.76	0.75	0.69				
Placer	Off-Site	10,902	3.05	0.11	97.06	30.76	2.16	1.98				
Northern Sierra	Off-Site	6,894	1.93	0.07	61.38	19.45	1.36	1.25				
San Joaquin Valley	Off-Site	1,900	0.53	0.02	16.92	5.36	0.38	0.35				
Mojave Desert	Off-Site	--	--	--	--	--	--	--				
South Coast	Off-Site	--	--	--	--	--	--	--				
Total Daily			**--**	**--**	**--**	**--**	**--**	**--**	**Not Applicable**			

Total BAAQMD:		**956**	**0.27**	**0.01**	**8.52**	**2.71**	**0.19**	**0.17**	**Not Applicable**			

Annual Emissions												
			Criteria Pollutant Emissions (TPY)						**Emissions (Metric Tons/Year)**			
Region		**Annual Total bhp-hours**	**POC**	**SO_2**	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
BAAQMD	Off-Site	331,948	0.05	0.00	1.48	0.47	0.03	0.03	162.94	0.01	0.00	164.47
Line Haul	On-Site	15,176	0.00	0.00	0.07	0.02	0.00	0.00	7.45	0.00	0.00	7.45
Switcher	On-Site	1,748	0.00	0.00	0.01	0.00	0.00	0.00	0.86	0.00	0.00	0.86
Yolo-Solano	Off-Site	17,152	0.00	0.00	0.08	0.02	0.00	0.00	8.42	0.00	0.00	8.50
Sacramento	Off-Site	1,392,202	0.19	0.01	6.20	1.96	0.14	0.13	683.38	0.05	0.02	689.80
Placer	Off-Site	3,979,267	0.56	0.02	17.71	5.61	0.39	0.36	1,953.28	0.15	0.05	1,971.61
Northern Sierra	Off-Site	2,516,190	0.35	0.01	11.20	3.55	0.25	0.23	1,235.11	0.10	0.03	1,246.70
San Joaquin Valley	Off-Site	693,574	0.10	0.00	3.09	0.98	0.07	0.06	340.45	0.03	0.01	343.65
Mojave Desert	Off-Site	--	--	--	--	--	--	--	--	--	--	--
South Coast	Off-Site	--	--	--	--	--	--	--	--	--	--	--
Total Annual			**1.25**	**0.05**	**39.83**	**12.63**	**0.89**	**0.81**	**4,391.90**	**0.34**	**0.11**	**4,433.03**

Total BAAQMD:		**348,871**	**0.05**	**0.00**	**1.55**	**0.49**	**0.03**	**0.03**	**171.25**	**0.01**	**0.00**	**172.78**

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Table B-6d Mobile Source - Rail Transport Post-Project Emissions

Locomotive Emission Factors

	Basis	Unit	Emission Factors									
	Basis	Unit	TOG	POC	SOx	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Switch	Tier 3	g/bhp-hr		0.60	0.00	5.00	2.40	0.10	0.09	490.87	0.038	0.012
Line Haul	2022-24 Avg	g/bhp-hr	0.14	0.13	0.005	4.04	1.28	0.09	0.08	490.87	0.038	0.012
Line Haul	2022	g/gal	3.20			89		2.00				
Line Haul	2023	g/gal	3.00			84		1.90		10,210	0.798	0.255
Line Haul	2024	g/gal	2.8	2.46		79		1.7				

Notes:

1. Rail transportation (locomotive) emission calculations are based on the following:
   a. Annual rail transportation (locomotive) brake horsepower-hours (Bhp-Hours) for the proposed project are based on the Rail Transportation Operational Estimates Process Rate Data, documented separately.
   b. Average daily rail transportation Bhp-Hours for the proposed project assume operation 365 days per year.
   c. Rail transportation assumes two one-way trips per round trip.
   d. The incoming trip assumes full railcars, requiring 4 locomotives to haul the train. The outbound/return trip assumes empty railcars requiring 2 locomotives to haul the empty railcars.

2. Criteria pollutant emissions (ROG, NOx, PM_{10}, $PM_{2.5}$, CO, and SO_2) are calculated based on two-way rail travel within each air quality management district specified.

3. Greenhouse gas emissions (CO_2, CH_4, N_2O, and CO_2e) are calculated based on two-way rail travel within California.

4. Line Haul Locomotive Emission Factors:
   a. Source for HC, NOx, and PM10 emission factors in grams/gallon: Emission Factors for Locomotives (Document No. EPA-420-F-09-025), U.S. Environmental Protection Agency, April 2009, Tables 5 to 7 (expected fleet average emission factors by calendar year for large line-haul locomotives). These factors are converted to grams/brake horsepower-hour (grams/bhp-hr) by dividing by the brake specific fuel consumption factor of 20.8 bhp-hr/gallon (source: Emission Factors for Locomotives). TOG is assumed to equal HC.

   b. The POC emission factor utilizes the California Air Resources Board's ROG weight fraction of 0.8785 X TOG (profile no. 818) for compression-ignition diesel-fired internal combustion engines. available at https://www.arb.ca.gov/ei/speciate/speciate.htm#specprof (accessed March 7, 2018).

   c. The $PM_{2.5}$ emission factor utilizes the California Air Resources Board's $PM_{2.5}$ weight fraction of 0.92 X PM and PM_{10} weight fraction of 1 X PM (profile no. 425) for diesel vehicle exhaust, available at https://www.arb.ca.gov/ei/speciate/speciate.htm#specprof (accessed March 7, 2018).

5. Onsite Switch Locomotive Emission Factors:
   Facility maintains a RailKing 330 Mobile Railcar Mover, Tier 3 Cummins QSB 6.7 204 bhp engine. Emission factors applied are consistent with EPA Locomotive Exhaust Emission Standards for Switch Duty-Cycle engines. Found at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OA09.pdf

6. The CO emission factor of 1.28 grams/bhp-hr is from *Emission Factors for Locomotives* , Table 1 (Line-Haul Emission Factors, g/bhp-hr).

Table B-6d Mobile Source - Rail Transport Post-Project Emissions

7. The SOx (as SO_2) emission factor is based on an assumed sulfur content of 15 parts per million diesel as follows:

   (15 lbs S/million lbs diesel) X (7.05 lb/gal diesel) X (1 gal diesel/20.8 bhp-hr) X (64 lb-mol SO_2/32 lb-mol S) X (453.59 g/lb) = 0.005 g SOx/bhp-hr.

   This assumes that California lower sulfur on-highway diesel fuel is used by locomotives. Source for locomotive brake specific fuel consumption factor of 20.8 bhp-hr/gallon: *Emission Factors for Locomotives* , Table 3 Factors, bhp-hr/gal), large line-haul and passenger locomotives.

8. Sources for CO_2 emission factors:

   The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.1 (US Default Factors for Calculating CO2 Emissions from Combustion of Transport Fuels)
   https://www.theclimateregistry.org/wp-content/uploads/2020/04/The-Climate-Registry-2020-Default-Emission-Factor-Document.pdf

9. Sources for CH_4, and N_2O emission factors:

   The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factor of 20.8 bhp-hr/gallon for large line-haul and passenger locomotives (source: Emission Factors for Locomotives).

10. Conversion factors:

20.8 bhp-hr/gallon	1,000,000 grams/metric ton
453.59 grams/pound	Global warming potential for methane: 21
2,000 pounds/ton	Global warming potential for nitrous oxide: 310

Table B-7 Mobile Source - Marine Vessel Transport Project Summary
Project Summary

Annual - Pre-Project Emissions

Transport Method	# Trips	BAAQMD Criteria Pollutant Emissions (TPY)						Statewide GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	90	19.38	374.29	263.82	34.38	27.92	10.62	29,500	0.37	1.913	30,101
Avon Vessels	120	4.77	30.26	93.33	11.17	3.30	3.19	6,335	0.11	0.314	6,434
Total Pre-Project		24.15	404.55	357.15	45.56	31.21	13.81	35,835	0.48	2.227	36,535

Annual - Post-Project Emissions

Transport Method	# Trips	BAAQMD Criteria Pollutant Emissions (TPY)						Statewide GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	40	2.22	1.53	31.20	7.18	1.09	1.01	2,543	0.03	0.165	2,595
Avon Vessels	364	6.69	2.02	80.93	33.75	2.72	2.61	12,059	0.20	0.598	12,248
Total Post-Project		8.91	3.55	112.13	40.93	3.81	3.62	14,602	0.23	0.763	14,844

Annual - Project Delta

Transport Method	# Trips	BAAQMD Criteria Pollutant Emissions (TPY)						Statewide GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	-50	(17.15)	(372.76)	(232.62)	(27.20)	(26.82)	(9.60)	(26,957)	(0.34)	(1.748)	(27,506)
Avon Vessels	n/a	1.92	(28.25)	(12.40)	22.58	(0.58)	(0.58)	5,724	0.10	0.284	5,814
Total Delta		(15.23)	(401.00)	(245.02)	(4.62)	(27.40)	(10.18)	n/a	n/a	n/a	n/a

Onsite Annual - Pre-Project Emissions

Transport Method	# Trips	Onsite Criteria Pollutant Emissions (TPY)						Onsite GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	90	6.36	292.01	79.52	8.68	18.43	6.93	19,764	0.08	1.465	20,220
Avon Vessels	120	0.96	18.72	24.66	1.99	1.28	1.22	3,020	0.02	0.184	3,077
Total Pre-Project	210	7.31	310.73	104.18	10.67	19.71	8.16	22,784	0.10	1.648	23,297

Onsite Annual - Post-Project Emissions

Transport Method	# Trips	Onsite Criteria Pollutant Emissions (TPY)						Onsite GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	40	0.30	1.02	7.15	0.74	0.37	0.33	1,408	0.01	0.104	1,440
Avon Vessels	364	0.52	1.06	10.82	3.96	0.40	0.36	2,438	0.02	0.148	2,484
Total Post-Project	404	0.83	2.08	17.97	4.70	0.77	0.69	3,846	0.02	0.253	3,925

Onsite Annual - Project Delta

Transport Method	# Trips	Onsite Criteria Pollutant Emissions (TPY)						Onsite GHG Emissions (Metric Tons/Year)			
		POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Amorco Vessels	(50)	(6.05)	(290.99)	(72.37)	(7.95)	(18.06)	(6.61)	(18,357)	(0.07)	(1.360)	(18,780)
Avon Vessels	244	(0.43)	(17.67)	(13.84)	1.97	(0.88)	(0.86)	(582)	(0.00)	(0.035)	(593)
Total Delta	(194)	(6.48)	(308.66)	(86.21)	(5.97)	(18.94)	(7.47)	(18,938)	(0.08)	(1.396)	(19,373)

Table B-8a Mobile Source - Marine Vessel Pre-Project Emisisons
Amorco Wharf Pre-Project Cargo Carrier Emissions

Trips/year: 90

Appendix H, Attachment C: Ships & Tugs - BAAQMD Prescribed Methodology

	Criteria Pollutants (lb/OGV)						GHG (MT/OGV)
Activity	POC	SO2	NOx	CO	PM10	PM2.5	CO2e
Transit	157.87	1012.22	1766.44	273.87	96.26	39.23	50.75
Maneuvering	105.25	674.81	1177.63	182.58	64.18	26.16	34.89
Hoteling	90.47	1324.51	977.51	149.99	98.28	20.54	52.45
Boiler	50.78	5164.61	789.52	42.92	311.22	133.52	172.22
Tugs (2)	26.2	141.32	1151.54	114.72	50.4	16.44	24.16
Total	430.58	8317.47	5862.64	764.07	620.34	235.89	344.46

	Criteria Pollutants (lb/yr)						GHG (MT/yr)
Activity	POC	SO2	NOx	CO	PM10	PM2.5	CO2e
Transit	14,208	91,100	158,980	24,648	8,663	3,531	4,567.6
Maneuvering	9,473	60,733	105,987	16,432	5,776	2,354	3,139.7
Hoteling	8,142	119,206	87,976	13,499	8,845	1,849	4,720.8
Boiler	4,570	464,815	71,057	3,863	28,010	12,017	15,499.4
Tugs (2)	2,358	12,719	103,639	10,325	4,536	1,480	2,173.8
Total	38,751.3	748,572.3	527,637.6	68,767.2	55,830.6	21,230.1	30,101.1

BAAQMD total (tpy or MT/yr)	19.38	374.29	263.82	34.38	27.92	10.62	30,101.1
Onsite total (tpy or MT/yr)	6.36	292.01	79.52	8.68	18.43	6.93	20,220.1

Notes:
- Pre-project emissions from "Tesoro Amorco Marine Oil Terminal Lease Consideration Project Final EIR" (February 2014).
- Full CEQA document available at https://www.slc.ca.gov/ceqa/tesoro-amorco/
- Criteria pollutant emissions per OGV from FEIR Appendix H, Attachment C: Ships & Tugs - BAAQMD Prescribed Methodology
- CO2e annual emissions from FEIR Appendix H, Attachment E: GHG Based on Fuel from BAAQMD Method

Table B-8b Mobile Source - Marine Vessel Pre-Project Emisisons
Avon Wharf Pre-Project Cargo Carrier Emissions

Trips/year: 120

	Criteria Pollutants (lb/OGV)						GHG (MT/OGV)
Activity	POC	SO2	NOx	CO	PM10	PM2.5	CO2e
Transit	26.90	86.07	546.20	45.52	15.72	14.48	12.29
Maneuvering	24.65	78.90	500.68	41.72	14.41	13.28	11.26
Hoteling	13.94	10.73	372.72	29.50	6.70	6.17	17.41
Boiler	2.01	301.33	38.35	3.65	14.61	14.24	8.24
Tugs (2)	12.00	27.36	97.54	65.80	3.52	5.00	4.42
Total	79.50	504.37	1,555.49	186.18	54.98	53.17	53.62

	Criteria Pollutants (lb/yr)						GHG (MT/yr)
Activity	POC	SO2	NOx	CO	PM10	PM2.5	CO2e
Transit	3,228	10,328	65,544	5,462	1,886	1,738	1,474.5
Maneuvering	2,958	9,468	60,082	5,006	1,729	1,594	1,351.6
Hoteling	1,673	1,288	44,726	3,540	804	740	2,089.0
Boiler	241	36,160	4,602	438	1,753	1,709	988.2
Tugs (2)	1,440	3,283	11,705	7,896	422	600	530.9
Total	9,540.0	60,526.8	186,658.8	22,342.8	6,595.2	6,380.4	6,434.3

BAAQMD total (tpy or MT/yr)	4.77	30.26	93.33	11.17	3.30	3.19	6,434.3
Onsite total (tpy or MT/yr)	0.96	18.72	24.66	1.99	1.28	1.22	3,077.2

Notes:
- Pre-project emissions from "Tesoro Avon Marine Oil Terminal Lease Consideration Project Final EIR" (January 2015).
- Full CEQA document available at https://www.slc.ca.gov/ceqa/tesoro-avon/
- Criteria pollutant emissions per OGV from FEIR Table 4.4-2
- CO2e annual emissions from FEIR Table 4.5-2

Table B-9a Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship from Amorco - Renewable Diesel

Vessel Type	HandyMax Tanker
Berth Location	Amorco
Cargo Per Vessel (Mbbl)	260
Round Trips/Year	40
Max speed (kn)	15.1

Transfer Activities Per Round-Trip

Material	Direction	Mbbl/yr	Mbbl/trip	Transfer Rate bbl/hr	Time hrs	Escort Tug Needed?
	Inbound	0	0.00	10,000	0.00	FALSE
Renewable Diesel	Outbound	10,147	253.68	6,000	42.28	TRUE

Additional Hoteling Time

Activity	Hrs
Hook-up (start)	3
Hook-up (end)	2
Bunkering (2-6 hrs on ~50% of ships)	1.5

Emissions Summary

	Emissions (Pounds)						Emissions (MT)			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Emissions/Round-Trip	111.13	359.13	1,559.98	76.53	54.70	50.67	64	0.00	0.004	65
Annual Total	4,445	14,365	62,399	3,061	2,188	2,027	2,543	0.03	0.165	2,595
Daily Total	12	39	171	8	6	6	7	0.00	0.000	7
Annual Onsite	610	1,471	14,292	2,037	735	655	1,408	0.01	0.10	1,440

Notes:
- Onsite emissions include hotelling only.

OGV Main Engine Usage per Round-Trip

Activity	Mode	# Escort Tugs Req'd (3)	Propulsion Max kW (1)	Speed (kn)	Load Factor (1)	Distance (nm/trip)	Duration (hr/trip)	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	0	9000	12	0.50	8.8	0.73	3,313
COLREGS Line to Golden Gate Bridge	Transit	0	9000	10	0.29	2.3	0.23	601
Golden Gate Bridge to Echo Buoy	Transit	0	9000	10	0.29	16.45	1.65	4,300
Echo Buoy to SPB Light #15	Transit	0	9000	10	0.29	7.7	0.77	2,013
SPB Light #15 to Near Shell Terminal	Transit	0	9000	8	0.15	6	0.75	1,004
Near Shell Terminal to Amorco Wharf	Transit	0	9000	5	0.04	0.5	0.10	33
At Amorco Wharf (Docking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
At Amorco Wharf (Hoteling and Prod. Transf	Hotelling	0	9000	n/a	0.00	n/a	48.78	-
At Amorco Wharf (Undocking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
Amorco Wharf to Near Shell Terminal	Transit	1	9000	8	0.15	0.5	0.06	84
Near Shell Terminal to SPB Light #15	Transit	1	9000	10	0.29	6	0.60	1,568
SPB Light #15 to COLREGS Line	Transit	1	9000	10	0.29	26.45	2.65	6,914
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	0	9000	12	0.50	8.8	0.73	3,313

Notes:
(1) Load factor = (speed/max speed)^3. Load factor of 0.02 represents minimum load factor for propulsion engines.
(2) Assume 1.5 hrs for docking and 1.5 hrs for undocking.
(3) Escort tug required to or from Golden Gate Bridge when carrying hydrocarbon.
(4) Maximum vessel speed based on Port of Los Angeles Air Emissions Inventory - 2019, Table 2.9

OGV Main Engine Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0
OGV Main Engines	0.80	1.86	19.09	0.53	0.42	0.38	0.4	0.00	0.000	0.4
OGV Main Engines	5.69	13.27	136.51	3.79	3.03	2.75	2.5	0.00	0.000	2.6
OGV Main Engines	2.66	6.21	63.90	1.77	1.42	1.29	1.2	0.00	0.000	1.2
OGV Main Engines	1.82	4.13	33.98	0.89	0.79	0.72	0.6	0.00	0.000	0.6
OGV Main Engines	0.38	0.54	2.50	0.03	0.08	0.07	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.15	0.34	2.83	0.07	0.07	0.06	0.0	0.00	0.000	0.1
OGV Main Engines	2.07	4.84	49.79	1.38	1.11	1.00	0.9	0.00	0.000	0.9
OGV Main Engines	9.15	21.34	219.50	6.10	4.88	4.42	4.1	0.00	0.000	4.1
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0

E = [EF g/kW-hr] x [Energy kW-hr] x [Low Load Factor] x [Conversion from g to lb or MT]

OGV Auxiliary Generator Usage per Round-Trip

Activity	Mode	Aux Eng. Max kW	Load Factor (1)	Hours/ Trip	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	750	24%	0.73	132
COLREGS Line to Golden Gate Bridge	Transit	750	24%	0.23	41
Golden Gate Bridge to Echo Buoy	Transit	750	24%	1.65	296
Echo Buoy to SPB Light #15	Transit	750	24%	0.77	139
SPB Light #15 to Near Shell Terminal	Transit	750	24%	0.75	135
Near Shell Terminal to Amorco Wharf	Transit	750	24%	0.10	18
At Amorco Wharf (Docking)	Maneuvering	750	33%	1.50	371
At Amorco Wharf (Hoteling and Prod. Transf	Hotelling	750	26%	48.78	9,512
At Amorco Wharf (Undocking)	Maneuvering	750	33%	1.50	371
Amorco Wharf to Near Shell Terminal	Transit	750	24%	0.06	11
Near Shell Terminal to SPB Light #15	Transit	750	24%	0.60	108
SPB Light #15 to COLREGS Line	Transit	750	24%	2.65	476
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	750	24%	0.73	132

Notes: (1) California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-5

OGV Auxiliary Generator Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.04	0.10	0.96	0.04	0.03	0.03	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.26	0.72	6.85	0.30	0.21	0.19	0.2	0.00	0.00	0.2
OGV Auxiliary Engines	0.12	0.34	3.21	0.14	0.10	0.09	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.12	0.33	3.13	0.14	0.10	0.09	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.02	0.04	0.42	0.02	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	8.39	23.07	220.19	9.79	6.71	6.08	6.5	0.00	0.00	6.6
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.01	0.03	0.26	0.01	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.10	0.26	2.50	0.11	0.08	0.07	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.42	1.15	11.02	0.49	0.34	0.30	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1

E = [EF g/kW-hr] x [Energy kW-hr] x [Conversion from g to lb or MT]

Table B-9a Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship from Amorco - Renewable Diesel

OGV Auxiliary Boiler Usage per Round-Trip

Activity	Mode	Boiler kW per Vessel [1,2]	Hours/ Transit	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	144	0.73	106
COLREGS Line to Golden Gate Bridge	Transit	144	0.23	33
Golden Gate Bridge to Echo Buoy	Transit	144	1.65	237
Echo Buoy to SPB Light #15	Transit	144	0.77	111
SPB Light #15 to Near Shell Terminal	Transit	144	0.75	108
Near Shell Terminal to Amorco Wharf	Transit	144	0.10	14
At Amorco Wharf (Docking)	Maneuvering	144	1.50	216
At Amorco Wharf (Hoteling and Prod. Transf	Hotelling	638	48.78	31,097
At Amorco Wharf (Undocking)	Maneuvering	144	1.50	216
Amorco Wharf to Near Shell Terminal	Transit	144	0.06	9
Near Shell Terminal to SPB Light #15	Transit	144	0.60	86
SPB Light #15 to COLREGS Line	Transit	144	2.65	381
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	144	0.73	106

Notes: (1) Port of Los Angeles Air Emissions Inventory - 2019 - Table 3.5 (Starcrest, 2020); Assume Tanker - Handysize
(2) Boiler load during hotelling based on engineering estimate of fuel consumption

OGV Auxiliary Boiler Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.01	0.01	0.15	0.04	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	1.04	0.31	0.09	0.08	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.02	0.05	0.49	0.15	0.04	0.04	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.02	0.05	0.48	0.14	0.04	0.04	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.00	0.01	0.06	0.02	0.01	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	6.86	13.71	137.11	41.13	11.65	10.28	28.7	0.00	0.00	29.4
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.00	0.00	0.04	0.01	0.00	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.02	0.04	0.38	0.11	0.03	0.03	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.08	0.17	1.68	0.50	0.14	0.13	0.4	0.00	0.00	0.4
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1

Tugboat Usage during Escort & Assist

Engine Type	Max Hp Per Tug	Load Factor [1]	# Tugboats	Tug-Hrs/ Round-Trip [2]	hp-hr/ Round-Trip
Escort - Main Engine	5,351	0.31	See above	3.31	5,486
Escort - Auxiliary Generator	402	0.43	See above	3.31	572
Assist - Main Engine	5,351	0.31	2	9.50	15,758
Assist - Auxiliary Generator	402	0.43	2	9.50	1,643

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 3.4 (Starcrest 2014); Assume Assist tug category
(2) Time spent operating per vessel trip. Estimated assist time to account for tug movement, docking, and undocking, plus 4x30 minute trips to/from temporary tug base.
(3) If escort tug is present, it will serve as one of the two assist tugs for docking/undocking, eliminating the need for one 30 minute trip to/from temporary tug base.

Tugboat Emissions during Escort & Assist

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Tug ME (1900-3300 hp, 2009)	10.81	53.17	76.92	0.07	3.58	3.58	2.7	0.000	0.000	2.7
Tug AE (250-500 hp, 2009)	1.31	5.47	7.31	0.01	0.27	0.27	0.3	0.000	0.000	0.3
Tug ME (1900-3300 hp, 2009)	31.05	152.72	220.93	0.19	10.27	10.27	7.6	0.000	0.000	7.8
Tug AE (250-500 hp, 2009)	3.78	15.72	21.01	0.02	0.78	0.78	0.8	0.000	0.000	0.9

Emission Calculation Notes:

For OGV main & aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)] x LLA

For OGV aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]

For OGV aux boilers:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]

For tug main & aux engines:
[Emissions (g) = [Energy hp-hr] x [EFo g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

Table B-9b Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship to/From Avon - Gasoline / Renewable Naphtha

Vessel Type	HandyMax Tanker
Berth Location	Avon
Cargo Per Vessel (Mbbl)	285
Round Trips/Year	36
Max speed (kn)	15.1

Transfer Activities Per Round-Trip

Material	Direction	Mbbl/yr	Mbbl/trip	Transfer Rate bbl/hr	Time hrs	Escort Tug Needed?
Gasoline	Inbound	10,220	283.89	10,000	28.39	TRUE
Renewable Naphtha	Outbound	365	10.14	6,000	1.69	TRUE

Additional Hoteling Time

Activity	Hrs
Hook-up (start)	3
Hook-up (end)	2
Bunkering (2-6 hrs on ~50% of ships)	1.5

Emissions Summary

	Emissions (Pounds)						Emissions (MT)			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Emissions/Round-Trip	121.18	413.67	1,586.36	64.75	54.77	51.18	58	0.00	0.004	60
Annual Total	4,362	14,892	57,109	2,331	1,972	1,842	2,103	0.03	0.132	2,145
Daily Total	12	41	156	6	5	5	6	0.00	0.000	6
Annual Onsite	412	993	9,646	1,375	496	442	950	0.00	0.07	972

Notes:
- Onsite emissions include hotelling only.

OGV Main Engine Usage per Round-Trip

Activity	Mode	# Escort Tugs Req'd	Propulsion Max kW (1)	Speed (kn)	Load Factor (1)	Distance (nm/trip)	Duration (hr/trip)	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	0	9000	12	0.50	8.8	0.73	3,313
COLREGS Line to Golden Gate Bridge	Transit	1	9000	10	0.29	2.3	0.23	601
Golden Gate Bridge to Echo Buoy	Transit	1	9000	10	0.29	16.45	1.65	4,300
Echo Buoy to SPB Light #15	Transit	1	9000	10	0.29	7.7	0.77	2,013
SPB Light #15 to Near Plains Terminal	Transit	1	9000	8	0.15	7.9	0.99	1,322
Near Plains Terminal to Avon Wharf	Transit	1	9000	5	0.04	0.5	0.10	33
At Avon Wharf (Docking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	0	9000	n/a	0.00	n/a	36.58	-
At Avon Wharf (Undocking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
Avon Wharf to Near Plains Terminal	Transit	1	9000	8	0.15	0.5	0.06	84
Near Plains Terminal to SPB Light #15	Transit	1	9000	10	0.29	7.9	0.79	2,065
SPB Light #15 to COLREGS Line	Transit	1	9000	10	0.29	26.45	2.65	6,914
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	0	9000	12	0.50	8.8	0.73	3,313

Notes: (1) Load factor = (speed/max speed)^3. Load factor of 0.02 represents minimum load factor for propulsion engines.
(2) Assume 1.5 hrs for docking and 1.5 hrs for undocking.
(3) Escort tug required to or from Golden Gate Bridge when carrying hydrocarbon.
(4) Maximum vessel speed based on Port of Los Angeles Air Emissions Inventory - 2019, Table 2.9

OGV Main Engine Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0
OGV Main Engines	0.80	1.86	19.09	0.53	0.42	0.38	0.4	0.00	0.000	0.4
OGV Main Engines	5.69	13.27	136.51	3.79	3.03	2.75	2.5	0.00	0.000	2.6
OGV Main Engines	2.66	6.21	63.90	1.77	1.42	1.29	1.2	0.00	0.000	1.2
OGV Main Engines	2.39	5.44	44.74	1.17	1.04	0.94	0.8	0.00	0.000	0.8
OGV Main Engines	0.38	0.54	2.50	0.03	0.08	0.07	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.15	0.34	2.83	0.07	0.07	0.06	0.0	0.00	0.000	0.1
OGV Main Engines	2.73	6.37	65.56	1.82	1.46	1.32	1.2	0.00	0.000	1.2
OGV Main Engines	9.15	21.34	219.50	6.10	4.88	4.42	4.1	0.00	0.000	4.1
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0

E = [EF g/kW-hr] x [Energy kW-hr] x [Low Load Factor] x [Conversion from g to lb or MT]

OGV Auxiliary Generator Usage per Round-Trip

Activity	Mode	Aux Eng. Max kW	Load Factor (1)	Hours/ Trip	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	750	24%	0.73	132
COLREGS Line to Golden Gate Bridge	Transit	750	24%	0.23	41
Golden Gate Bridge to Echo Buoy	Transit	750	24%	1.65	296
Echo Buoy to SPB Light #15	Transit	750	24%	0.77	139
SPB Light #15 to Near Plains Terminal	Transit	750	24%	0.99	178
Near Plains Terminal to Avon Wharf	Transit	750	24%	0.10	18
At Avon Wharf (Docking)	Maneuvering	750	33%	1.50	371
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	750	26%	36.58	7,133
At Avon Wharf (Undocking)	Maneuvering	750	33%	1.50	371
Avon Wharf to Near Plains Terminal	Transit	750	24%	0.06	11
Near Plains Terminal to SPB Light #15	Transit	750	24%	0.79	142
SPB Light #15 to COLREGS Line	Transit	750	24%	2.65	476
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	750	24%	0.73	132

Notes: (1) California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-5

OGV Auxiliary Generator Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.04	0.10	0.96	0.04	0.03	0.03	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.26	0.72	6.85	0.30	0.21	0.19	0.2	0.00	0.00	0.2
OGV Auxiliary Engines	0.12	0.34	3.21	0.14	0.10	0.09	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.16	0.43	4.11	0.18	0.13	0.11	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.02	0.04	0.42	0.02	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	6.29	17.30	165.12	7.34	5.03	4.56	4.9	0.00	0.00	5.0
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.01	0.03	0.26	0.01	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.13	0.34	3.29	0.15	0.10	0.09	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.42	1.15	11.02	0.49	0.34	0.30	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1

E = [EF g/kW-hr] x [Energy kW-hr] x [Conversion from g to lb or MT]

Table B-9b Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship to/From Avon - Gasoline / Renewable Naphtha

OGV Auxiliary Boiler Usage per Round-Trip

Activity	Mode	Boiler kW per Vessel [1,2]	Hours/ Transit	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	144	0.73	106
COLREGS Line to Golden Gate Bridge	Transit	144	0.23	33
Golden Gate Bridge to Echo Buoy	Transit	144	1.65	237
Echo Buoy to SPB Light #15	Transit	144	0.77	111
SPB Light #15 to Near Plains Terminal	Transit	144	0.99	142
Near Plains Terminal to Avon Wharf	Transit	144	0.10	14
At Avon Wharf (Docking)	Maneuvering	144	1.50	216
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	638	36.58	23,319
At Avon Wharf (Undocking)	Maneuvering	144	1.50	216
Avon Wharf to Near Plains Terminal	Transit	144	0.06	9
Near Plains Terminal to SPB Light #15	Transit	144	0.79	114
SPB Light #15 to COLREGS Line	Transit	144	2.65	381
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	144	0.73	106

Notes: (1) Port of Los Angeles Air Emissions Inventory - 2019 - Table 3.5 (Starcrest, 2020); Assume Tanker - Handysize
(2) Boiler load during hotelling based on engineering estimate of fuel consumption

OGV Auxiliary Boiler Emissions per Round-Trip

EF Lookup	Lb/Trip POC	CO	NOx	SO_2	PM10	PM2.5	MT/Trip CO2	CH4	N2O	CO2e
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.01	0.01	0.15	0.04	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	1.04	0.31	0.09	0.08	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.02	0.05	0.49	0.15	0.04	0.04	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.03	0.06	0.63	0.19	0.05	0.05	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.00	0.01	0.06	0.02	0.01	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	5.14	10.28	102.82	30.85	8.74	7.71	21.5	0.00	0.00	22.0
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.00	0.00	0.04	0.01	0.00	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.03	0.05	0.50	0.15	0.04	0.04	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.08	0.17	1.68	0.50	0.14	0.13	0.4	0.00	0.00	0.4
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1

Tugboat Usage during Escort & Assist

Engine Type	Max Hp Per Tug	Load Factor [1]	# Tugboats	Tug-Hrs/ Round-Trip [2]	hp-hr/ Round-Trip
Escort - Main Engine	5,351	0.31	See above	7.23	11,992
Escort - Auxiliary Generator	402	0.43	See above	7.23	1,251
Assist - Main Engine	5,351	0.31	2	9.00	14,928
Assist - Auxiliary Generator	402	0.43	2	9.00	1,557

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 3.4 (Starcrest 2014); Assume Assist tug category
(2) Time spent operating per vessel trip. Estimated assist time to account for tug movement, docking, and undocking, plus 4x30 minute trips to/from temporary tug base.
(3) If escort tug is present, it will serve as one of the two assist tugs for docking/undocking, eliminating the need for one 30 minute trip to/from temporary tug base.

Tugboat Emissions during Escort & Assist

EF Lookup	Lb/Trip POC	CO	NOx	SO_2	PM10	PM2.5	MT/Trip CO2	CH4	N2O	CO2e
Tug ME (1900-3300 hp, 2009)	23.63	116.23	168.14	0.15	7.82	7.82	5.8	0.000	0.000	5.9
Tug AE (250-500 hp, 2009)	2.87	11.96	15.99	0.02	0.59	0.59	0.6	0.000	0.000	0.6
Tug ME (1900-3300 hp, 2009)	29.41	144.68	209.30	0.18	9.73	9.73	7.2	0.000	0.000	7.3
Tug AE (250-500 hp, 2009)	3.58	14.89	19.90	0.02	0.74	0.74	0.8	0.000	0.000	0.8

Emission Calculation Notes:

For OGV main & aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)] x LLA
For OGV aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]
For OGV aux boilers:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]
For tug main & aux engines:
[Emissions (g) = [Energy hp-hr] x [EFo g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

Table B-9c Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship to Avon - RD Fd Stock

Vessel Type	HandyMax Tanker
Berth Location	Avon
Cargo Per Vessel (Mbbl)	260
Round Trips/Year	22
Max speed (kn)	15.1

Transfer Activities Per Round-Trip

Material	Direction	Mbbl/yr	Mbbl/trip	Transfer Rate bbl/hr	Time hrs	Escort Tug Needed?
RD Fd Stock	Inbound	5,475	248.86	10,000	24.89	FALSE
	Outbound	0	0.00	6,000	0.00	FALSE

Additional Hoteling Time

Activity	Hrs
Hook-up (start)	3
Hook-up (end)	2
Bunkering (2-6 hrs on ~50% of ships)	1.5

Emissions Summary

	Emissions (Pounds)						Emissions (MT)			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Emissions/Round-Trip	101.83	311.20	1,512.34	62.46	48.24	44.62	51	0.00	0.003	52
Annual Total	2,240	6,846	33,272	1,374	1,061	982	1,129	0.02	0.070	1,151
Daily Total	6	19	91	4	3	3	3	0.00	0.000	3
Annual Onsite	216	521	5,058	721	260	232	498	0.00	0.04	510

Notes:
- Onsite emissions include hotelling only.

OGV Main Engine Usage per Round-Trip

Activity	Mode	# Escort Tugs Req'd	Propulsion Max kW (1)	Speed (kn)	Load Factor (1)	Distance (nm/trip)	Duration (hr/trip)	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	0	9000	12	0.50	8.8	0.73	3,313
COLREGS Line to Golden Gate Bridge	Transit	0	9000	10	0.29	2.3	0.23	601
Golden Gate Bridge to Echo Buoy	Transit	0	9000	10	0.29	16.45	1.65	4,300
Echo Buoy to SPB Light #15	Transit	0	9000	10	0.29	7.7	0.77	2,013
SPB Light #15 to Near Plains Terminal	Transit	0	9000	8	0.15	7.9	0.99	1,322
Near Plains Terminal to Avon Wharf	Transit	0	9000	5	0.04	0.5	0.10	33
At Avon Wharf (Docking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	0	9000	n/a	0.00	n/a	31.39	-
At Avon Wharf (Undocking)	Maneuvering	0	9000	n/a	0.02	n/a	1.50	270
Avon Wharf to Near Plains Terminal	Transit	0	9000	8	0.15	0.5	0.06	84
Near Plains Terminal to SPB Light #15	Transit	0	9000	12	0.50	7.9	0.66	2,974
SPB Light #15 to COLREGS Line	Transit	0	9000	12	0.50	26.45	2.20	9,956
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	0	9000	12	0.50	8.8	0.73	3,313

Notes: (1) Load factor = $(\text{speed/max speed})^3$. Load factor of 0.02 represents minimum load factor for propulsion engines.
(2) Assume 1.5 hrs for docking and 1.5 hrs for undocking.
(3) Escort tug required to or from Golden Gate Bridge when carrying hydrocarbon.
(4) Maximum vessel speed based on Port of Los Angeles Air Emissions Inventory - 2019, Table 2.9

OGV Main Engine Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0
OGV Main Engines	0.80	1.86	19.09	0.53	0.42	0.38	0.4	0.00	0.000	0.4
OGV Main Engines	5.69	13.27	136.51	3.79	3.03	2.75	2.5	0.00	0.000	2.6
OGV Main Engines	2.66	6.21	63.90	1.77	1.42	1.29	1.2	0.00	0.000	1.2
OGV Main Engines	2.39	5.44	44.74	1.17	1.04	0.94	0.8	0.00	0.000	0.8
OGV Main Engines	0.38	0.54	2.50	0.03	0.08	0.07	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.000	0.0
OGV Main Engines	7.56	8.08	39.64	0.24	1.39	1.26	0.2	0.00	0.000	0.2
OGV Main Engines	0.15	0.34	2.83	0.07	0.07	0.06	0.0	0.00	0.000	0.1
OGV Main Engines	3.93	9.18	94.41	2.62	2.10	1.90	1.8	0.00	0.000	1.8
OGV Main Engines	13.17	30.73	316.08	8.78	7.02	6.37	5.9	0.00	0.000	6.0
OGV Main Engines	4.38	10.22	105.16	2.92	2.34	2.12	2.0	0.00	0.000	2.0

E = [EF g/kW-hr] x [Energy kW-hr] x [Low Load Factor] x [Conversion from g to lb or MT]

OGV Auxiliary Generator Usage per Round-Trip

Activity	Mode	Aux Eng. Max kW	Load Factor (1)	Hours/ Trip	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	750	24%	0.73	132
COLREGS Line to Golden Gate Bridge	Transit	750	24%	0.23	41
Golden Gate Bridge to Echo Buoy	Transit	750	24%	1.65	296
Echo Buoy to SPB Light #15	Transit	750	24%	0.77	139
SPB Light #15 to Near Plains Terminal	Transit	750	24%	0.99	178
Near Plains Terminal to Avon Wharf	Transit	750	24%	0.10	18
At Avon Wharf (Docking)	Maneuvering	750	33%	1.50	371
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	750	26%	31.39	6,120
At Avon Wharf (Undocking)	Maneuvering	750	33%	1.50	371
Avon Wharf to Near Plains Terminal	Transit	750	24%	0.06	11
Near Plains Terminal to SPB Light #15	Transit	750	24%	0.66	119
SPB Light #15 to COLREGS Line	Transit	750	24%	2.20	397
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	750	24%	0.73	132

Notes: (1) California ARB, May 2011, Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels, Table II-5

OGV Auxiliary Generator Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.04	0.10	0.96	0.04	0.03	0.03	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.26	0.72	6.85	0.30	0.21	0.19	0.2	0.00	0.00	0.2
OGV Auxiliary Engines	0.12	0.34	3.21	0.14	0.10	0.09	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.16	0.43	4.11	0.18	0.13	0.11	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.02	0.04	0.42	0.02	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	5.40	14.84	141.68	6.30	4.32	3.91	4.2	0.00	0.00	4.3
OGV Auxiliary Engines	0.33	0.90	8.59	0.38	0.26	0.24	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.01	0.03	0.26	0.01	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Engines	0.10	0.29	2.74	0.12	0.08	0.08	0.1	0.00	0.00	0.1
OGV Auxiliary Engines	0.35	0.96	9.18	0.41	0.28	0.25	0.3	0.00	0.00	0.3
OGV Auxiliary Engines	0.12	0.32	3.06	0.14	0.09	0.08	0.1	0.00	0.00	0.1

E = [EF g/kW-hr] x [Energy kW-hr] x [Conversion from g to lb or MT]

Table B-9c Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Ship to Avon - RD Fd Stock

OGV Auxiliary Boiler Usage per Round-Trip

Activity	Mode	Boiler kW per Vessel (1,2)	Hours/ Transit	kW-hr/ Round-Trip
Pilot Boarding (Sea Buoy) to COLREGS Line	Transit	144	0.73	106
COLREGS Line to Golden Gate Bridge	Transit	144	0.23	33
Golden Gate Bridge to Echo Buoy	Transit	144	1.65	237
Echo Buoy to SPB Light #15	Transit	144	0.77	111
SPB Light #15 to Near Plains Terminal	Transit	144	0.99	142
Near Plains Terminal to Avon Wharf	Transit	144	0.10	14
At Avon Wharf (Docking)	Maneuvering	144	1.50	216
At Avon Wharf (Hoteling and Prod. Transfer)	Hotelling	638	31.39	20,009
At Avon Wharf (Undocking)	Maneuvering	144	1.50	216
Avon Wharf to Near Plains Terminal	Transit	144	0.06	9
Near Plains Terminal to SPB Light #15	Transit	144	0.66	95
SPB Light #15 to COLREGS Line	Transit	144	2.20	317
COLREGS Line to Pilot Boarding (Sea Buoy)	Transit	144	0.73	106

Notes: (1) Port of Los Angeles Air Emissions Inventory - 2019 - Table 3.5 (Starcrest, 2020); Assume Tanker - Handysize
(2) Boiler load during hotelling based on engineering estimate of fuel consumption

OGV Auxiliary Boiler Emissions per Round-Trip

EF Lookup	Lb/Trip POC	CO	NOx	SO_2	PM10	PM2.5	MT/Trip CO2	CH4	N2O	CO2e
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.01	0.01	0.15	0.04	0.01	0.01	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	1.04	0.31	0.09	0.08	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.02	0.05	0.49	0.15	0.04	0.04	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.03	0.06	0.63	0.19	0.05	0.05	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.00	0.01	0.06	0.02	0.01	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	4.41	8.82	88.22	26.47	7.50	6.62	18.4	0.00	0.00	18.9
OGV Auxiliary Boilers	0.05	0.10	0.95	0.29	0.08	0.07	0.2	0.00	0.00	0.2
OGV Auxiliary Boilers	0.00	0.00	0.04	0.01	0.00	0.00	0.0	0.00	0.00	0.0
OGV Auxiliary Boilers	0.02	0.04	0.42	0.13	0.04	0.03	0.1	0.00	0.00	0.1
OGV Auxiliary Boilers	0.07	0.14	1.40	0.42	0.12	0.10	0.3	0.00	0.00	0.3
OGV Auxiliary Boilers	0.02	0.05	0.47	0.14	0.04	0.03	0.1	0.00	0.00	0.1

Tugboat Usage during Escort & Assist

Engine Type	Max Hp Per Tug	Load Factor (1)	# Tugboats	Tug-Hrs/ Round-Trip (2)	hp-hr/ Round-Trip
Escort - Main Engine	5,351	0.31	See above	0.00	-
Escort - Auxiliary Generator	402	0.43	See above	0.00	-
Assist - Main Engine	5,351	0.31	2	10.00	16,587
Assist - Auxiliary Generator	402	0.43	2	10.00	1,730

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 3.4 (Starcrest 2014); Assume Assist tug category
(2) Time spent operating per vessel trip. Estimated assist time to account for tug movement, docking, and undocking, plus 4x30 minute trips to/from temporary tug base.
(3) If escort tug is present, it will serve as one of the two assist tugs for docking/undocking, eliminating the need for one 30 minute trip to/from temporary tug base.

Tugboat Emissions during Escort & Assist

EF Lookup	Lb/Trip POC	CO	NOx	SO_2	PM10	PM2.5	MT/Trip CO2	CH4	N2O	CO2e
Tug ME (1900-3300 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug AE (250-500 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug ME (1900-3300 hp, 2009)	32.68	160.76	232.56	0.20	10.81	10.81	8.0	0.000	0.000	8.2
Tug AE (250-500 hp, 2009)	3.98	16.54	22.11	0.02	0.82	0.82	0.9	0.000	0.000	0.9

Emission Calculation Notes:

For OGV main & aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)] x LLA

For OGV aux engines:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]

For OGV aux boilers:
[Emissions (g)] = [Energy (kW-hr)] x [EF (g/kW-hr)]

For tug main & aux engines:
[Emissions (g) = [Energy hp-hr] x [EFo g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

Table B-9d Mobile Source - Marine Vessel Post-Project Emissions

Operational Marine Vessel Emissions

Rail to Barge to Avon (Brownwater (1-2 barge tow)) - RD Fd Stock

Vessel Type	Barge
Berth Location	Avon
Average Cargo Per Trip (Mbb	32.4
Round Trips/Year	306
Max speed (kn)	n/a

Transfer Activities Per Round-Trip

Material	Location	Mbbl/yr	Mbbl/trip	Transfer Rate bbl/hr	Time hrs	Escort Tug Needed?
RD Fd Stock	Stockton				9.79	FALSE
RD Fd Stock	Avon				15.49	FALSE

Additional Hoteling Time

Location	Hrs
Stockton	4.2
Avon	2.6

Transit Time	**Hrs**
Transit One-way	7.2

Emissions Summary

		Emissions (Pounds)						Emissions (MT)			
		POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Emissions/Round-Trip		40.17	263.03	405.33	1.32	14.03	14.01	29	0.00	0.001	29
Annual Total (BAAQMD)	BAAQMD	6,774	45,761	71,485	329	2,399	2,392	5,475	0.09	0.245	5,553
Annual Total (SJVAPCD)	SJVAPCD	5,516	34,726	52,546	75	1,896	1,896	3,351	0.06	0.150	3,399
Annual Total		12,291	80,487	124,031	404	4,294	4,287	8,827	0.15	0.395	8,953
Daily Total (BAAQMD)	BAAQMD	19	125	196	1	7	7	15	0.00	0.001	15
Daily Total (SJVAPCD)	SJVAPCD	15	95	144	0	5	5	9	0.00	0.000	9
Daily Total		34	221	340	1	12	12	24	0.00	0.001	25
Annual Onsite	BAAQMD	422	6,407	6,943	21	49	49	990	0.01	0.04	1,003

Notes: - Onsite emissions include hotelling only.

Propulsion Tug Main Engine Usage per Round-Trip

Propulsion tug main engine, hp 1500
Propulsion tug # main engines used 2

Activity	Mode	Air District	# Escort Tugs Req'd	Duration (hr/trip)	Load Factor (1)	hp-hr/ Transit
At Stockton (Hoteling and Prod. Transfer)	Hotelling	SJVAPCD	0	14.01	0.00	-
At Stockton (Undocking)	Maneuvering	SJVAPCD	0	1.00	0.45	1,350
Wait After (fleeting)	Fleeting	SJVAPCD	0	3.22	0.00	-
Cruise - SJVAPCD	Transit	SJVAPCD	0	2.55	0.45	3,444
Cruise - BAAQMD	Transit	BAAQMD	0	4.65	0.45	6,276
Wait Before (fleeting)	Fleeting	BAAQMD	0	18.52	0.00	-
At Avon Wharf (Docking)	Maneuvering	BAAQMD	0	1.00	0.45	1,350
At Avon Wharf (Hoteling and Prod. Transfer	Hotelling	BAAQMD	0	18.06	0.00	-
At Avon Wharf (Undocking)	Maneuvering	BAAQMD	0	1.00	0.45	1,350
Wait After (fleeting)	Fleeting	BAAQMD	0	2.60	0.00	-
Cruise - BAAQMD	Transit	BAAQMD	0	4.65	0.45	6,276
Cruise - SJVAPCD	Transit	SJVAPCD	0	2.55	0.45	3,444
Wait Before (fleeting)	Fleeting	SJVAPCD	0	11.67	0.00	-
At Stockton (Docking)	Maneuvering	SJVAPCD	0	1.00	0.45	1,350

Notes: Load Factors from CARB, Appendix C Updates on the Emissions Inventory for Commercial Harbor Craft Operating in California, Table 3

Propulsion Tug Main Engine Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	0.44	3.10	7.80	0.02	0.24	0.24	0.8	0.00	0.00	0.8
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	1.13	7.91	19.91	0.04	0.62	0.62	2.0	0.00	0.00	2.0
Propulsion Tug Main Engine	2.06	14.41	36.28	0.08	1.12	1.12	3.6	0.00	0.00	3.6
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	0.44	3.10	7.80	0.02	0.24	0.24	0.8	0.00	0.00	0.8
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	0.44	3.10	7.80	0.02	0.24	0.24	0.8	0.00	0.00	0.8
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	2.06	14.41	36.28	0.08	1.12	1.12	3.6	0.00	0.00	3.6
Propulsion Tug Main Engine	1.13	7.91	19.91	0.04	0.62	0.62	2.0	0.00	0.00	2.0
Propulsion Tug Main Engine	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.0
Propulsion Tug Main Engine	0.44	3.10	7.80	0.02	0.24	0.24	0.8	0.00	0.00	0.8

Barge Auxiliary Generator Usage per Round-Trip

Propulsion tug aux gen engine, hp 140

Activity	Mode	Air District	# Engines Operating	Duration (hr/trip)	Load Factor	hp-hr/ Transit
At Stockton (Hoteling and Prod. Transfer)	Hotelling	SJVAPCD	1	14.01	0.75	1,471
At Stockton (Undocking)	Maneuvering	SJVAPCD	1	1.00	0.75	105
Wait After (fleeting)	Fleeting	SJVAPCD	1	3.22	0.75	339
Cruise - SJVAPCD	Transit	SJVAPCD	1	2.55	0.75	268
Cruise - BAAQMD	Transit	BAAQMD	1	4.65	0.75	488
Wait Before (fleeting)	Fleeting	BAAQMD	1	18.52	0.75	1,944
At Avon Wharf (Docking)	Maneuvering	BAAQMD	1	1.00	0.75	105
At Avon Wharf (Hoteling and Prod. Transfer	Hotelling	BAAQMD	1	18.06	0.75	1,896
At Avon Wharf (Undocking)	Maneuvering	BAAQMD	1	1.00	0.75	105
Wait After (fleeting)	Fleeting	BAAQMD	1	2.60	0.75	272
Cruise - BAAQMD	Transit	BAAQMD	1	4.65	0.75	488
Cruise - SJVAPCD	Transit	SJVAPCD	1	2.55	0.75	268
Wait Before (fleeting)	Fleeting	SJVAPCD	1	11.67	0.75	1,226
At Stockton (Docking)	Maneuvering	SJVAPCD	1	1.00	0.75	105

Notes: (1) Port of Los Angeles Air Emissions Inventory - 2019 - Table 3.2 (Starcrest, 2020); Assume Tanker - Handysize

Barge Auxiliary Generator Emissions per Round-Trip

	Lb/Trip						MT/Trip			
EF Lookup	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Propulsion Tug Aux Gen Engine	0.42	9.63	7.98	0.02	0.04	0.04	0.8	0.00	0.00	0.8
Propulsion Tug Aux Gen Engine	0.03	0.69	0.57	0.00	0.00	0.00	0.1	0.00	0.00	0.1
Propulsion Tug Aux Gen Engine	0.10	2.22	1.84	0.00	0.01	0.01	0.2	0.00	0.00	0.2
Propulsion Tug Aux Gen Engine	0.08	1.75	1.45	0.00	0.01	0.01	0.2	0.00	0.00	0.2
Propulsion Tug Aux Gen Engine	0.14	3.20	2.65	0.01	0.01	0.01	0.3	0.00	0.00	0.3
Propulsion Tug Aux Gen Engine	0.55	12.73	10.55	0.02	0.05	0.05	1.1	0.00	0.00	1.1
Propulsion Tug Aux Gen Engine	0.03	0.69	0.57	0.00	0.00	0.00	0.1	0.00	0.00	0.1
Propulsion Tug Aux Gen Engine	0.54	12.42	10.29	0.02	0.05	0.05	1.1	0.00	0.00	1.1
Propulsion Tug Aux Gen Engine	0.03	0.69	0.57	0.00	0.00	0.00	0.1	0.00	0.00	0.1
Propulsion Tug Aux Gen Engine	0.08	1.78	1.48	0.00	0.01	0.01	0.2	0.00	0.00	0.2
Propulsion Tug Aux Gen Engine	0.14	3.20	2.65	0.01	0.01	0.01	0.3	0.00	0.00	0.3
Propulsion Tug Aux Gen Engine	0.08	1.75	1.45	0.00	0.01	0.01	0.2	0.00	0.00	0.2
Propulsion Tug Aux Gen Engine	0.35	8.02	6.65	0.01	0.03	0.03	0.7	0.00	0.00	0.7
Propulsion Tug Aux Gen Engine	0.03	0.69	0.57	0.00	0.00	0.00	0.1	0.00	0.00	0.1

E = [EF g/kW-hr] x [Energy kW-hr] x [Conversion from g to lb or MT]

Table B-9d Mobile Source - Marine Vessel Post-Project Emissions
Operational Marine Vessel Emissions
Rail to Barge to Avon (Brownwater (1-2 barge tow)) - RD Fd Stock

Barge Offload Pump Usage per Round-Trip
Barge aux pump engine, hp 345

Activity	Mode	Air District	# Engines Operaing	Duration (hr/trip)	Load Factor	hp-hr/ Transit
At Avon Wharf (Hoteling and Prod. Transfer	Hotelling	BAAQMD	1	15.49	0.71	3,795

Notes: (1) Port of Los Angeles Air Emissions Inventory - 2019 - Table 3.5 (Starcrest, 2020); Assume Tanker - Handysize

Barge Offload Pump Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Barge Aux Pump Engine	0.84	8.52	12.40	0.05	0.11	0.11	2.2	0.00	0.00	2.2

Barge Circulation Pump Usage per Round-Trip
Barge circ pump engine, hp 140

Activity	Mode	Air District	# Engines Operaing	Duration (hr/trip)	Load Factor	hp-hr/ Transit
Near Avon Wharf	Fleeting	BAAQMD	1	0.22	0.71	22

Notes: Load Factor from CARB, Appendix C Updates on the Emissions Inventory for Commercial Harbor Craft Operating in California, Table 3

Barge Circulation Pump Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Barge Circ Pump Engine	0.01	0.15	0.12	0.00	0.00	0.00	0.0	0.00	0.00	0.0

Barge Circulation Heater Usage per Round-Trip
Barge circ heater, MMBtu/hr 8

Activity	Mode	Air District	# Heaters Operaing	Duration (hr/trip)	Load Factor	kW-hr/ Transit
Near Avon Wharf	Fleeting	BAAQMD	1	0.22	1	521

Notes: Load factor not known

Barge Circulation Heater Emissions per Round-Trip

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
OGV Auxiliary Boilers	0.11	0.23	2.30	0.69	0.20	0.17	0.5	0.00	0.00	0.5

Tugboat Usage during Escort & Assist

Engine Type	# Tugboats	Air District	Max HP per Tug	Load Factor (1)	Tug-Hours/ Round-Trip (2)	hp-hr/ Round-Trip
Escort - Main Engine (BAAQMD)	See above	BAAQMD	5,351	0.31	0.00	-
Escort - Auxiliary Generator (BAAQMD)	See above	BAAQMD	402	0.43	0.00	-
Escort - Main Engine (SJVAPCD)	See above	SJVAPCD	5,000	0.31	0.00	-
Escort - Auxiliary Generator (SJVAPCD)	See above	SJVAPCD	402	0.43	0.00	-
Assist - Main Engine (BAAQMD)	1	BAAQMD	5,351	0.31	4.00	6,635
Assist - Auxiliary Generator (BAAQMD)	1	BAAQMD	402	0.43	4.00	692
Assist - Main Engine (SJVAPCD)	1	SJVAPCD	5,000	0.31	4.00	6,200
Assist - Auxiliary Generator (SJVAPCD)	1	SJVAPCD	402	0.43	4.00	692

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 3.4 (Starcrest 2014), Assist Tug category
(2) Time spent operating per vessel trip. Estimated assist time to account for tug movement, docking, and undocking, plus 4x30 minute trips to/from temporary tug base.
(3) If escort tug is present, it will serve as an assist tug for docking/undocking.

Tugboat Emissions during Escort & Assist

EF Lookup	Lb/Trip						MT/Trip			
	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	CO2e
Tug ME (1900-3300 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug AE (250-500 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug ME (1900-3300 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug AE (250-500 hp, 2009)	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.000	0.000	0.0
Tug ME (1900-3300 hp, 2009)	13.07	64.30	93.02	0.08	4.33	4.33	3.2	0.000	0.000	3.3
Tug AE (250-500 hp, 2009)	1.59	6.62	8.85	0.01	0.33	0.33	0.4	0.000	0.000	0.4
Tug ME (1900-3300 hp, 2009)	12.22	60.09	86.93	0.08	4.04	4.04	3.0	0.000	0.000	3.0
Tug AE (250-500 hp, 2009)	1.59	6.62	8.85	0.01	0.33	0.33	0.4	0.000	0.000	0.4

Emission Calculation Notes:
For propulsion tug main & aux engines:
[Emissions (g) = [Energy hp-hr] x [EFo g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])
For tug main & aux engines:
[Emissions (g) = [Energy hp-hr] x [EFo g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

Table B-10 Mobile Source - Marine Vessel Emission Factors for OGV
Operational Marine Vessel Emissions
Marine Vessel Emission Factors

Emission Factors for OGV

Engine Type	Assumed Fuel Type	Assumed Fuel Use Application	EF Units	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	Source
OGV Main Engines	MGO (0.1% S)	Tier 2, Slow	g/kW-hr	0.60	1.40	14.40	0.40	0.32	0.29	589	0.012	0.029	(1,4)
OGV Auxiliary Engines	MGO (0.1% S)	Tier 2	g/kW-hr	0.40	1.10	10.50	0.47	0.32	0.29	686	0.008	0.029	(2,4)
OGV Auxiliary Boilers	MGO (0.1% S)	All	g/kW-hr	0.10	0.20	2.00	0.60	0.17	0.15	922	0.002	0.075	(3,4)

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Tables 2.5, 2.6. (Starcrest 2014)
(2) Port of Long Beach Air Emissions Inventory - 2013 - Tables 2.10, 2.11. (Starcrest 2014)
(3) Port of Long Beach Air Emissions Inventory - 2013 - Table 2.14, 2.15. (Starcrest 2014)
(4) MGO (0.3% S) emission factors were calculated from HFO (2.7% S) emission factors in the Long Beach 2013 document by applying fuel correction factors per Table 2.17. MGO (0.3% S) SO2 emission factors were converted to MGO (0.1% S) emission factors by scaling the emission factor with the relative sulfur contents.
(5) Low-load adjustment factors are calculated for each leg of transit based on OGV speed/engine load, using the low-load adjustment regression factors from Port of Long Beach Air Emissions Inventory - 2013 - Table 2.7 (Starcrest 2014)

MGO OGV Fuel Correction Factors

Actual Fuel	PM10	PM2.5	NOx	SO_2	CO	POC	CO2	N2O	CH4
MGO (0.3%)	0.21	0.21	0.94	1	1	1	0.95	0.94	1

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 2.17. (Starcrest 2014)

Low-Load Emission Factor Regression Factors for OGV Main Propulsion Engines

Variable	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O
Exponent	1.5	1	1.5	0	1.5	1.5	0	1.5	1.5
Intercept	0.3859	0.1458	10.45	0	0.2551	0.2551	0	0.3859	10.45
Coefficient	0.0667	0.8378	0.1255	1	0.0059	0.0059	1	0.0667	0.1255
Ref. EF @ 20% Loa	1.132	4.335	11.853	1	0.321	0.321	1	1.132	11.853

Notes: (1) Port of Long Beach Air Emissions Inventory - 2013 - Table 2.7. (Starcrest 2014)

Table B-11 Mobile Source - Marine Vessel Emission Factors for Tugs

Operational Marine Vessel Emissions

Marine Vessel Emission Factors

Emission Factors for OGV

Engine Type	Assumed Fuel Type	Assumed Fuel Use Application		EF Units	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	Source
Tug ME (1900-3300 hp, 2009)	CARB (15 ppm S)	2009	2675 hp	g/bhp-hr	0.89	4.40	6.36	0.01	0.30	0.30	483.96	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.68	3.73	5.53	0.006	0.20	0.20	484	0.007	0.022	(1,2,3)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(6)
Age				yrs	15	15	15	15	15	15	15	15	15	(7)
Useful Life				yrs	21	21	21	21	21	21	21	21	21	(8)
Tug AE (250-500 hp, 2009)	CARB (15 ppm S)	2009	402 hp	g/bhp-hr	1.04	4.34	5.80	0.01	0.22	0.22	511.55	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.81	3.73	5.10	0.006	0.15	0.15	512	0.006	0.022	(1,2,4)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(6)
Age				yrs	15	15	15	15	15	15	15	15	15	(7)
Useful Life				yrs	23	23	23	23	23	23	23	23	23	(8)
Tug ME (1900-3300 hp, Tier 3)	CARB (15 ppm S)	2014	3356 hp	g/bhp-hr	0.82	4.17	5.43	0.01	0.33	0.33	483.96	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.68	3.73	4.94	0.006	0.25	0.25	484	0.007	0.022	(1,2,3)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(6)
Age				yrs	10	10	10	10	10	10	10	10	10	(7)
Useful Life				yrs	21	21	21	21	21	21	21	21	21	(8)
Tug AE (250-500 hp, Tier 3)	CARB (15 ppm S)	2014	288 hp	g/bhp-hr	0.96	4.14	4.35	0.01	0.10	0.10	511.55	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.81	3.73	3.99	0.006	0.08	0.08	512	0.006	0.022	(1,2,4)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(6)
Age				yrs	10	10	10	10	10	10	10	10	10	(7)
Useful Life				yrs	23	23	23	23	23	23	23	23	23	(8)

Notes:
(1) Emission Estimation Methodology for Commericial Harbor Craft Operating in California, Appendix B. (CARB 2007)
(2) For SOx EF Calculation, BSFC = 184 g/bhp-hr, per Port of Long Beach Air Emissions Inventory - 2013 (Starcrest 2014)
(3) CH4 & N2O EFs - Main Engines: Port of Long Beach Air Emissions Inventory - 2013 - Table 2.6. (Starcrest 2014)
(4) CH4 & N2O EFs - Aux Engines: Port of Long Beach Air Emissions Inventory - 2013 - Table 2.11. (Starcrest 2014)
(5) Fuel correction factors were not applied as outlined in section 3.5.5 of Port of Long Beach Air Emissions Inventory - 2013, as a conservative estimate, since engines may have been certified on ULSD.
(6) Deterioration Factors: Emission Estimation Methodology for Commericial Harbor Craft Operating in California, Appendix B, Table II-5. (CARB 2007)
(7) Age determined as of: 2024
(8) Useful LIfe: Port of Long Beach Air Emissions Inventory - 2013 - Table 3.6. (Starcrest 2014)
(9) [EF (g/bhp-hr)] = [EF_o g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

Table B-12 Mobile Source - Marine Vessel Emission Factors for Barges

Operational Marine Vessel Emissions

Barge Engine Emission Factors

Emission Factors for Barge Engines

Engine Type	Assumed Fuel Type	Assumed Fuel Use Application		EF Units	POC	CO	NOx	SO_2	PM10	PM2.5	CO2	CH4	N2O	Source
Propulsion Tug Main Engine	CARB (15 ppm S)	2015	1500 hp	g/bhp-hr	0.15	1.04	2.62	0.006	0.08	0.08	568.30	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.12	0.92	2.36	0.006	0.06	0.06	568.30	0.009	0.022	(1,2,3)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(1)
Age				yrs	9	9	9	9	9	9	9	9	9	(6)
Useful Life				yrs	17	17	17	17	17	17	17	17	17	(7)
Propulsion Tug Aux Gen Engine	CARB (15 ppm S)	2015	140 hp	g/bhp-hr	0.13	2.97	2.46	0.006	0.01	0.01	568.30	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.11	2.70	2.27	0.006	0.01	0.01	568.30	0.006	0.022	(1,2,4)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(1)
Age				yrs	9	9	9	9	9	9	9	9	9	(6)
Useful Life				yrs	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	(7)
Barge Aux Pump Engine	CARB (15 ppm S)	2015	345 hp	g/bhp-hr	0.10	1.02	1.48	0.006	0.01	0.01	568.30	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.08	0.92	1.36	0.006	0.01	0.01	568.30	0.006	0.022	(1,2,4)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(1)
Age				yrs	9	9	9	9	9	9	9	9	9	(6)
Useful Life				yrs	21.00	21	21	21	21	21	21	21	21	(7)
Barge Circ Pump Engine	CARB (15 ppm S)	2015	140 hp	g/bhp-hr	0.13	2.99	2.47	0.006	0.01	0.01	568.30	0.01	0.02	
Zero-hr EF				g/bhp-hr	0.11	2.70	2.27	0.006	0.01	0.01	568.30	0.006	0.022	(1,2,4)
Deterioration Factor				-	0.44	0.25	0.21	0.00	0.67	0.67	0.00	0.44	0.21	(1)
Age				yrs	9	9	9	9	9	9	9	9	9	(6)
Useful Life				yrs	21.00	21	21	21	21	21	21	21	21	(7)

Notes:
(1) Zero-hr EFs: CARB, California Barge and Dredge Emissions Inventory Database (2011) http://www.arb.ca.gov/msei/categories.htm
(2) For SOx EF Calculation, BSFC = 184 g/bhp-hr, per Port of Long Beach Air Emissions Inventory - 2013 (Starcrest 2014)
(3) CH4 & N2O EFs - Main Engines: Port of Long Beach Air Emissions Inventory - 2013 - Table 2.6. (Starcrest 2014)
(4) CH4 & N2O EFs - Aux Engines: Port of Long Beach Air Emissions Inventory - 2013 - Table 2.11. (Starcrest 2014)
(5) Fuel correction factors were not applied as outlined in section 3.5.5 of Port of Long Beach Air Emissions Inventory - 2013, as a conservative estimate, since engines may have been certified on ULSD.
(6) Age determined as of: 2024
(7) Useful LIfe: CARB, Appendix C, Updates on the Emissions Inventory for Commercial Harbor Craft Operating in California, Table 3
(8) [EF (g/bhp-hr)] = [EF_o g/bhp-hr] x (1+[Deterioration Factor] x [Engine Age]/[Useful Life])

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Table B-13 Mobile Source - Employee Transport Project Summary
Project Summary

Daily Emissions

				Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
Scenario	**Region**	**Average Daily Number of Employee Trips**	**Average Daily Miles Travelled**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	370	14,816	1.73	0.12	16.61	0.53	4.53	0.79				
	On-Site		1,062	0.12	0.01	1.19	0.04	9.03	1.36	(Not Applicable)			
	BAAQMD		15,879	*1.85*	*0.13*	*17.80*	*0.57*	*13.55*	*2.16*				
Post-Project	BAAQMD	78	3,134	0.37	0.02	3.51	0.11	0.96	0.17				
	On-Site		225	0.03	0.00	0.25	0.01	1.91	0.29	(Not Applicable)			
	BAAQMD			*0.39*	*0.03*	*3.76*	*0.12*	*2.87*	*0.46*				
Delta:	BAAQMD	**-292**	**-11,682**	**-1.36**	**-0.09**	**-13.09**	**-0.42**	**-3.57**	**-0.63**				
	On-Site		**-838**	**-0.10**	**-0.01**	**-0.94**	**-0.03**	**-7.12**	**-1.07**	(Not Applicable)			
	BAAQMD			*(1.46)*	*(0.10)*	*(14.03)*	*(0.45)*	*(10.69)*	*(1.70)*				

Annual Emissions

				Criteria Pollutant Emissions (Tons/Yr)						GHG Emissions (Metric Tons/Yr)			
Scenario	**Region**	**Total Number of Employee Trips**	**Total Miles Travelled**	**NOx**	**SO_2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Pre-Project Average	BAAQMD	135,200	5,408,000	0.22	0.02	2.16	0.07	0.59	0.10				
	On-Site		387,754	0.02	0.00	0.15	0.00	1.17	0.18				
	BAAQMD		5,795,754	*0.24*	*0.02*	*2.31*	*0.07*	*1.76*	*0.28*				
	California									1,539.99	0.01	0.14	1,583.01
Post-Project	BAAQMD	28,600	1,144,000	0.05	0.00	0.46	0.01	0.12	0.02				
	On-Site		82,025	0.00	0.00	0.03	0.00	0.25	0.04				
	BAAQMD			*0.05*	*0.00*	*0.49*	*0.02*	*0.37*	*0.06*				
	California									325.77	0.00	0.03	334.87
Delta:	BAAQMD	**-106,600**	**-4,264,000**	**-0.18**	**-0.01**	**-1.70**	**-0.05**	**-0.46**	**-0.08**				
	On-Site		**-305,729**	**-0.01**	**0.00**	**-0.12**	**0.00**	**-0.93**	**-0.14**				
	BAAQMD			*(0.19)*	*(0.01)*	*(1.82)*	*(0.06)*	*(1.39)*	*(0.22)*				
	California									**-1,214.22**	**-0.01**	**-0.11**	**-1,248.14**

Notes:
1. Criteria Pollutant Emissions based on travel within Bay Area Air Quality Management District (BAAQMD).
2. Greenhouse Gas (GHG) Emissions based on statewide travel.
3. Pre-Project Average Annual emissions have been adjusted based on facility staffing from October 2015 - September 2020. Post-project emissions have been estimated based on anticipated post-project staffing.
4. Pre-Project and post-project emissions are based on 2022 - 2024 average emission factors.
5. Region-based subtotals: "BAAQMD" represents the total travel and associated emissions within BAAQMD, but off-site from the facility.

Table B-14a Mobile Source - Employee Pre-Project Transportation

Operating Year: Pre-Project Average October 2015 - September 2020

Light Duty Cars				Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
Region	**Road Type**	**Daily Average Trips:**	**Daily Average Miles:**	**POC**	**SO_2**	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
BAAQMD	Freeway	260	10,400	0.19	0.06	0.81	13.48	2.22	0.36				
Onsite - North	Local	104	200	0.00	0.00	0.02	0.26	1.21	0.18				
Onsite - South	Local	156	546	0.01	0.00	0.04	0.71	3.30	0.50				
Light Duty Trucks													
BAAQMD	Freeway	260	10,400	0.34	0.06	0.91	3.12	2.30	0.44				
Onsite - North	Local	104	200	0.01	0.00	0.02	0.06	1.21	0.18				
Onsite - South	Local	156	546	0.02	0.00	0.05	0.16	3.31	0.50				
Total Daily:				**0.57**	**0.13**	**1.85**	**17.80**	**13.55**	**2.16**	**Not Applicable**			
Total BAAQMD:				**0.53**	**0.12**	**1.73**	**16.61**	**4.53**	**0.79**				
Total On-Site:				**0.04**	**0.01**	**0.12**	**1.19**	**9.03**	**1.36**				

Light Duty Cars				Criteria Pollutant Emissions (Tons/Yr)						GHG Emissions (Metric Tons/Yr)			
Region	**Type**	**Total Annual Trips:**	**Total Annual Miles:**	**POC**	**SO_2**	**NOx**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
BAAQMD	Freeway	67,600	2,704,000	0.02	0.01	0.11	1.75	0.29	0.05	688.81	0.01	0.01	692
Onsite - North	Local	27,040	51,917	0.00	0.00	0.00	0.03	0.16	0.02	13.23	0.00	0.00	13
Onsite - South	Local	40,560	141,960	0.00	0.00	0.01	0.09	0.43	0.06	36.16	0.00	0.00	36
Light Duty Trucks													
BAAQMD	Freeway	67,600	2,704,000	0.04	0.01	0.12	0.41	0.30	0.06	748.15	0.00	0.12	785
Onsite - North	Local	27,040	51,917	0.00	0.00	0.00	0.01	0.16	0.02	14.36	0.00	0.00	15
Onsite - South	Local	40,560	141,960	0.00	0.00	0.01	0.02	0.43	0.07	39.28	0.00	0.01	41
Total Annual:			**5,795,754**	**0.07**	**0.02**	**0.24**	**2.31**	**1.76**	**0.28**	**1,539.99**	**0.01**	**0.14**	**1,583.01**
Total BAAQMD:				**0.07**	**0.02**	**0.22**	**2.16**	**0.59**	**0.10**	**1436.96**	**0.01**	**0.13**	**1477.10**
Total On-Site:				**0.00**	**0.00**	**0.02**	**0.15**	**1.17**	**0.18**	**103.03**	**0.00**	**0.01**	**105.91**

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Table B-14b Mobile Source - Employee Post-Project Transportation

Operating Year: Post-Project

Light Duty Cars				Criteria Pollutant Emissions (Pounds/Day)						GHG Emissions (Pounds/Day)			
Region	Road Type	Daily Average Trips:	Daily Average Miles:	POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	55	2,200	0.04	0.01	0.17	2.85	0.47	0.08				
Onsite - North	Local	22	42	0.00	0.00	0.00	0.05	0.26	0.04				
Onsite - South	Local	33	116	0.00	0.00	0.01	0.15	0.70	0.11				
Light Duty Trucks													
BAAQMD	Freeway	55	2,200	0.07	0.01	0.19	0.66	0.49	0.09				
Onsite - North	Local	22	42	0.00	0.00	0.00	0.01	0.26	0.04				
Onsite - South	Local	33	116	0.00	0.00	0.01	0.03	0.70	0.11				
Total Daily:				**0.12**	**0.03**	**0.39**	**3.76**	**2.87**	**0.46**	**Not Applicable**			
Total BAAQMD:				**0.11**	**0.02**	**0.37**	**3.51**	**0.96**	**0.17**				
Total On-Site:				**0.01**	**0.00**	**0.03**	**0.25**	**1.91**	**0.29**				

Light Duty Cars				Criteria Pollutant Emissions (Tons/Yr)						GHG Emissions (Metric Tons/Yr)			
Region	Type	Total Annual Trips:	Total Annual Miles:	POC	SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
BAAQMD	Freeway	14,300	572,000	0.01	0.00	0.02	0.37	0.06	0.01	145.71	0.00	0.00	146
Onsite - North	Local	5,720	10,982	0.00	0.00	0.00	0.01	0.03	0.00	2.80	0.00	0.00	3
Onsite - South	Local	8,580	30,030	0.00	0.00	0.00	0.02	0.09	0.01	7.65	0.00	0.00	8
Light Duty Trucks													
BAAQMD	Freeway	14,300	572,000	0.01	0.00	0.03	0.09	0.06	0.01	158.26	0.00	0.02	166
Onsite - North	Local	5,720	10,982	0.00	0.00	0.00	0.00	0.03	0.01	3.04	0.00	0.00	3
Onsite - South	Local	8,580	30,030	0.00	0.00	0.00	0.00	0.09	0.01	8.31	0.00	0.00	9
Total Annual:				**0.02**	**0.00**	**0.05**	**0.49**	**0.37**	**0.06**	**325.77**	**0.00**	**0.03**	**334.87**
Total BAAQMD:				**0.01**	**0.00**	**0.05**	**0.46**	**0.12**	**0.02**	**303.97**	**0.00**	**0.03**	**312.46**
Total On-Site:				**0.00**	**0.00**	**0.00**	**0.03**	**0.25**	**0.04**	**21.79**	**0.00**	**0.00**	**22.40**

Appendix C

Health Risk Assessment

ALG
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GROUP

BARR

Martinez Renewable Fuels Project

CEQA Health Risk Assessment

Prepared for
Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation

July 2021

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CEQA Health Risk Assessment

July 2021

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1.0 Introduction and Summary

Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation (herein referenced as Marathon), has applied for permits to construct and operate the proposed Martinez Renewable Fuels Project (project) at its existing Martinez Refinery (herein referenced as Martinez or facility) and Amorco Terminal. Site locations are shown in Figure 1-1 below. This report presents the results of a health risk assessment (HRA) prepared to demonstrate that toxic air contaminant emission increases associated with the project are below BAAQMD CEQA Thresholds of Significance.

Results of the HRA show that impacts from the project are well below BAAQMD CEQA thresholds. Details of the HRA follow.

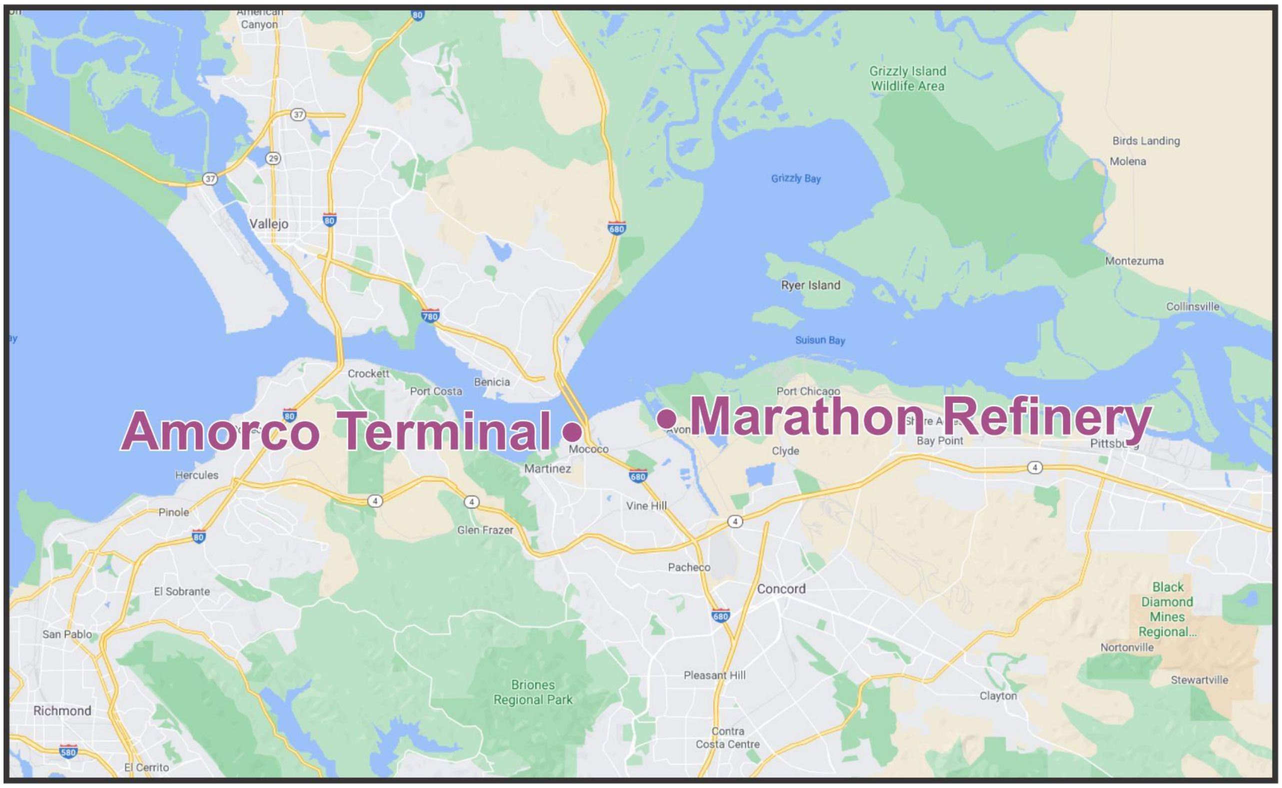

Figure 1-1 Locations of Marathon Facilities

2.0 Modeling Approach

2.1 Methodology

Project cancer and chronic risk were determined by subtracting pre-project risk from post-project risk at offsite receptors. This approach was taken to assess the impact of the project itself (i.e., to determine if the proposed project increased or reduced offsite risk).

Pre-project sources included all equipment associated with the project, including those that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Post-project sources included all new sources, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Mobile sources of diesel particulate matter, along with ship hoteling at the Avon and Amorco wharfs, were also included. Note that some of the post-project sources have no toxics in their emissions. Acute risk was based on post-project emissions only[1].

A separate modeling evaluation was performed for diesel particulate matter (DPM) emissions resulting from construction activities associated with the project. Construction activities at the facility are expected to take place over an estimated 22-month duration. Construction activities at the Avon wharf and at the Amorco wharf are expected to take place over approximately 3 months. Due to the different construction project durations, separate model runs were performed for the facility and wharf sources, and results were summed in a spreadsheet.

Modeling was performed following BAAQMD and OEHHA guidance[2]. All operational, mobile, and construction sources were assumed to emit 24 hours per day, 7 days per week. Hourly emission rates were assumed to be the annual emission rates divided by 8,760. As DPM is associated only with cancer and chronic risk, acute risk from construction activities was not evaluated.

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[1] Because the maximum acute risk at any receptor could occur under different meteorological conditions for the pre-project and the post-project scenarios, subtracting pre-project maximum acute risk from post-project maximum acute risk would potentially provide inaccurate estimates of the increase (or decrease) in risk. Therefore, a conservative approach of only considering post-project emissions was taken. For any individual source with lower post-project emissions than pre-project emissions for a particular toxic chemical, acute risk from that chemical from that source would be reduced.

[2] Bay Area Air Quality Management District, BAAQMD Health Risk Assessment Modeling Protocol, December 2020.

California Office of Environmental Health Hazard Assessment (OEHHA) 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines, Guidance Manual for Preparation of Health Risk Assessments, February 2015.

The results of the health risk assessment were compared to BAAQMD CEQA Thresholds of Significance[3]. The thresholds are shown below:

- Increased cancer risk of >10.0 in a million
- Increased non-cancer risk of > 1.0 Hazard Index (chronic or acute)

Results of the HRA show that impacts from the project are well below BAAQMD CEQA thresholds. For operational sources, post-project cancer and chronic risks were found to be lower than pre-project risks at all receptors (i.e., net risk values at all receptors were negative). Acute risk was evaluated based on post-project emissions only. Acute risks were found to be low at every potential receptor. For construction activities, cancer and chronic risk were well below CEQA thresholds.

2.2 Dispersion Model

The AMS/EPA Regulatory Model (AERMOD, v. 21112), the air dispersion model currently preferred by U.S. EPA and approved by the BAAQMD, was used for this analysis. AERMOD simulates the atmospheric transport and dilution of emissions from project sources. This mathematical model estimates dilution of emissions by diffusion and turbulent mixing with ambient air as the emissions travel downwind from a source. AERMOD can predict the resulting concentrations at specified locations of interest (commonly referred to as receptors). The model is capable of predicting impacts from any combination of point, area, and volume sources in terrain ranging from flat to complex.

2.3 Project Sources

2.3.1 Operational Sources

As described above, modeled sources include all new equipment, equipment that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Stationary sources were modeled as point, volume, and area sources as appropriate. Storage tanks were modeled as AREACIRC sources with the height set equal to the height of the tank and the radius set equal to the radius of the tank, with the exception of fixed roof tanks on vapor recovery which were modeled as point sources with location and parameters at the stack. Process unit fugitive piping component sources were modeled as volume sources with a release height of 10 feet. Cooling towers were modeled as volume sources with release heights based on actual cooling tower heights. Mobile sources consisted of locomotive engines, trucks traveling on paved roads within facility boundaries, and ship hoteling at the Avon and Amorco wharfs. Locomotive engines were modeled as a string of evenly-spaced volume sources along the segments of track where engines are expected to travel. Truck exhaust was modeled as line sources along the roads traveled to and from the various operational areas within the facility. Ship hoteling was modeled as point sources located in the approximate center of where ships are expected to berth at the Avon and Amorco wharves.

[3] Bay Area Air Quality Management District, California Environmental Quality Act Air Quality Guidelines, May 2017, Table 2-1.

Total pre- and post-project emission rates by substance are provided in Attachment A. A complete list of sources included in the modeling and their respective parameters are included in Attachment B. A map of the modeled sources is included as Figure C-1 in Attachment C. Source-by-source emission rates can be found in the electronic files provided in Attachment F.

2.3.2 Construction Sources

Construction sources included offroad diesel equipment such as lifts, air compressors, cranes, forklifts, generators, and tractors as well as onroad diesel vehicles such as pickup trucks, cement trucks, dump trucks, and water trucks. Offroad equipment were modeled as area sources, with a single area source encompassing construction activity within facility boundaries as well as an area source at the Avon wharf and an area source at the Amorco wharf where construction will take place. Onroad vehicles were modeled as line sources located along roads where travel is expected.

Construction DPM emission rates are provided in Attachment A. A list of construction emission sources included in the modeling and their respective parameters are included in Attachment B. A map of the modeled sources is included as Figure C-2 in Attachment C.

2.4 Terrain Characterization

AERMOD requires that each source in the analysis be categorized as being in either a rural or an urban setting. As most of the land in the immediate vicinity of the terminal is undeveloped, and the areas north of the facility are water, all sources were designated as rural.

Sources and receptors were modeled with consideration of terrain elevations. The AERMOD terrain processor (AERMAP) was used to calculate terrain elevations for each source and receptor from the U.S. Geological Survey (USGS) National Elevation Dataset (NED).

2.5 Building Downwash

When point sources are located near or on buildings or structures, the dispersion of the plume can be influenced. The wake produced on the lee side of the structure can cause the plume to be pulled toward the ground near the structure resulting in higher concentrations. This is called building downwash. Stack heights that minimize downwash effects are designated good engineering practice (GEP) stack heights.

The effects of building downwash have been examined in this modeling analysis. AERMOD uses the EPA-approved Building Profile Input Program with Plume Rise Model Enhancements (BPIP-PRIME) to provide input for the downwash analysis. This program calculates the GEP formula stack heights and direction-specific building dimensions for input to the dispersion calculations. BPIP-PRIME requires the input of building coordinates and heights, and stack coordinates; structures judged to have downwash potential were included.

2.6 Meteorological Data

A five-year dataset covering the years 2012, 2013, 2014, 2015, and 2017 for a meteorological station located at the Marathon Refinery was used. The data was processed using AERMET version 18081, the

AERMOD meteorological data preprocessor. A windrose showing a graphical distribution of wind speed and wind direction for the time period modeled is shown in Figure D-1 in Attachment D.

2.7 Receptors

Receptor spacing followed BAAQMD guidance and included the following:

- 20-m spacing along the fenceline
- 25-m spaced receptors out to 200 meters
- 50-m spaced receptors out to 500 meters from the facility boundary
- 100-m spaced receptors out to 2,000+ meters from the facility boundary

Additionally, sensitive receptors (hospitals, schools, and daycare centers) within the modeling domain were added. An additional set of receptors, spaced at 500 meters apart, was added to the far northern portion of the modeling domain for the construction modeling only, in order to fully capture the one per million residential cancer risk contour line.

Receptor heights above ground were set to 0.0 meters. This network is composed of Cartesian (X,Y) receptors with Universal Transverse Mercator (UTM) coordinates. The modeling was conducted using the North American Datum of 1983 (NAD83).

Figure C-3 plots the receptor locations. A total of 22,731 fenceline, grid, and sensitive receptors were included in the analysis (plus an additional 234 receptors for the construction modeling scenario). A list of the sensitive receptors is included in Attachment E. The closest sensitive receptor was located at the Floyd I. Marchus School, about 850 meters southeast of the southern boundary of the facility.

3.0 Risk Characterization

The air dispersion modeling is used to estimate normalized ground level concentrations based on an emission rate of one gram per second for each emission source (χ/Q or Chi over Q). Since ambient concentration is directly related to emission rate, the χ/Q is then multiplied in HARP by the emission rate for each substance from each source to obtain a ground-level concentration (GLC) resulting from each substance. Potential pathways of exposure to potential offsite receptors by each substance are identified (e.g., inhalation, dermal) and the appropriate algorithms are then used together with the χ/Q to estimate the concentration in air, soil, water, vegetation, and animals. The potential exposure levels to receptors are then estimated for each substance. HARP analyzes this data to calculate cancer risk and non-cancer risks. Default risk analysis methods were used, and default values for all pathways were used with the exception of the dermal pathway, which assumed a "cold" climate per OEHHA guidance. Per OEHHA guidance for HARP modeling, a deposition velocity of 0.02 m/s was assumed for the non-inhalation pathways.

The exposure pathways chosen for this analysis were inhalation, homegrown produce, dermal absorption, soil ingestion, and mother's milk for residential exposure and inhalation, dermal absorption, and soil ingestion for worker pathways. Pathways of fish ingestion, dairy milk ingestion, drinking water consumption, and meat ingestion were not used as the facility does not impact a local fishable body of water, grazing land, dairy, or water reservoir.

3.1 Carcinogens

The cancer health impacts are characterized as a cancer risk that represents the chances per million people of developing cancer. The cancer risk from each substance is added together to arrive at a total cancer risk. HARP calculates cancer risk based on annual average concentrations. Assumed exposure durations are provided in the table below.

Table 3-1 Exposure Duration Assumptions for Cancer Risk

Modeling Scenario	Residential Exposure	Worker Exposure	Worker Adjustment Factor
Operations	24 hours per day, 350 days per year over a 30-year period	8 hours per day, 250 days per year over a 25-year period	None
Construction	24 hours per day, 350 days per year over a 2-year period (facility area) or a 1-year period (wharf areas)	8 hours per day, 250 days per year over a 2-year period (facility area) or a 1-year period (wharf areas)	None

3.2 Non-Carcinogens

The non-cancer health impacts are characterized by a hazard index (HI). When more than one chemical is considered, it is assumed that the effects are additive provided the associated chemicals are expected to have an adverse impact on the same target organ system (respiratory system, liver, etc.). Thus, chemical-specific hazard indices are summed to arrive at a hazard index for each target organ. For any organ system, a total hazard index exceeding 1.0 indicates a potential health effect. Although the assumption of additivity of exposure to multiple chemicals ignores possible antagonistic or synergistic interactions, this approach has been accepted by regulatory agencies as generally conservative.

4.0 Health Risk Results

BAAQMD CEQA Air Quality Guidelines provide Thresholds of Significance of an increased cancer risk of 10.0 per million and an increased non-cancer chronic or acute hazard index of 1.0. The predicted increase in health risks at maximally exposed offsite receptors resulting from the project are summarized below. As shown, the highest calculated cancer, chronic, and acute risks are below CEQA Thresholds of Significance. Therefore, project risk impacts are less than significant.

4.1 Operational Sources

The predicted increase in health risks at maximally exposed offsite receptors resulting from operational sources are given by category in Table 4-1 below. As shown, the highest calculated cancer and chronic risks are negative, indicating a reduction in risk, and increases in acute risk are below the CEQA Thresholds of Significance.

Table 4-1 Summary of Results at Maximally Exposed Offsite Receptors

Location	Risk/HI Value	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Cancer Risk (Per Million)[4]				
Point of maximum impact (PMI)	-0.55	11755	576400	4204500
Chronic Hazard Index				
Point of maximum impact (PMI)	-0.00220	18609	574800	4212100
Acute Hazard Index				
Point of maximum impact (PMI)	0.336	192	581794.8	4210144.5
Residential receptor	0.097	8911	583750	4206400
Offsite workplace receptor	0.107	1646	583625	4206650
Sensitive Receptor	0.074	22708	584099	4205924

The maximum acute hazard index at the point of maximum impact (PMI) was 0.336, at a fenceline receptor on the northeast side of the facility near the water treatment surge ponds. The largest sources of risk were fugitive emissions associated with Stage 1 wastewater treatment (source ID 2001) and the bulk loading rack (source ID 1025) at 68.2% and 14.7%, respectively. The remaining sources responsible for the risk were primarily piping fugitives and storage tanks. The risk was almost entirely due to benzene (>98%). The target organ/system for the highest acute risk at the PMI was the immunological system.

The maximum acute hazard index at a residential receptor was 0.097 south of the facility across the California Delta Highway. The maximum acute hazard index at an offsite workplace receptor was 0.107,

[4] As cancer and chronic risk were below zero at all receptors, only the highest values are shown here.

located near the fenceline south of Mallard Reservoir. The maximum acute hazard index at a sensitive receptor was 0.074 at Concord Christian Schools located about one kilometer south of the facility. The locations of the maximum acute hazard indices are shown in Figure C-5.

4.2 Construction Sources

The predicted increase in health risks at maximally exposed offsite receptors resulting from construction sources are given by category in Table 4-2 below. As shown, the highest calculated cancer and chronic risks at residential, worker, and sensitive receptors are below the CEQA Thresholds of Significance. Note that as only diesel particulate matter (DPM) emissions were modeled from construction sources and no acute health risk assessment values have been developed for DPM, acute risk was not considered.

Table 4-2 Summary of Results at Maximally Exposed Offsite Receptors

Location	Risk/HI Value	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Cancer Risk (Per Million)				
Residential receptor	2.65	4861	585025	4209500
Offsite workplace receptor	0.04	3444	584825	4208650
Sensitive Receptor	0.70	22689	579754	4207262
Chronic Hazard Index				
Residential receptor	0.0015	4861	585025	4209500
Offsite workplace receptor	0.0015	3444	584825	4208650
Sensitive Receptor	0.0004	22689	579754	4207262

The maximum cancer risk at a residential receptor was 2.65 per million, at a receptor located in a neighborhood east of the facility. The maximum cancer risk at a worker receptor was 0.04 per million, at a commercial/industrial area just east of Mallard Reservoir south of the eastern portion of the facility. The maximum cancer risk at a sensitive receptor[5] was 0.70 per million, at Las Juntas Elementary School located about 2,000 meters west of the southwestern facility fenceline.

The maximum chronic risks at the highest residential receptor, highest worker receptor, and highest sensitive receptor were very low (hazard index <0.01) and were found at the same locations as the respective maximum cancer risks.

[5] Cancer risk at sensitive receptors was conservatively calculated assuming 24 hours per day exposure, 350 days per year over a 30-year period (same as residential cancer risk).

5.0 Conclusion

This HRA shows that health risk impacts from the Martinez Renewable Fuels Project will be well below BAAQMD CEQA Thresholds of Significance. There is generally a significant reduction in operational source toxic emissions which results in a reduction in cancer and chronic risk, and any increase in acute risk will be insignificant. The increases in cancer and chronic risk associated with diesel particulate matter emissions from construction equipment are well below CEQA thresholds.

Attachment A

Emission Rates

Table A-1 Pre-Project Modeled Emission Rates – Operational Sources Modeling

CAS #	TAC Name	Emission Rate (lb/yr)	Emission Rate (lb/hr)
1080	Dibenzofurans (chlorinated) {PCDFs} [Treated as 2378TCDD for HRA]	9.77E-06	1.12E-09
1085	Dioxins, total, with individ. isomers also reported {PCDDs}	1.56E-05	1.77E-09
1151	PAHs, total, w/o individ. components reported [Treated as B(a)P for HRA]	2.06E+01	2.35E-03
9901	Diesel engine exhaust, particulate matter (Diesel PM)	1.63E+04	1.87E+00
50-00-0	Formaldehyde	4.59E+03	5.24E-01
56-23-5	Carbon tetrachloride	1.04E+01	1.19E-03
57-12-5	Cyanide compounds (inorganic)	1.40E+01	1.59E-03
67-56-1	Methanol	8.07E+02	9.21E-02
67-66-3	Chloroform	1.28E+01	1.46E-03
71-43-2	Benzene	3.23E+03	3.69E-01
74-83-9	Methyl bromide {Bromomethane}	4.26E+01	4.87E-03
74-90-8	Hydrocyanic acid	7.07E+04	8.07E+00
75-00-3	Ethyl chloride {Chloroethane}	6.21E-01	7.08E-05
75-01-4	Vinyl chloride	4.90E+00	5.59E-04
75-07-0	Acetaldehyde	1.09E+03	1.25E-01
75-09-2	Methylene chloride {Dichloromethane}	3.19E+03	3.64E-01
75-15-0	Carbon disulfide	1.86E+03	2.13E-01
75-34-3	1,1-Dichloroethane	7.84E+00	8.95E-04
79-00-5	1,1,2-Trichloroethane	1.05E+01	1.19E-03
79-34-5	1,1,2,2-Tetrachloroethane	1.31E+01	1.49E-03
91-20-3	Naphthalene	3.29E+02	3.76E-02
100-41-4	Ethyl benzene	1.53E+03	1.75E-01
100-42-5	Styrene	7.84E+00	8.95E-04
106-46-7	p-Dichlorobenzene	2.13E+01	2.44E-03
106-93-4	Ethylene dibromide {EDB}	1.44E+01	1.64E-03
106-99-0	1,3-Butadiene	1.64E+02	1.88E-02
107-02-8	Acrolein	2.03E+01	2.32E-03
107-06-2	Ethylene dichloride {EDC}	7.84E+00	8.95E-04
108-88-3	Toluene	7.86E+03	8.98E-01
108-90-7	Chlorobenzene	8.45E+00	9.65E-04

CAS #	TAC Name	Emission Rate (lb/yr)	Emission Rate (lb/hr)
108-95-2	Phenol	1.39E+02	1.59E-02
110-54-3	Hexane	3.53E+04	4.03E+00
111-42-2	Diethanolamine	5.57E+01	6.36E-03
115-07-1	Propylene	3.51E+03	4.01E-01
127-18-4	Perchloroethylene {Tetrachloroethene}	2.21E+01	2.52E-03
463-58-1	Carbonyl sulfide	1.05E+04	1.19E+00
1319-77-3	Cresols (mixtures of) {Cresylic acid}	1.41E+02	1.61E-02
1330-20-7	Xylenes (mixed)	4.73E+03	5.40E-01
1336-36-3	PCBs {Polychlorinated biphenyls}	1.88E-02	2.14E-06
1634-04-4	Methyl tert-butyl ether	1.67E+00	1.91E-04
7439-92-1	Lead	3.90E+01	4.45E-03
7439-96-5	Manganese	7.76E+01	8.86E-03
7439-97-6	Mercury	1.02E+01	1.17E-03
7440-02-0	Nickel	2.52E+02	2.88E-02
7440-38-2	Arsenic	1.74E+01	1.99E-03
7440-41-7	Beryllium	2.02E+00	2.30E-04
7440-43-9	Cadmium	2.09E+01	2.39E-03
7440-48-4	Cobalt	5.27E+00	6.02E-04
7440-50-8	Copper	8.72E+01	9.96E-03
7440-62-2	Vanadium (fume or dust)	1.13E+02	1.29E-02
7647-01-0	Hydrochloric acid	1.77E+04	2.02E+00
7664-41-7	Ammonia	1.31E+05	1.49E+01
7664-93-9	Sulfuric acid	2.13E+04	2.43E+00
7782-49-2	Selenium	1.23E+02	1.40E-02
7782-50-5	Chlorine	3.92E+01	4.47E-03
7783-06-4	Hydrogen sulfide	1.18E+04	1.34E+00
18540-29-9	Chromium, hexavalent (& compounds)	1.02E+01	1.16E-03

Table A-2 Post-Project Modeled Emission Rates – Operational Sources Modeling

CAS #	TAC Name	Emission Rate (lb/yr)	Emission Rate (lb/hr)
1151	PAHs, total, w/o individ. components reported [Treated as B(a)P for HRA]	8.23E+00	9.40E-04
9901	Diesel engine exhaust, particulate matter (Diesel PM)	1.40E+03	1.60E-01
50-00-0	Formaldehyde	8.93E+02	1.02E-01
57-12-5	Cyanide compounds (inorganic)	2.05E+01	2.34E-03
67-56-1	Methanol	3.67E+03	4.18E-01
67-66-3	Chloroform	7.19E+00	8.21E-04
71-43-2	Benzene	1.05E+03	1.20E-01
75-07-0	Acetaldehyde	4.23E+02	4.83E-02
91-20-3	Naphthalene	7.15E+01	8.16E-03
100-41-4	Ethyl benzene	3.64E+02	4.16E-02
106-46-7	p-Dichlorobenzene	8.96E+00	1.02E-03
107-21-1	Ethylene glycol	6.93E+00	7.91E-04
108-88-3	Toluene	1.31E+03	1.50E-01
108-95-2	Phenol	6.06E+01	6.92E-03
110-54-3	Hexane	3.39E+04	3.87E+00
111-42-2	Diethanolamine	6.13E-05	7.00E-09
115-07-1	Propylene	4.44E+02	5.07E-02
463-58-1	Carbonyl sulfide	3.51E+03	4.01E-01
1310-73-2	Sodium hydroxide	1.82E-01	2.08E-05
1319-77-3	Cresols (mixtures of) {Cresylic acid}	1.91E+01	2.18E-03
1330-20-7	Xylenes (mixed)	8.84E+02	1.01E-01
1634-04-4	Methyl tert-butyl ether	8.11E+00	9.26E-04
7439-92-1	Lead	1.99E+01	2.27E-03
7439-96-5	Manganese	3.63E+01	4.14E-03
7439-97-6	Mercury	2.29E+00	2.61E-04
7440-02-0	Nickel	4.18E+01	4.77E-03
7440-38-2	Arsenic	6.81E+00	7.77E-04
7440-41-7	Beryllium	3.35E-01	3.82E-05
7440-43-9	Cadmium	6.49E+00	7.41E-04
7440-48-4	Cobalt	1.78E+00	2.03E-04
7440-50-8	Copper	4.54E+01	5.18E-03

CAS #	TAC Name	Emission Rate (lb/yr)	Emission Rate (lb/hr)
7440-62-2	Vanadium (fume or dust)	1.75E+01	2.00E-03
7647-01-0	Hydrochloric acid	6.26E+03	7.15E-01
7664-41-7	Ammonia	9.76E+03	1.11E+00
7664-93-9	Sulfuric acid	7.75E+01	8.84E-03
7782-49-2	Selenium	3.96E+01	4.52E-03
7782-50-5	Chlorine	0.00E+00	0.00E+00
7783-06-4	Hydrogen sulfide	8.55E+02	9.76E-02
18540-29-9	Chromium, hexavalent (& compounds)	9.86E+00	1.13E-03

Table A-3 Construction DPM Emission Rates

Project Component	Project Total Emissions (lbs)	Estimated Annual Emissions (lbs)
Off-road Diesel Construction Equipment – Main Facility	949.22	474.61
Off-road Diesel Construction Equipment – Avon Wharf	3.47	3.47
Off-road Diesel Construction Equipment – Amorco Wharf	0.94	0.94
Trucks – Employee North	1.25	0.63
Trucks – Employee South	3.43	1.71
Trucks – WWT South	0.37	0.18
Trucks – 3HDS South	0.36	0.18
Trucks – Main Material Yard South	1.82	0.91

Notes:

1. Facility construction expected to occur over an estimated 22-month period. Modeling assumed construction duration of 2 years with total emissions split evenly over each year. Truck emission sources listed above associated with facility construction.
2. Avon Wharf and Amorco Wharf construction expected to occur over an estimated 3-month period. Modeling assumed construction duration of 1 year. Truck traffic associated with wharf construction considered negligible.

Attachment B

Emission Source Parameters

Table B-1 POINT Source Parameters – Operational Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
323	Tank A-323 - Fixed roof (vents to control device)	581929.3	4209618.9	3.1	2	0	0.01	0.15
606	50 Unit Wastewater Air Stripper A (vents to S950 Unit 50 Crude Heater)	581314.9	4209477.4	8.3	30.5	616.5	10.96	2.13
607	50 Unit Wastewater Air Stripper B (vents to S950 Unit 50 Crude Heater)	581314.9	4209477.4	8.3	30.5	616.5	10.96	2.13
802	S802: FCCU	582410	4208800	4.2	106.7	560.9	22.15	3.65
901	No. 7 Boiler (vents to FCCU stack S802)	582410	4208800	4.2	106.7	560.9	22.15	3.65
904	S904: No. 6 Boiler	581935	4208532	7.3	106.7	433.2	4.32	4.57
908	S908: F8 & S1470: F-71 Stack (aka 90814701)	582431	4208873	3.9	22.9	710.9	14.37	1.83
909	S909: No. 1 Feed Prep Heater F9	582329	4208838	3.4	30.5	685.9	6.81	1.68
912	S912: No. 1 Feed Prep Heater F12	582319	4208837	3.8	24.2	607	12.19	1.8
913	S913: No. 2 Feed Prep Heater F13	582322	4208864	4	31.1	685.9	1.24	3.11
915	S915: Platformer Intermediate Heater F15	582232.9	4208965	3.9	27.4	644.3	3.22	1.43
916	S916: No. 1 HDS Heater F16	582225	4208956	3.8	27.4	699.8	7.68	1.22
917	S917: No. 1 HDS Prefract Reboiler F17	582216	4208954	3.8	18.3	672	3.52	1.28
919	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166	4208902	4.5	61	685.9	2.25	3.51
920	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166	4208902	4.5	61	685.9	2.25	3.51

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
922	S922: No. 5 Gas Debutanizer Reboiler F22	582253.1	4208726.4	5.2	61	644.3	0.96	2.56
926	S926: No. 2 Reformer Splitter Reboiler F26	582205	4209221	3.8	61	644.3	5.05	1.98
928	HDN & Hydrocracker Reactor Heaters (928)	582212	4209138	3.8	22.9	718.2	5.24	4.1
929	HDN & Hydrocracker Reactor Heaters (929)	582212	4209138	3.8	22.9	718.2	5.24	4.1
930	HDN & Hydrocracker Reactor Heaters (930)	582212	4209138	3.8	22.9	718.2	5.24	4.1
931	HDN & Hydrocracker Reactor Heaters (931)	582212	4209138	3.8	22.9	718.2	5.24	4.1
932	HDN & Hydrocracker Reactor Heaters (932)	582212	4209138	3.8	22.9	718.2	5.24	4.1
933	HDN & Hydrocracker Reactor Heaters (933)	582212	4209138	3.8	22.9	718.2	5.24	4.1
934	HDN & Hydrocracker Reactor Heaters (934)	582212	4209138	3.8	22.9	718.2	5.24	4.1
935	HDN & Hydrocracker Reactor Heaters (935)	582212	4209138	3.8	22.9	718.2	5.24	4.1
937	S937: H2 Plant Heater F37	582243.2	4209167.7	3.9	41.1	538.7	8.69	3.1
950	S950: 50 Unit Crude Heater F50	581314.9	4209477.4	8.3	30.5	616.5	10.96	2.13
955	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4064	582297.9	4208816.3	2.8	10.1	630.4	6.16	0.38
956	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4065	582292.7	4208822.3	3	10.1	630.4	6.16	0.38

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
957	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4066	582287.8	4208828.6	3.1	10.1	630.4	6.16	0.38
958	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4067	582282.4	4208834.3	2.9	10.1	630.4	6.16	0.38
959	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4068	582276.7	4208840.1	3.2	10.1	630.4	6.16	0.38
960	12900 cubic inch displacement, 660 HP, No. 4 Gas Plant Vapor Compressor No. 4096	582271.3	4208846.5	3.3	10.1	630.4	6.16	0.38
971	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	582054	4209154	4.3	80.2	456.5	0.26	2.99
972	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	582054	4209154	4.3	80.2	456.5	0.26	2.99
974	S973: No. 3 HDS Recycle Gas F55 & S974: Fract. Feed F56 Heaters (973_974)	581995	4209075	4.5	61	422	12.48	1.1
1020	No. 3 UOP Reformer	582018	4209180	4.3	32.5	302	3.68	0.15
1106	S1106: No. 4 HDS F72	582092.3	4209069.5	4.8	61	601.5	0.11	1.49
1401	S1401: Sulfur Recovery Unit	582773	4208997	3.4	102.1	694.3	15.8	1.83

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
1418	Rich DEA Tank A-750-Fixed roof (abated by SRU stack incinerators)	582773	4208997	3.4	102.1	694.3	15.8	1.83
1470	No. 71 Furnace; No. 3 Crude Vacuum Distillation Heater	582431	4208873	3.9	22.9	710.9	14.37	1.83
1511	S1511: DCU Heater F78	582079.5	4208870.7	5.1	61	643.7	15.24	2.44
1512	S1512: DCU Heater F79	582027	4208928	5	61	643.7	15.24	2.44
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	582386.1	4208957.9	3.8	16	1144.3	2.86	0.76
699_1	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery (vents to S908, 909, 912, 699_1 = 908)	582431	4208873	4.0	22.9	710.9	14.37	1.83
699_2	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery (vents to S908, 909, 912, 699_2 = 909)	582329	4208838	4.2	30.5	685.9	6.81	1.68
699_3	Tank A-699, White, API Separator Recovered Oil, A-14 Vapor Recovery (vents to S908, 909, 912, 699_3 = 912)	582319	4208837	5.0	24.2	607.0	12.19	1.80
AVONWHRF	Avon Wharf vessel hoteling exhaust	579775.11	4211664.2	0	43	618	16	0.5
AMRCWHRF	Amorco Wharf vessel hoteling exhaust	576917.72	4210114.4	0	43	618	16	0.5

Table B-2 VOLUME Source Parameters – Operational Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
795	#3 Reformer V-307	582059.5	4209191.4	4.3	0.9	0.57	0.85
977	No. 3 Crude Unit Cooling Tower [CT-048]	582338.7	4208884.3	4.3	9.6	4.65	8.93
987	No. 50 Unit Cooling Tower [CT-016]	581292.0	4209475.8	8.4	6.1	4.97	5.67
1025	Bulk Plant; Bottom Loading Facilities	581119.5	4210043.9	3.2	1.5	4.65	1.40
1571	Sulfur Loading Truck Terminal, 1200 tons/day, 73000 tons/yr	582821.0	4209022.0	3.3	1.5	2.33	1.40
2001	Stage 1 wastewater treatment fugitives	582048.1	4209475.2	3.3	3.0	9.00	2.83
2025	ARA Feed Pretreatment fugitives	581897.3	4209066.8	3.8	3.0	9.00	2.83
975_1	No. 4 Gas Plant Cooling Tower [CT-007] (1 of 6)	582110.7	4208745.9	5.3	6.4	3.81	5.94
975_2	No. 4 Gas Plant Cooling Tower [CT-007] (2 of 6)	582122.9	4208756.8	5.4	6.4	3.81	5.94
975_3	No. 4 Gas Plant Cooling Tower [CT-007] (3 of 6)	582134.9	4208767.4	5.3	6.4	3.81	5.94
975_4	No. 4 Gas Plant Cooling Tower [CT-007] (4 of 6)	582147.3	4208778.5	5.2	6.4	3.81	5.94
975_5	No. 4 Gas Plant Cooling Tower [CT-007] (5 of 6)	582159.4	4208789.3	5.0	6.4	3.81	5.94
975_6	No. 4 Gas Plant Cooling Tower [CT-007] (6 of 6)	582171.9	4208799.7	4.9	6.4	3.81	5.94
983_1	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (1 of 5)	582113.4	4209373.8	3.4	10.3	2.79	9.63
983_2	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (2 of 5)	582122.0	4209364.1	3.5	10.3	2.79	9.63
983_3	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (3 of 5)	582130.6	4209354.4	3.6	10.3	2.79	9.63
983_4	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (4 of 5)	582139.2	4209344.7	3.6	10.3	2.79	9.63
983_5	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (5 of 5)	582147.8	4209335.0	3.7	10.3	2.79	9.63
988_1	No. 3 Reformer Cooling Tower [CT-075] (1 of 3)	582118.3	4209122.5	4.6	2.9	1.49	2.69
988_2	No. 3 Reformer Cooling Tower [CT-075] (2 of 3)	582122.0	4209125.6	4.6	2.9	1.49	2.69
988_3	No. 3 Reformer Cooling Tower [CT-075] (3 of 3)	582125.7	4209128.8	4.6	2.9	1.49	2.69
A001	Cat Cracker (A001)	582313.0	4208768.0	4.1	3.0	18.60	2.83

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
A003	No.5 Gas Plant fugitives (S-1526)	582207.2	4208707.3	5.4	3.0	32.56	2.83
A004	HDS Plant No. 2 fugitives (S1003)	582154.1	4208936.4	4.5	3.0	23.26	2.83
A005	HDS Plant No. 1 fugitives (S-1002)	582219.2	4208988.1	3.8	3.0	23.26	2.83
A006_1	No. 2 Reformer (A006) (1 of 2)	582197.7	4209202.4	3.8	3.0	15.12	2.83
A006_2	No. 2 Reformer (A006) (2 of 2)	582151.4	4209256.7	3.9	3.0	15.12	2.83
A007_1	No.4 Gas Plant (A007) (1 of 2)	582277.9	4208832.6	2.9	3.0	11.63	2.83
A007_2	No.4 Gas Plant (A007) (2 of 2)	582246.2	4208800.1	3.9	3.0	11.63	2.83
A011_1	No.1 Feed Prep (A011) (1 of 2)	582339.1	4208834.0	4.1	3.0	6.28	2.83
A011_2	No.1 Feed Prep (A011) (2 of 2)	582361.8	4208809.5	4.1	3.0	6.28	2.83
A013_1	No.2 Feed Prep (A013) (1 of 2)	582292.9	4208886.3	4.1	3.0	6.28	2.83
A013_2	No.2 Feed Prep (A013) (2 of 2)	582309.7	4208866.9	4.0	3.0	6.28	2.83
A016_1	Unit No. 50 (A016) (1 of 2)	581206.7	4209562.7	9.3	3.0	12.79	2.83
A016_2	Unit No. 50 (A016) (2 of 2)	581250.9	4209515.2	8.5	3.0	12.79	2.83
A018	Foul Water Strippers fugitives	582294.4	4208924.2	4.0	3.0	18.60	2.83
A031	Boiler House No. 6 (A031)	581963.1	4208521.2	7.3	3.0	11.63	2.83
A034	No.1 Gas Plant fugitives (S-500024)	581847.8	4209445.8	3.9	3.0	13.95	2.83
A044	FCCU #7 Boiler (A044)	582313.0	4208768.0	4.1	3.0	18.60	2.83
A048	No. 3 Crude (A048)	582363.4	4208891.0	4.1	3.0	19.77	2.83
A067	Hydrocracker 1st Stage H.D.N fugitives (S-1008)	582258.6	4209102.5	3.9	3.0	24.19	2.83
A068	Hydrocracker 2nd Stage fugitives (S-1007)	582258.6	4209102.5	3.9	3.0	24.19	2.83
A073	Alkylation Plant fugitives (S-1009)	582079.5	4209323.2	3.8	3.0	27.91	2.83
A075	No. 3 Reformer (A075)	582037.2	4209176.4	4.3	3.0	19.77	2.83
A076	No.3 H.D.S. Plant fugitives (S-850)	581974.3	4209126.5	4.6	3.0	27.91	2.83
A078_1	Chemical Plant Scot (A078) (1 of 2)	582752.4	4209029.8	3.3	3.0	3.49	2.83
A078_2	Chemical Plant Scot (A078) (2 of 2)	582763.6	4209039.1	3.2	3.0	9.00	2.83
A080_1	Chemical Plant Ammonia (A080) (1 of 3)	582802.3	4209058.9	3.3	3.0	6.98	2.83
A080_2	Chemical Plant Ammonia (A080) (2 of 3)	582822.4	4209076.3	3.3	3.0	6.98	2.83
A080_3	Chemical Plant Ammonia (A080) (3 of 3)	582842.9	4209092.1	3.3	3.0	6.98	2.83

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
A091_1	Benzene Saturation (A091) (1 of 2)	582114.4	4209213.2	3.9	3.0	3.95	2.83
A091_2	Benzene Saturation (A091) (2 of 2)	582128.4	4209198.0	3.8	3.0	3.95	2.83
A102	Delayed Coker fugitives (S-1510)	582043.5	4208826.1	3.2	3.0	48.84	2.83
LINE_01 to LINE_08	Railcar - Line Haul (8 total sources)	See modeling files			5.6	4.19	2.60
S_D_01 to S_D_42	Railcar - Switcher D (42 total sources)	See modeling files			5.6	4.19	2.60
S_ABC_01 to S_ABC_54	Railcar - Switcher ABC (54 total sources)	See modeling files			5.6	4.19	2.60
S_EF_01 to S_EF_57	Railcar - Switcher EF (57 total sources)	See modeling files			5.6	4.19	2.60

Table B-3 AREACIRC Source Parameters – Operational Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Radius of Circle (m)
432	Tank A-432 - Fixed roof	582028.7	4209440.3	3.5	14.6	15.2
517	Tank A-517	581673.9	4209535.3	4.0	12.6	18.3
620	Tank A-620	582439.7	4209205.9	3.9	12.2	18.3
621	Tank A-621	582474.9	4209170.1	4.0	12.2	18.3
622	Tank A-622 - Fixed roof	582309.5	4209019.8	3.7	12.2	18.3
651	Tank A-651 - External floating roof	582404.5	4209257.0	4.7	14.6	21.3
692	Tank A-692 - External floating roof	580912.7	4210197.5	13.7	17.1	15.2
711	Tank A-711	581027.2	4210176.9	7.9	13.7	17.4
771	Tank A-713 - External floating roof	582504.1	4208934.2	4.1	7.3	3.1
872	Tank A-872 - External Floating Roof	582367.1	4207702.4	17.8	16.9	26.8
1404	Sulfur Storage Tank A-756- Fixed roof	582846.8	4209013.3	3.4	9.8	6.4
1463	Tank A-867- External Floating Roof	582265.1	4207825.0	16.4	17.1	26.8
1464	Tank A-868- External Floating Roof	582527.8	4207791.2	8.1	12.2	20.4

1465	Tank A-869- External Floating Roof	582575.9	4207691.8	8.8	12.2	20.4
1496	Tank A-876- Fixed roof	582400.0	4209000.0	4.4	9.0	9.0
1554	Tank A-943	581622.0	4209485.9	4.6	14.6	15.2
2028	Tank A-932	580971.2	4210152.8	13.0	14.6	20.4
873	Tank A-895	582406.6	4209176.0	4.0	14.6	18.3
TK10162	MTK-10162 Demulsifier Tank	582247.7	4208813.6	3.9	2.2	1.0

Table B-4 AREAPOLY Source Parameters – Operational Sources

Source ID	Source Description	Base Elevation (m)	Release Height (m)	Number of Vertices	Init. Vertical Dimension (m)	Easting (X) (m)	Northing (Y) (m)
830	Water Treatment Surge Ponds	2.8	0	13	0	581395.6	4209840.9
						581460.3	4209930.1
						581596.9	4209995.6
						581862.0	4209728.1
						581859.7	4209691.0
						581753.1	4209599.4
						581716.8	4209648.4
						581753.9	4209710.7
						581646.6	4209791.2
						581609.5	4209759.6
						581612.6	4209733.6
						581574.0	4209697.3
						581518.7	4209698.9

Table B-5 LINE Source Parameters – Operational Sources

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
EMP_N1	Employees from north via Solano Way (1 of 4)	581122.73	4209871	3.38	1.3	581149.83	4209804.5	7.62	1.2
EMP_N2	Employees from north via Solano Way (2 of 4)	581154.08	4209804	3.8	1.3	581242.82	4209761.5	7.62	1.2
EMP_N3	Employees from north via Solano Way (3 of 4)	581246.73	4209759.3	3.2	1.3	581686.34	4209245.4	7.62	1.2
EMP_N4	Employees from north via Solano Way (4 of 4)	581686.34	4209245.4	6.65	1.3	581900.4	4208832.5	7.62	1.2
EMP_N5	Employees from north - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	1.2
EMP_S1	Employees from south - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	1.2
EMP_S2	Employees from south via Solano Way (1 of 4)	581900.4	4208832.5	8.59	1.3	582198.83	4208257	7.62	1.2
EMP_S3	Employees from south via Solano Way (2 of 4)	582198.83	4208257	9.84	1.3	582497.25	4207681.6	7.62	1.2
EMP_S4	Employees from south via Solano Way (3 of 4)	582497.25	4207681.6	11.77	1.3	582795.68	4207106.1	7.62	1.2
EMP_S5	Employees from south via Solano Way (4 of 4)	582795.68	4207106.1	8.57	1.3	583094.1	4206530.7	7.62	1.2
WW1	Trucks - WWT South - Road to WWT off Solano Way (1 of 3)	581909.87	4209663.1	3.18	3.4	581680.61	4209466.1	7.62	3.2
WW2	Trucks - WWT South - Road to WWT off Solano Way (2 of 3)	581680.61	4209466.1	4.03	3.4	581666.21	4209359	7.62	3.2
WW3	Trucks - WWT South - Road to WWT off Solano Way (3 of 3)	581666.21	4209359	5.21	3.4	581686.34	4209245.4	7.62	3.2
WW4	Trucks - WWT South - via Solano Way (1 of 4)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	3.2

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
WW5	Trucks - WWT South - via Solano Way (2 of 4)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	3.2
WW6	Trucks - WWT South - via Solano Way (3 of 4)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	3.2
WW7	Trucks - WWT South - via Solano Way (4 of 4)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	3.2
3HDS_S1	Trucks - 3HDS - road off Solano Way (1 of 3)	581903	4208838	8.51	3.4	581926.6	4208861.6	7.62	3.2
3HDS_S2	Trucks - 3HDS - road off Solano Way (2 of 3)	581926.6	4208861.6	6.89	3.4	581923.2	4208887.9	7.62	3.2
3HDS_S3	Trucks - 3HDS - road off Solano Way (3 of 3)	581923.2	4208887.9	6.4	3.4	582111.5	4209023.2	7.62	3.2
3HDS_S4	Trucks - 3HDS via Solano Way (1 of 4)	581900.4	4208832.5	8.59	3.4	582198.83	4208257	7.62	3.2
3HDS_S5	Trucks - 3HDS via Solano Way (2 of 4)	582198.83	4208257	9.84	3.4	582497.25	4207681.6	7.62	3.2
3HDS_S6	Trucks - 3HDS via Solano Way (3 of 4)	582497.25	4207681.6	11.77	3.4	582795.68	4207106.1	7.62	3.2
3HDS_S7	Trucks - 3HDS via Solano Way (4 of 4)	582795.68	4207106.1	8.57	3.4	583094.1	4206530.7	7.62	3.2
MMY_S1	Trucks - Main Material Yard South - road off Solano Way to yard (1 of 4)	582199.7	4208267.8	9.62	3.4	582542.5	4208436.8	7.62	3.2
MMY_S2	Trucks - Main Material Yard South - road off Solano Way to yard (2 of 4)	582542.5	4208436.8	4.01	3.4	582585.4	4208487.8	7.62	3.2
MMY_S3	Trucks - Main Material Yard South - road off Solano Way to yard (3 of 4)	582585.4	4208487.8	3.83	3.4	582981.45	4208782.5	7.62	3.2

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
MMY_S4	Trucks - Main Material Yard South - road off Solano Way to yard (4 of 4)	582981.45	4208782.5	6.57	3.4	583377.5	4209077.2	7.62	3.2
MMY_S5	Trucks - Main Material Yard South - via Solano Way (1 of 3)	582198.83	4208257	9.84	3.4	582497.25	4207681.6	7.62	3.2
MMY_S6	Trucks - Main Material Yard South - via Solano Way (2 of 3)	582497.25	4207681.6	11.77	3.4	582795.68	4207106.1	7.62	3.2
MMY_S7	Trucks - Main Material Yard South - via Solano Way (3 of 3)	582795.68	4207106.1	8.57	3.4	583094.1	4206530.7	7.62	3.2

Table B-6 AREAPOLY Source Parameters – Construction Sources

Source ID	Source Description	Base Elevation (m)	Release Height (m)	Number of Vertices	Init. Vertical Dimension (m)	Easting (X) (m)	Northing (Y) (m)
CNSTRCT	Construction area	3.67	3.4	10	3.2	581860.69	4209609.8
						581929.94	4209665.2
						582063.39	4209531.8
						582205.5	4209266.2
						582548.98	4208913.5
						582114.79	4208540.9
						582040.65	4208662.2
						582210.68	4208803.1
						581898.31	4209152.5
						582102.06	4209327.9

Table B-7 LINE Source Parameters – Operational Sources

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
GAS_N	Trucks - Gasoline - from north - north of Waterfront Rd	581138.1	4210066	3.01	3.4	581199.3	4209899.8	7.62	6.8
GAS_S1	Trucks - Gasoline - from south - north of Waterfront Rd	581138.1	4210066	3.01	3.4	581199.3	4209899.8	7.62	6.8
GAS_S2	Trucks - Gasoline - from south - south of Waterfront Rd (1 of 7)	581122.7	4209871	3.38	3.4	581149.8	4209804.5	7.62	6.8
GAS_S3	Trucks - Gasoline - from south - south of Waterfront Rd (2 of 7)	581154.1	4209804	3.8	3.4	581242.8	4209761.5	7.62	6.8
GAS_S4	Trucks - Gasoline - from south - south of Waterfront Rd (3 of 7)	581246.7	4209759	3.2	3.4	581686.3	4209245.4	7.62	6.8
GAS_S5	Trucks - Gasoline - from south - south of Waterfront Rd (4 of 7)	581686.3	4209245	6.65	3.4	582038.3	4208566.7	7.62	6.8
GAS_S6	Trucks - Gasoline - from south - south of Waterfront Rd (5 of 7)	582038.3	4208567	8.93	3.4	582390.2	4207888	7.62	6.8
GAS_S7	Trucks - Gasoline - from south - south of Waterfront Rd (6 of 7)	582390.2	4207888	11.21	3.4	582742.2	4207209.3	7.62	6.8
GAS_S8	Trucks - Gasoline - from south - south of Waterfront Rd (7 of 7)	582742.2	4207209	9.49	3.4	583094.1	4206530.7	7.62	6.8
EMP_N1	Employees from north via Solano Way (1 of 4)	581122.7	4209871	3.38	1.3	581149.8	4209804.5	7.62	2.6
EMP_N2	Employees from north via Solano Way (2 of 4)	581154.1	4209804	3.8	1.3	581242.8	4209761.5	7.62	2.6
EMP_N3	Employees from north via Solano Way (3 of 4)	581246.7	4209759	3.2	1.3	581686.3	4209245.4	7.62	2.6
EMP_N4	Employees from north via Solano Way (4 of 4)	581686.3	4209245	6.65	1.3	581900.4	4208832.5	7.62	2.6
EMP_N5	Employees from north - road off Solano Way to parking area	581896.4	4208830	8.6	1.3	581703.6	4208730.3	7.62	2.6

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
EMP_S1	Employees from south - road off Solano Way to parking area	581896.4	4208830	8.6	1.3	581703.6	4208730.3	7.62	2.6
EMP_S2	Employees from south via Solano Way (1 of 4)	581900.4	4208833	8.59	1.3	582198.8	4208257	7.62	2.6
EMP_S3	Employees from south via Solano Way (2 of 4)	582198.8	4208257	9.84	1.3	582497.3	4207681.6	7.62	2.6
EMP_S4	Employees from south via Solano Way (3 of 4)	582497.3	4207682	11.77	1.3	582795.7	4207106.1	7.62	2.6
EMP_S5	Employees from south via Solano Way (4 of 4)	582795.7	4207106	8.57	1.3	583094.1	4206530.7	7.62	2.6
WW1	Trucks - Wastewater Caustic - Road to WWT off Solano Way (1 of 3)	581909.9	4209663	3.18	3.4	581680.6	4209466.1	7.62	6.8
WW2	Trucks - Wastewater Caustic - Road to WWT off Solano Way (2 of 3)	581680.6	4209466	4.03	3.4	581666.2	4209359	7.62	6.8
WW3	Trucks - Wastewater Caustic - Road to WWT off Solano Way (3 of 3)	581666.2	4209359	5.21	3.4	581686.3	4209245.4	7.62	6.8
WW4	Trucks - Wastewater Caustic - via Solano Way (1 of 4)	581686.3	4209245	6.65	3.4	582038.3	4208566.7	7.62	6.8
WW5	Trucks - Wastewater Caustic - via Solano Way (2 of 4)	582038.3	4208567	8.93	3.4	582390.2	4207888	7.62	6.8
WW6	Trucks - Wastewater Caustic - via Solano Way (3 of 4)	582390.2	4207888	11.21	3.4	582742.2	4207209.3	7.62	6.8
WW7	Trucks - Wastewater Caustic - via Solano Way (4 of 4)	582742.2	4207209	9.49	3.4	583094.1	4206530.7	7.62	6.8
DMDS1	Trucks - DMDS - road off Solano Way	581896.7	4208847	8.54	3.4	582061	4208973.9	7.62	6.8
DMDS2	Trucks - DMDS - via Solano Way (1 of 4)	581893.4	4208846	8.48	3.4	582193.6	4208267	7.62	6.8
DMDS3	Trucks - DMDS - via Solano Way (2 of 4)	582193.6	4208267	9.84	3.4	582493.8	4207688.2	7.62	6.8

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
DMDS4	Trucks - DMDS - via Solano Way (3 of 4)	582493.8	4207688	11.69	3.4	582793.9	4207109.5	7.62	6.8
DMDS5	Trucks - DMDS - via Solano Way (4 of 4)	582793.9	4207109	8.57	3.4	583094.1	4206530.7	7.62	6.8
MISC1	Trucks - Misc along Solano Way (1 of 4)	581686.3	4209245	6.65	3.4	582038.3	4208566.7	7.62	6.8
MISC2	Trucks - Misc along Solano Way (2 of 4)	582038.3	4208567	8.93	3.4	582390.2	4207888	7.62	6.8
MISC3	Trucks - Misc along Solano Way (3 of 4)	582390.2	4207888	11.21	3.4	582742.2	4207209.3	7.62	6.8
MISC4	Trucks - Misc along Solano Way (4 of 4)	582742.2	4207209	9.49	3.4	583094.1	4206530.7	7.62	6.8
LNG_LR	Trucks - LNG load rack - north of Waterfront Rd	581138.1	4210066	3.01	3.4	581199.3	4209899.8	7.62	6.8
CHEM_S1	Trucks - Chem Plant - road off Solano Way to yard (1 of 4)	582199.7	4208268	9.62	3.4	582542.5	4208436.8	7.62	3.2
CHEM_S2	Trucks - Chem Plant - road off Solano Way to yard (2 of 4)	582542.5	4208437	4.01	3.4	582585.4	4208487.8	7.62	3.2
CHEM_S3	Trucks - Chem Plant - road off Solano Way to yard (3 of 4)	582585.4	4208488	3.83	3.4	582951.3	4208760.4	7.62	3.2
CHEM_S4	Trucks - Chem Plant - road off Solano Way to yard (4 of 4)	582951.3	4208760	6.57	3.4	582799.5	4208927	7.62	3.2
CHEM_S5	Trucks - Chem Plant - via Solano Way (1 of 3)	582198.8	4208257	9.84	3.4	582497.3	4207681.6	7.62	3.2
CHEM_S6	Trucks - Chem Plant - via Solano Way (2 of 3)	582497.3	4207682	11.77	3.4	582795.7	4207106.1	7.62	3.2
CHEM_S7	Trucks - Chem Plant - via Solano Way (3 of 3)	582795.7	4207106	8.57	3.4	583094.1	4206530.7	7.62	3.2

Attachment C

Maps and Diagrams

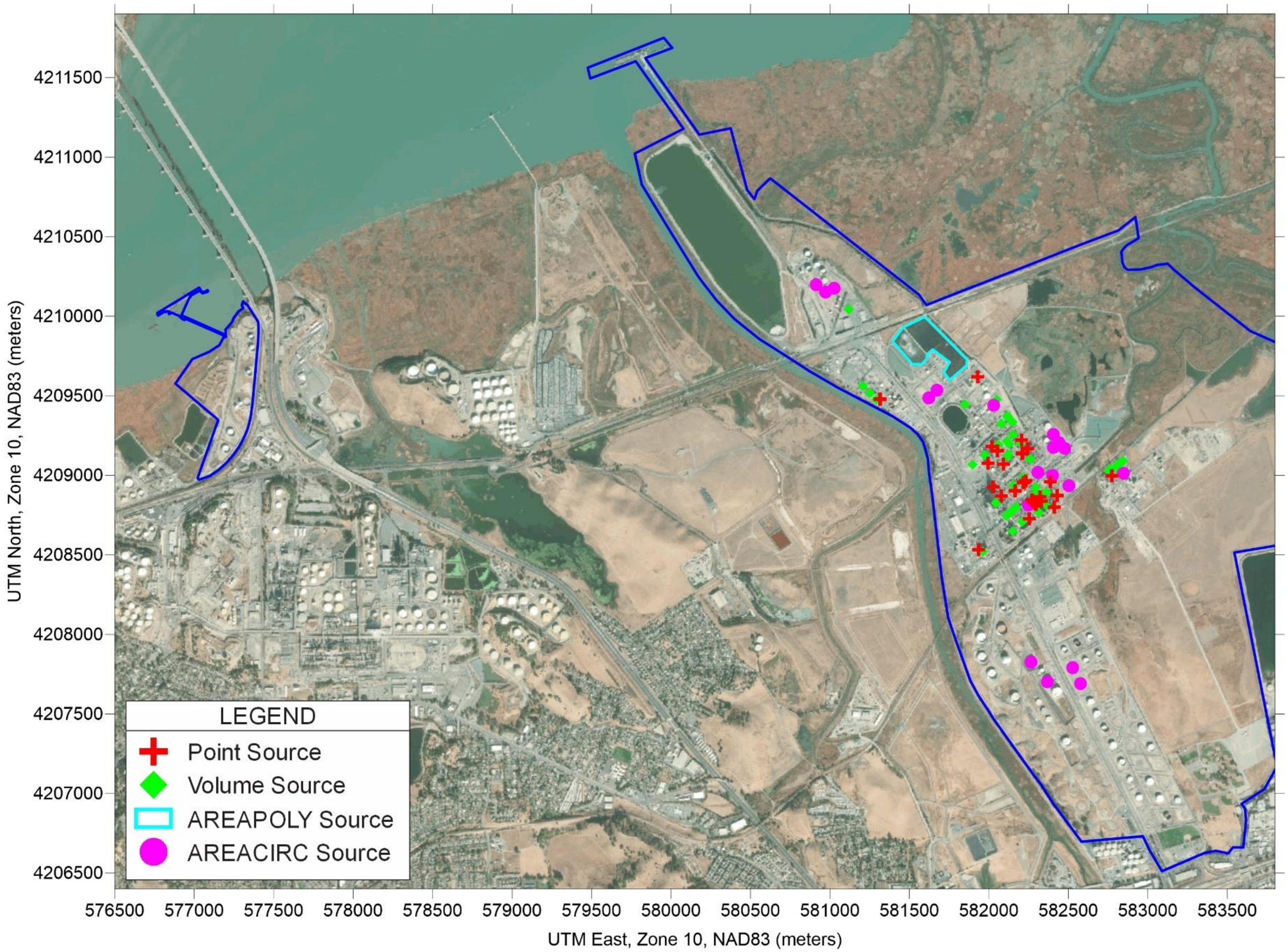


Figure C-1 **Modeled Source Locations Diagram – Operational Sources Modeling**

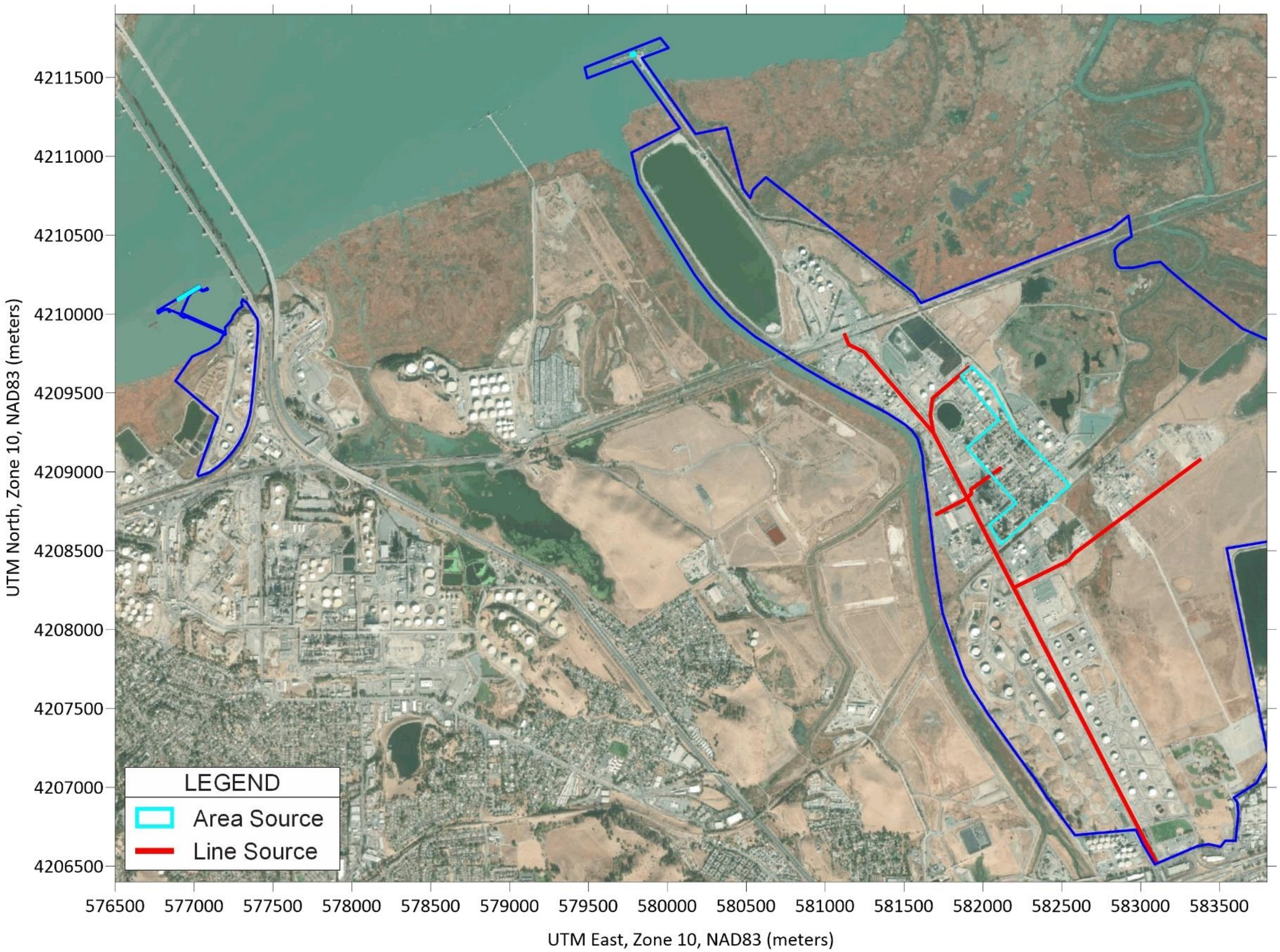


Figure C-2 Modeled Source Locations Diagram – Construction Sources Modeling

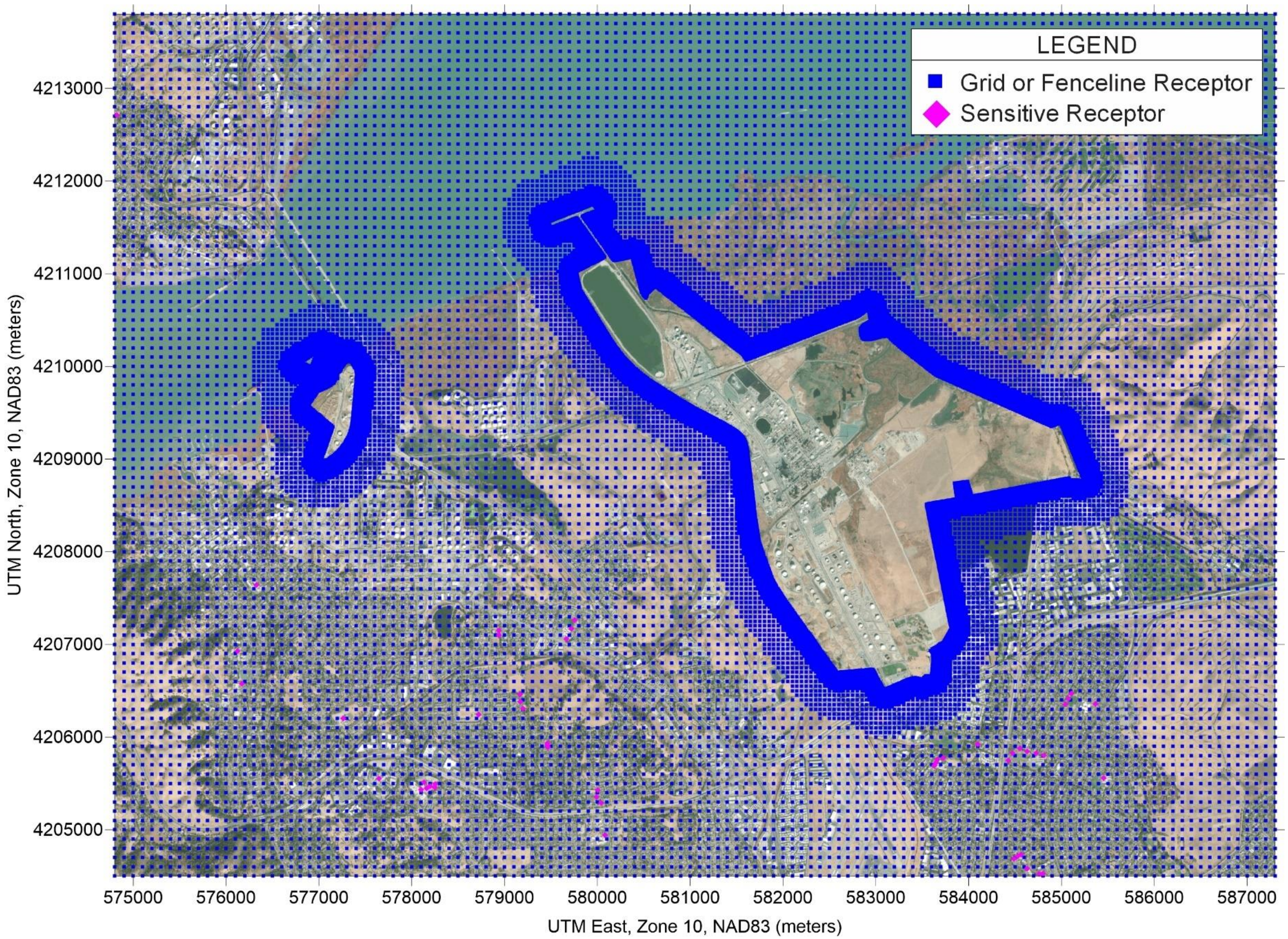


Figure C-3 Receptor Grid Diagram – Operational Sources Modeling

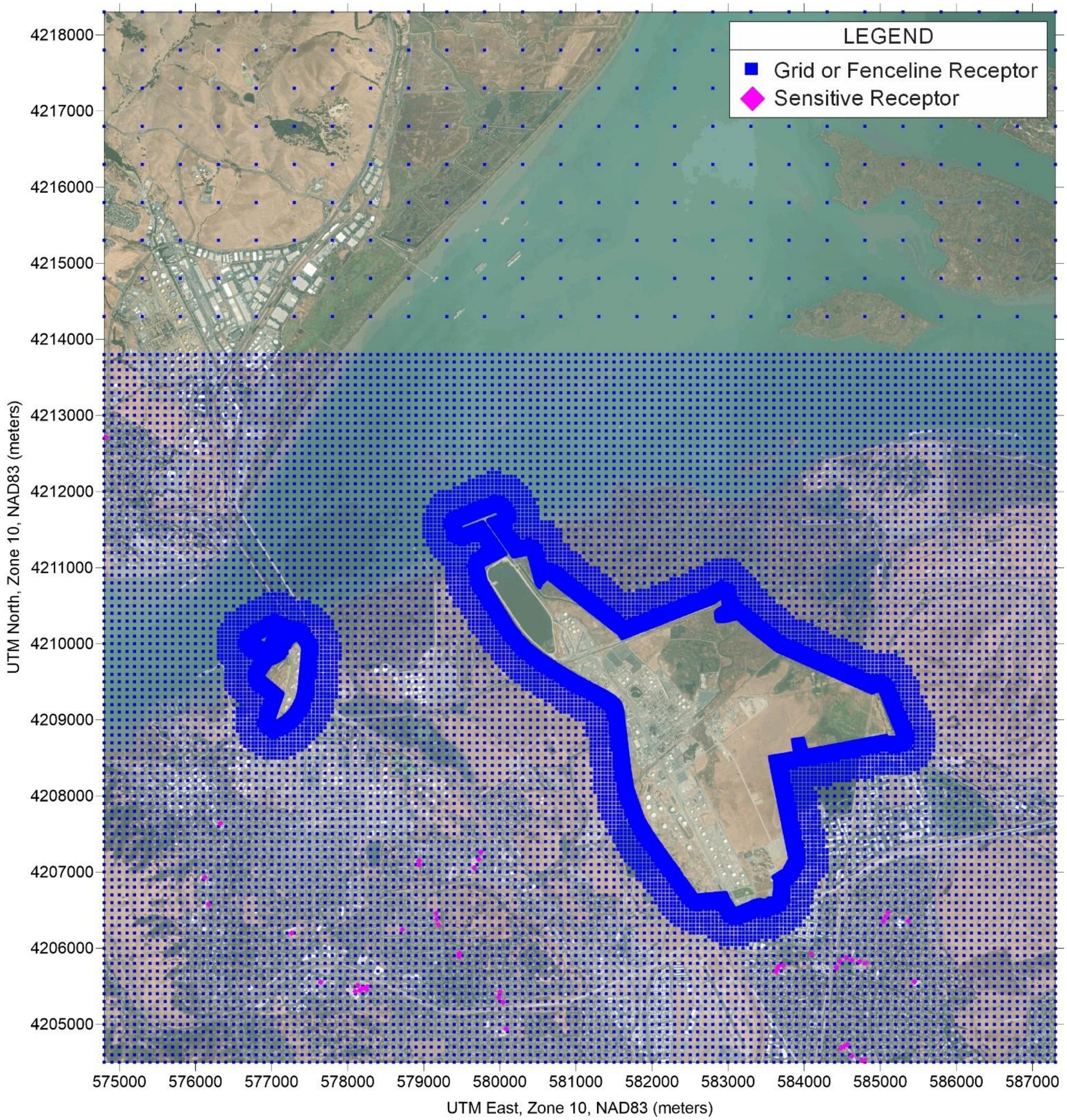


Figure C-4 Receptor Grid Diagram – Construction Sources Modeling

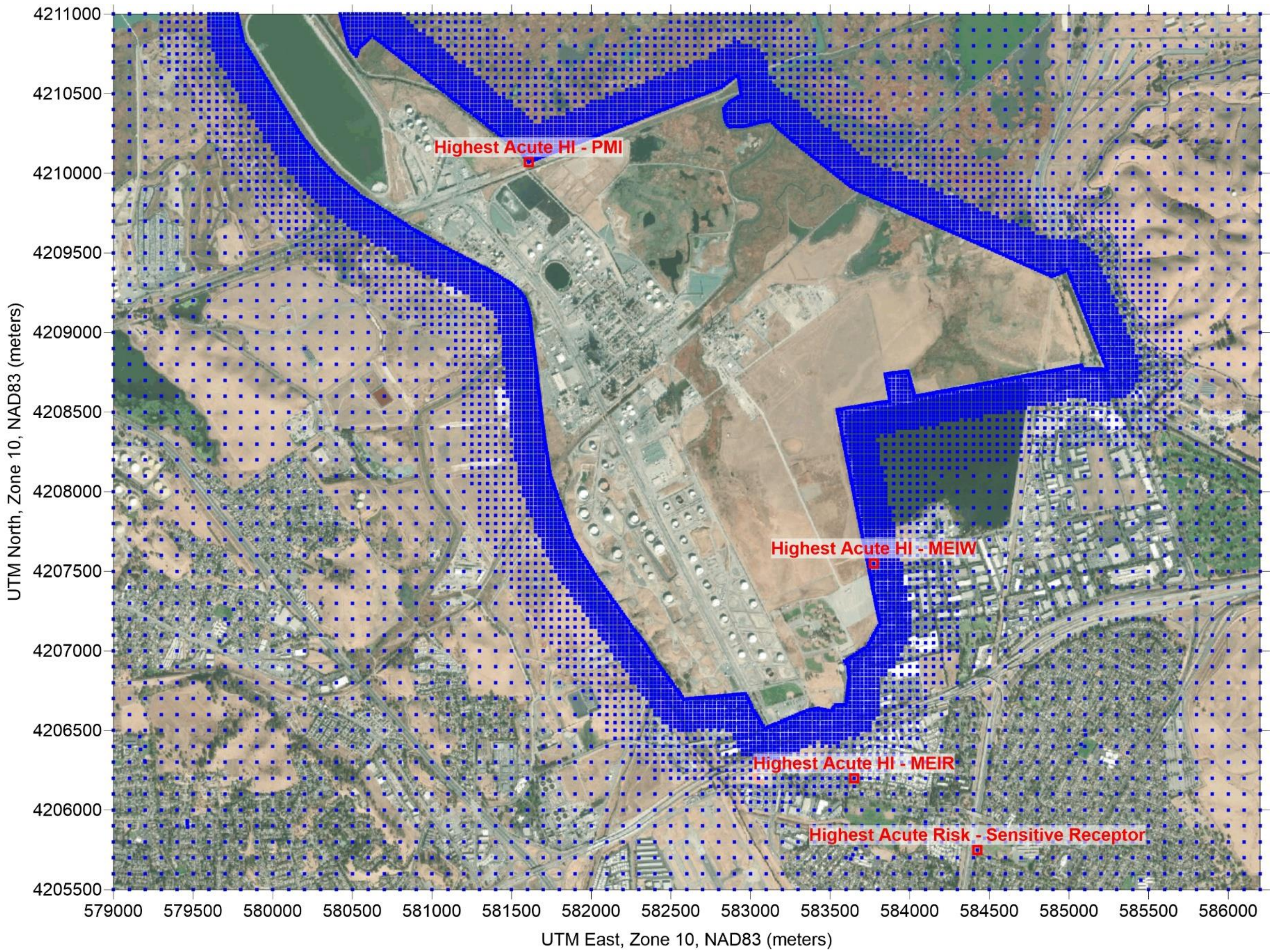


Figure C-5 Locations of Maximum Impacted Receptors – Operational Sources Modeling

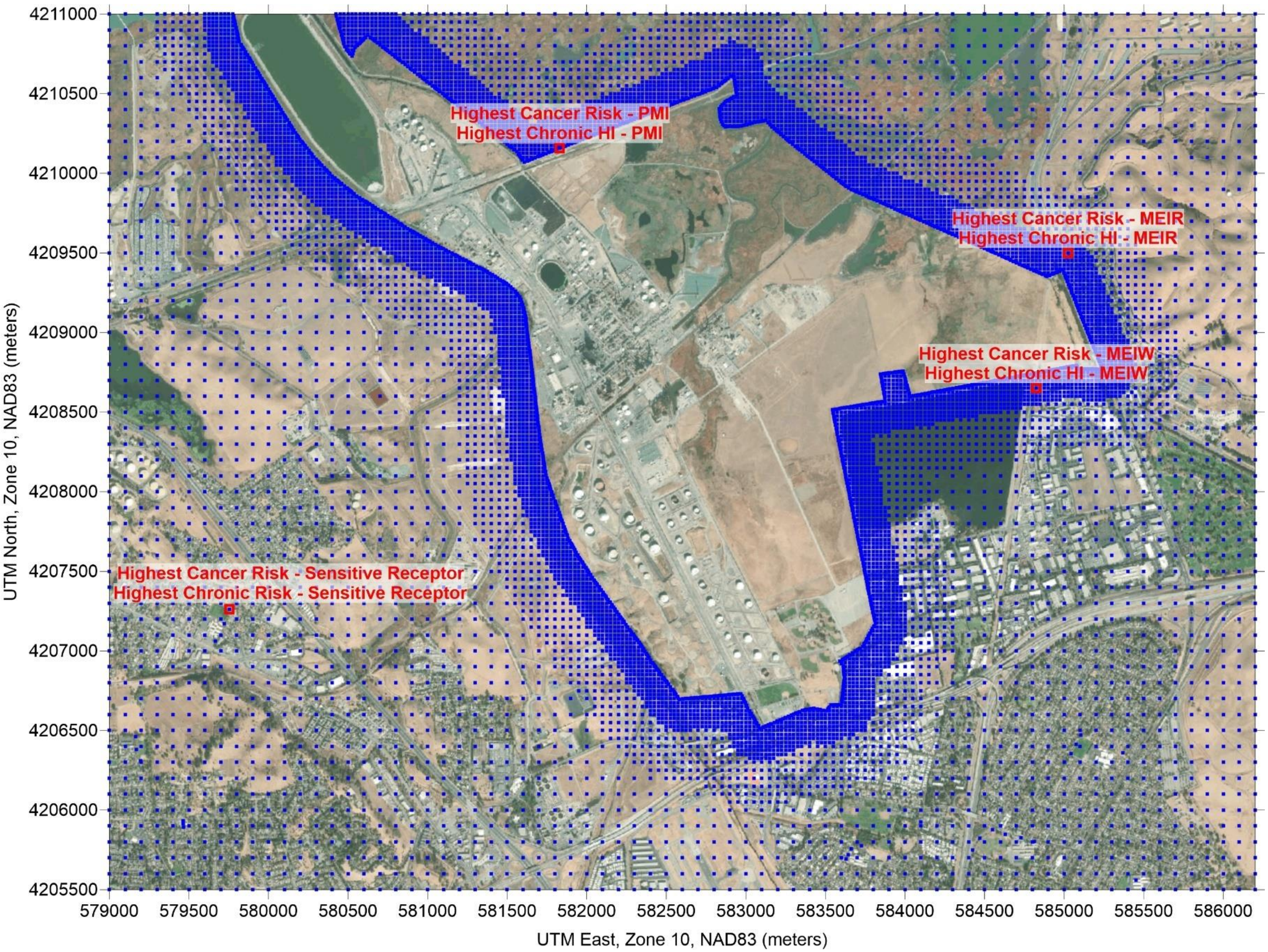


Figure C-6 Locations of Maximum Impacted Receptors – Construction Source Modeling

Attachment D

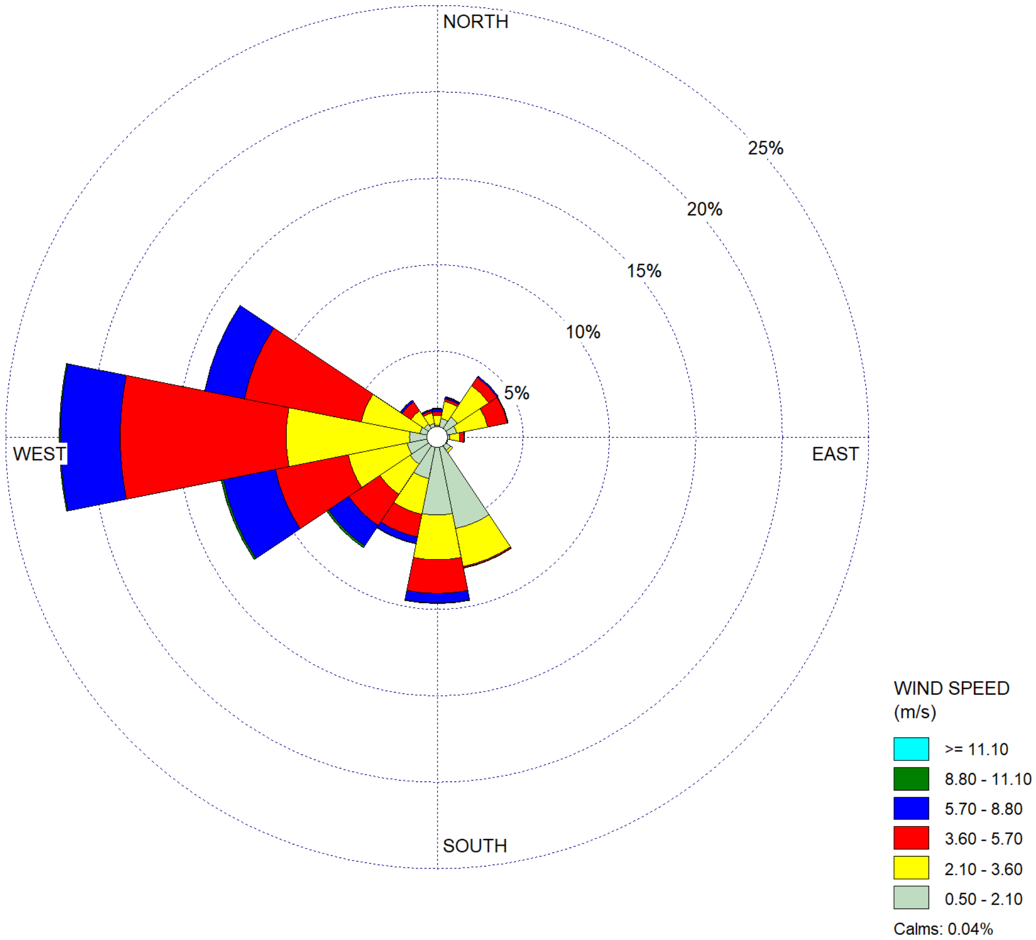
Windrose

WIND ROSE PLOT:

Station #23254 - Golden Eagle Refinery, Martinez, CA

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

Start Date: 1/1/2012 - 00:00
End Date: 12/31/2017 - 23:59

COMPANY NAME:

MODELER:

CALM WINDS:

0.04%

TOTAL COUNT:

43777 hrs.

AVG. WIND SPEED:

3.41 m/s

DATE:

11/4/2020

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure D-1 Windrose

Attachment E

Sensitive Receptors

Table E-1 List of Sensitive Receptors

Description	Receptor Number	Easting (X) (m)	Northing (Y) (m)
VA Medical Center	22682	577647	4205553
John Muir Elementary School	22683	577262	4206201
Martinez Junior High School	22684	576327	4207641
Contra Costa County Martinez Health Center	22685	576125	4206929
Alhambra High School	22686	576172	4206579
Holbrook Elementary School	22687	585453	4205560
Robert Semple Elementary School	22688	574823	4212714
Las Juntas Elementary School 1	22689	579754	4207262
Las Juntas Elementary School 2	22690	579721	4207172
Las Juntas Elementary School 3	22691	579666	4207060
Berean Christian School	22692	578941	4207150
Berean Christian School	22693	578941	4207099
Helping Hands Christian Preschool 1	22694	580004	4205426
Helping Hands Christian Preschool 2	22695	579989	4205354
Helping Hands Christian Preschool 3	22696	580043	4205290
Morelleo Park Elementary School 1	22697	579169	4206381
Morelleo Park Elementary School 2	22698	579166	4206460
Morelleo Park Elementary School 3	22699	579197	4206309
Morello Hills Christian Preschool	22700	578721	4206244
Bayside Montessori Learning Center 1	22701	579464	4205932
Bayside Montessori Learning Center 2	22702	579464	4205914
Bayside Montessori Learning Center 3	22703	579465	4205893
Floyd I. Marchus School 1	22704	583663	4205758
Floyd I. Marchus School 2	22705	583643	4205719
Floyd I. Marchus School 3	22706	583726	4205775
Floyd I. Marchus School 4	22707	583630	4205693
Concord Christian Schools	22708	584099	4205924
Glenbrook Middle School 1	22709	584425	4205750
Glenbrook Middle School 2	22710	584471	4205825
Glenbrook Middle School 3	22711	584551	4205877
Glenbrook Middle School 4	22712	584631	4205847
Glenbrook Middle School 5	22713	584729	4205827
Glenbrook Middle School 6	22714	584811	4205803
Williams School 1	22715	584566	4204734
Williams School 2	22716	584528	4204713
Williams School 3	22717	584486	4204688
John Muir Health Physical Rehabilitation Center	22718	584628	4204583
Contra Costa Imaging Center	22719	584760	4204525
John Muir Medical Center 1	22720	584800	4204526
Sun Terrace Elementary School 1	22721	585044	4206354
Sun Terrace Elementary School 2	22722	585106	4206471

Description	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Sun Terrace Elementary School 3	22723	585076	4206414
Sun Terrace Pre-School	22724	585368	4206359
Contra Costa Juvenile Hall	22725	580083	4204942
Kaiser Permanente 1	22726	578134	4205512
Kaiser Permanente 2	22727	578198	4205472
Kaiser Permanente 3	22728	578254	4205491
Kaiser Permanente 4	22729	578249	4205457
Kaiser Permanente 5	22730	578162	4205449
Kaiser Permanente 6	22731	578099	4205431

Attachment F

Modeling Files

(The AERMOD and HARP modeling files are provided under separate cover.)

Appendix D

$PM_{2.5}$ Emissions Assessment

Martinez Renewable Fuels Project

CEQA $PM_{2.5}$ Modeling Analysis

Prepared for
Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation

July 2021

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CEQA $PM_{2.5}$ Emissions Assessment

July 2021

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1.0 Introduction and Summary

Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation (herein referenced as Marathon), has applied for permits to construct and operate the proposed Martinez Renewable Fuels Project (project) at its existing Martinez Refinery (herein referenced as Martinez or facility) and Amorco Terminal. Site locations are shown in Figure 1-1 below. This report presents the results of a dispersion modeling analysis prepared to demonstrate that emission increases of fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$) associated with the project are below BAAQMD CEQA Thresholds of Significance.

Results of the modeling analysis show that impacts from the project are below BAAQMD CEQA thresholds. Details of the modeling analysis follow.

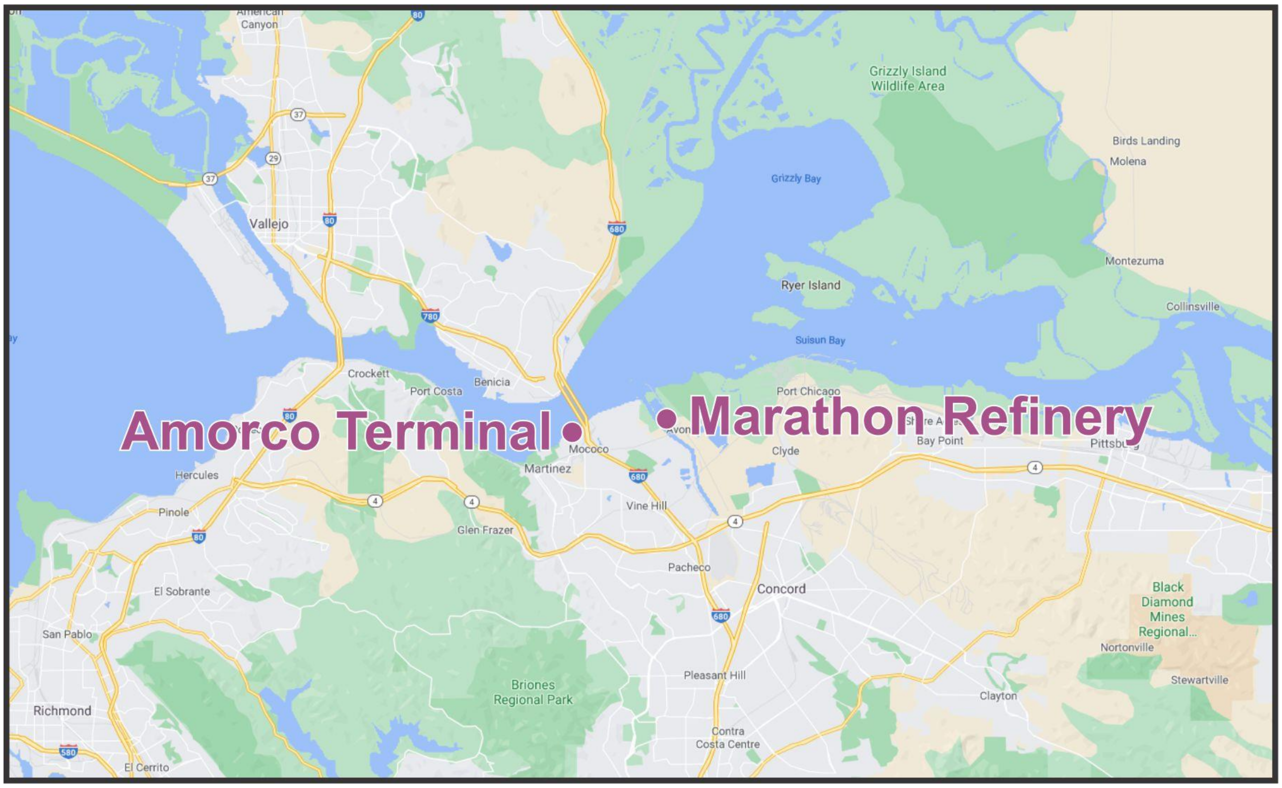

Figure 1-1 Locations of Marathon Facilities

2.0 Modeling Approach

2.1 Methodology

BAAQMD CEQA Guidelines[1] state that a project has a significant impact of there is an incremental increase of greater than 0.3 micrograms per cubic meter (μg/m^3) annual average $PM_{2.5}$. The modeling approach taken in this analysis was to subtract post-project annual average $PM_{2.5}$ concentrations from pre-project annual average $PM_{2.5}$ concentrations at receptors in the vicinity of the facility.

Pre-project sources included all equipment associated with the project, including those that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Post-project sources included all new sources, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Mobile sources of $PM_{2.5}$, along with ship hoteling at the Avon and Amorco wharfs, were also included.

Modeling was performed following BAAQMD guidance[2]. All sources were assumed to emit 24 hours per day, 7 days per week.

Results of the modeling analysis show that impacts from the project are below BAAQMD CEQA thresholds. Post-project $PM_{2.5}$ concentrations were found to be lower than pre-project concentrations at all receptors (i.e., net change at all receptors was negative).

2.2 Dispersion Model

The AMS/EPA Regulatory Model (AERMOD, v. 21112), the air dispersion model currently preferred by U.S. EPA and approved by the BAAQMD, was used for this analysis. AERMOD simulates the atmospheric transport and dilution of emissions from project sources. This mathematical model estimates dilution of emissions by diffusion and turbulent mixing with ambient air as the emissions travel downwind from a source. AERMOD can predict the resulting concentrations at specified locations of interest (commonly referred to as receptors). The model is capable of predicting impacts from any combination of point, area, and volume sources in terrain ranging from flat to complex.

2.3 Project Sources

As described above, modeled sources include all new equipment, equipment that will be shut down, equipment that will be physically changed, and equipment that will undergo a change in the method of operation. Combustion sources were modeled as point sources (stacks). Cooling towers were modeled as volume sources with release heights based on actual cooling tower heights. Coke screening and crushing as well as coke and sulfur loadout were also modeled as volume sources. The two coke silos were

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[1] Bay Area Air Quality Management District, California Environmental Quality Act Air Quality Guidelines, May 2017, Table 2-1.
[2] Bay Area Air Quality Management District, BAAQMD Health Risk Assessment Modeling Protocol, December 2020.

modeled as area sources. Mobile sources consisted of locomotive engines, trucks traveling on paved roads within facility boundaries, and ship hoteling at the Avon and Amorco wharfs. Locomotive engines were modeled as a string of evenly-spaced volume sources along the segments of track where engines are expected to travel. Truck exhaust was modeled as line sources along the roads traveled to and from the various operational areas within the facility. Ship hoteling was modeled as point sources located in the approximate center of where ships are expected to berth at the Avon and Amorco wharves.

Source-by-source pre- and post-project emission rates are provided in Attachment A. A complete list of sources included in the modeling and their respective parameters are included in Attachment B. Maps of the modeled pre-project and post-project sources are included as Figure C-1 and Figure C-2, respectively, in Attachment C.

2.4 Terrain Characterization

AERMOD requires that each source in the analysis be categorized as being in either a rural or an urban setting. As most of the land in the immediate vicinity of the terminal is undeveloped, and the areas north of the facility are water, all sources were designated as rural.

Sources and receptors were modeled with consideration of terrain elevations. The AERMOD terrain processor (AERMAP) was used to calculate terrain elevations for each source and receptor from the U.S. Geological Survey (USGS) National Elevation Dataset (NED).

2.5 Building Downwash

When point sources are located near or on buildings or structures, the dispersion of the plume can be influenced. The wake produced on the lee side of the structure can cause the plume to be pulled toward the ground near the structure resulting in higher concentrations. This is called building downwash. Stack heights that minimize downwash effects are designated good engineering practice (GEP) stack heights.

The effects of building downwash have been examined in this modeling analysis. AERMOD uses the EPA-approved Building Profile Input Program with Plume Rise Model Enhancements (BPIP-PRIME) to provide input for the downwash analysis. This program calculates the GEP formula stack heights and direction-specific building dimensions for input to the dispersion calculations. BPIP-PRIME requires the input of building coordinates and heights, and stack coordinates; structures judged to have downwash potential were included.

2.6 Meteorological Data

A five-year dataset covering the years 2012, 2013, 2014, 2015, and 2017 for a meteorological station located at the Marathon Refinery was used. The data was processed using AERMET version 18081, the AERMOD meteorological data preprocessor. The model calculated 5-yr average $PM_{2.5}$ concentrations at each receptor; the 5-yr average was used to compare against the CEQA annual average $PM_{2.5}$ concentration threshold of 0.3 μg/m^3. A windrose showing a graphical distribution of wind speed and wind direction for the time period modeled is shown in Figure D-1 in Attachment D.

2.7 Receptors

Receptor spacing followed BAAQMD guidance and included the following:

- 20-m spacing along the fenceline
- 25-m spaced receptors out to 200 meters
- 50-m spaced receptors out to 500 meters from the facility boundary
- 100-m spaced receptors out to 2,000+ meters from the facility boundary

Additionally, sensitive receptors (hospitals, schools, and daycare centers) within the modeling domain were added.

Receptor heights above ground were set to 0.0 meters. This network is composed of Cartesian (X,Y) receptors with Universal Transverse Mercator (UTM) coordinates. The modeling was conducted using the North American Datum of 1983 (NAD83).

Figure C-3 plots the receptor locations. A total of 22,731 fenceline, grid, and sensitive receptors were included in the analysis. A list of the sensitive receptors is included in Attachment D. The closest sensitive receptor was located at the Floyd I. Marchus School, about 850 meters southeast of the southern boundary of the facility.

3.0 Modeling Results

AERMOD calculated the average $PM_{2.5}$ concentrations over the 5 years of meteorological data used in the modeling for pre-project and post-project sources. The $PM_{2.5}$ concentrations were greater for the pre-project case at all receptors. The largest decrease in average $PM_{2.5}$ concentrations at any receptor was 39.3 $\mu g/m^3$, and the smallest decrease was 0.03 $\mu g/m^3$. This indicates a reduction in any health risks associated with exposure to $PM_{2.5}$. Notably, the highest average $PM_{2.5}$ concentration when only considering post-project emissions was 0.12 $\mu g/m^3$.

4.0 Conclusion

This modeling analysis shows that health risk impacts associated with $PM_{2.5}$ emissions from the Martinez Renewable Fuels Project will be well below the BAAQMD CEQA Threshold of Significance for $PM_{2.5}$. Therefore, project impacts are below BAAQMD CEQA $PM_{2.5}$ thresholds and the proposed project would not result in a significant impact.

Attachment A

Emission Rates

Table A-1 Modeled $PM_{2.5}$ Emission Rates

Source ID	Source Description	Pre-Project Emission Rate (tons/yr)	Post-Project Emission Rate (tons/yr)
919	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	7.51E-01	1.57E+00
920	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	1.02E+00	5.87E-01
928	HDN & Hydrocracker Reactor Heaters (928)	3.02E-01	2.12E-01
929	HDN & Hydrocracker Reactor Heaters (929)	2.60E-01	2.12E-01
930	HDN & Hydrocracker Reactor Heaters (930)	2.90E-01	2.12E-01
931	HDN & Hydrocracker Reactor Heaters (931)	2.87E-01	4.54E-01
932	HDN & Hydrocracker Reactor Heaters (932)	3.13E-01	4.54E-01
933	HDN & Hydrocracker Reactor Heaters (933)	3.59E-01	4.54E-01
934	HDN & Hydrocracker Reactor Heaters (934)	1.56E+00	3.11E+00
937	S937: H2 Plant Heater F37	1.04E+01	1.47E+01
973	S973: No. 3 HDS Recycle Gas F55 & S974: Fract. Feed F56 Heaters (973_974)	1.18E+00	1.29E+00
1511	S1511: DCU Heater F78	5.00E+00	5.87E+00
1512	S1512: DCU Heater F79	4.83E+00	4.90E-01
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	--	6.16E-02
AVONWHRF	Avon Wharf vessel hoteling exhaust	1.22E+00	3.61E-01
AMRCWHRF	Amorco Wharf vessel hoteling exhaust	6.93E+00	3.27E-01
802	S802: FCCU	5.26E+01	--
802TOIL	S802: FCCU (Torch Oil)	2.16E+00	--
901	No. 7 Boiler (vents to FCCU stack S802)	2.52E+00	--
904	S904: No. 6 Boiler	3.60E+01	--
908	S908: F8 & S1470: F-71 Stack (aka 90814701)	4.42E+00	--
909	S909: No. 1 Feed Prep Heater F9	1.69E+00	--
912	S912: No. 1 Feed Prep Heater F12	2.46E+00	--
913	S913: No. 2 Feed Prep Heater F13	8.60E-01	--
915	S915: Platformer Intermediate Heater F15	1.50E-01	--
916	S916: No. 1 HDS Heater F16	7.64E-01	--
917	S917: No. 1 HDS Prefract Reboiler F17	2.62E-01	--
922	S922: No. 5 Gas Debutanizer Reboiler F22	1.84E+00	--
926	S926: No. 2 Reformer Splitter Reboiler F26	9.27E-01	--
935	HDN & Hydrocracker Reactor Heaters (935)	1.71E+00	--
950	S950: 50 Unit Crude Heater F50	7.49E+00	--

Source ID	Source Description	Pre-Project Emission Rate (tons/yr)	Post-Project Emission Rate (tons/yr)
955	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4064	2.67E-01	--
956	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4065	2.46E-01	--
957	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4066	2.19E-01	--
958	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4067	2.35E-01	--
959	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4068	2.66E-01	--
960	12900 cubic inch displacement, 660 HP, No. 4 Gas Plant Vapor Compressor No. 4096	1.64E-01	--
971	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	5.58E-01	--
972	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	1.16E-01	--
974	S973: No. 3 HDS Recycle Gas F55 & S974: Fract. Feed F56 Heaters (973_974)	1.19E+00	--
1106	S1106: No. 4 HDS F72	2.42E-01	--
1401	S1401: Sulfur Recovery Unit	6.76E-02	--
1470	No. 71 Furnace; No. 3 Crude Vacuum Distillation Heater	7.27E-01	--
1510	S1510: Delayed Coker	1.02E-03	--
975_1 to 975_6	No. 4 Gas Plant Cooling Tower [CT-007]	3.12E+01	--
977	No. 3 Crude Unit Cooling Tower [CT-048]	8.71E+00	--
979	NO. 2 Feed Prep. Cooling Tower	3.13E+00	--
983_1 to 983_5	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006]	2.41E+01	--
987	No. 50 Unit Cooling Tower [CT-016]	1.12E+01	--
988_1 to 988_3	No. 3 Reformer Cooling Tower [CT-075]	4.22E+00	--
1513	Coke Screen/Crusher	7.11E+00	--
1516	Coker Truck Loadout	1.56E+00	--
1571	Sulfur Loading Truck Terminal, 1200 tons/day, 73000 tons/yr	7.95E-03	--
1514	Coke Silo #1	1.34E+00	--
1515	Coke Silo #2	1.34E+00	--
GAS_N	Trucks - Gasoline load rack - from north	3.34E-03	6.17E-03
GAS_S1 to GAS_S8	Trucks - Gasoline load rack - from south	1.05E-01	1.93E-01

Source ID	Source Description	Pre-Project Emission Rate (tons/yr)	Post-Project Emission Rate (tons/yr)
EMP_N1 to EMP_N5	Employees from north	4.74E-02	1.00E-02
EMP_S1 to EMP_S5	Employees from south	1.30E-01	2.74E-02
WW1 to WW7	Trucks - Wastewater Caustic	--	2.64E-03
DMDS1 to DMDS5	Trucks - DMDS	--	1.84E-04
MISC1 to MISC4	Trucks - Misc	1.67E-01	5.43E-02
LNG_LR	Trucks - LNG load rack	3.10E-03	--
CHEM_S1 to CHEM_S7	Trucks - Chem Plant	1.70E-02	--

Attachment B

Emission Source Parameters

Table B-1 POINT Source Parameters – Pre-Project Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
919	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166.0	4208902.0	4.5	61.0	685.9	2.25	3.51
920	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166.0	4208902.0	4.5	61.0	685.9	2.25	3.51
928	HDN & Hydrocracker Reactor Heaters (928)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
929	HDN & Hydrocracker Reactor Heaters (929)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
930	HDN & Hydrocracker Reactor Heaters (930)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
931	HDN & Hydrocracker Reactor Heaters (931)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
932	HDN & Hydrocracker Reactor Heaters (932)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
933	HDN & Hydrocracker Reactor Heaters (933)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
934	HDN & Hydrocracker Reactor Heaters (934)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
937	S937: H2 Plant Heater F37	582243.2	4209167.7	3.9	41.1	538.7	8.69	3.10
973	S973: No. 3 HDS Recycle Gas F55 & S974: Fract. Feed F56 Heaters (973_974)	581995.0	4209075.0	4.5	61.0	422.0	12.48	1.10
1511	S1511: DCU Heater F78	582079.5	4208870.7	5.1	61.0	643.7	15.24	2.44
1512	S1512: DCU Heater F79	582027.0	4208928.0	5.0	61.0	643.7	15.24	2.44

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
AVONWHRF	Avon Wharf vessel hoteling exhaust[3]	579775.1	4211664.2	0.0	43.0	618.0	16.00	0.50
AMRCWHRF	Amorco Wharf vessel hoteling exhaust	576917.7	4210114.4	0.0	43.0	618.0	16.00	0.50
802	S802: FCCU	582410.0	4208800.0	4.2	106.7	560.9	22.15	3.65
802TOIL	S802: FCCU (Torch Oil)	582410.0	4208800.0	4.2	106.7	560.9	22.15	3.65
901	No. 7 Boiler (vents to FCCU stack S802)	582410.0	4208800.0	4.2	106.7	560.9	22.15	3.65
904	S904: No. 6 Boiler	581935.0	4208532.0	7.3	106.7	433.2	4.32	4.57
908	S908: F8 & S1470: F-71 Stack (aka 90814701)	582431.0	4208873.0	3.9	22.9	710.9	14.37	1.83
909	S909: No. 1 Feed Prep Heater F9	582329.0	4208838.0	3.4	30.5	685.9	6.81	1.68
912	S912: No. 1 Feed Prep Heater F12	582319.0	4208837.0	3.8	24.2	607.0	12.19	1.80
913	S913: No. 2 Feed Prep Heater F13	582322.0	4208864.0	4.0	31.1	685.9	1.24	3.11
915	S915: Platformer Intermediate Heater F15	582232.9	4208965.0	3.9	27.4	644.3	3.22	1.43
916	S916: No. 1 HDS Heater F16	582225.0	4208956.0	3.8	27.4	699.8	7.68	1.22
917	S917: No. 1 HDS Prefract Reboiler F17	582216.0	4208954.0	3.8	18.3	672.0	3.52	1.28
922	S922: No. 5 Gas Debutanizer Reboiler F22	582253.1	4208726.4	5.2	61.0	644.3	0.96	2.56

[3] Avon and Amorco vessel hoteling stack parameters assumed to be equal to the parameters used in a California Air Resources Board study of DPM emissions at the Ports of Los Angeles and Long Beach [California Air Resources Board, *Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach, Final Report*, April 2006, p. 29].

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
926	S926: No. 2 Reformer Splitter Reboiler F26	582205.0	4209221.0	3.8	61.0	644.3	5.05	1.98
935	HDN & Hydrocracker Reactor Heaters (935)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
950	S950: 50 Unit Crude Heater F50	581314.9	4209477.4	8.3	30.5	616.5	10.96	2.13
955	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4064	582297.9	4208816.3	2.8	10.1	630.4	6.16	0.38
956	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4065	582292.7	4208822.3	3.0	10.1	630.4	6.16	0.38
957	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4066	582287.8	4208828.6	3.1	10.1	630.4	6.16	0.38
958	17200 cubic inch displacement, 800 HP, No. 4 Gas Plant Vapor Compressor No. 4067	582282.4	4208834.3	2.9	10.1	630.4	6.16	0.38
959	17200 cubic inch displacement, 880 HP, No. 4 Gas Plant Vapor Compressor No. 4068	582276.7	4208840.1	3.2	10.1	630.4	6.16	0.38
960	12900 cubic inch displacement, 660 HP, No. 4 Gas Plant Vapor Compressor No. 4096	582271.3	4208846.5	3.3	10.1	630.4	6.16	0.38

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
971	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	582054.0	4209154.0	4.3	80.2	456.5	0.26	2.99
972	S91 & S972 No. 3 Reformer UOP Furnace F53 & Reboiler F54 (971_972)	582054.0	4209154.0	4.3	80.2	456.5	0.26	2.99
974	S973: No. 3 HDS Recycle Gas F55 & S974: Fract. Feed F56 Heaters (973_974)	581995.0	4209075.0	4.5	61.0	422.0	12.48	1.10
1106	S1106: No. 4 HDS F72	582092.3	4209069.5	4.8	61.0	601.5	0.11	1.49
1401	S1401: Sulfur Recovery Unit	582773.0	4208997.0	3.4	102.1	694.3	15.80	1.83
1470	No. 71 Furnace; No. 3 Crude Vacuum Distillation Heater	582431.0	4208873.0	3.9	22.9	710.9	14.37	1.83
1510	S1510: Delayed Coker	582020.0	4208864.4	3.3	54.9	458.2	0.31	0.31

Table B-2 POINT Source Parameters – Post-Project Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
919	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166.0	4208902.0	4.5	61.0	685.9	2.25	3.51
920	S919: No. 2 HDS Depent Reboiler F19 (aka 919_1)	582166.0	4208902.0	4.5	61.0	685.9	2.25	3.51
928	HDN & Hydrocracker Reactor Heaters (928)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
929	HDN & Hydrocracker Reactor Heaters (929)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
930	HDN & Hydrocracker Reactor Heaters (930)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
931	HDN & Hydrocracker Reactor Heaters (931)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
932	HDN & Hydrocracker Reactor Heaters (932)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
933	HDN & Hydrocracker Reactor Heaters (933)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
934	HDN & Hydrocracker Reactor Heaters (934)	582212.0	4209138.0	3.8	22.9	718.2	5.24	4.10
937	S937: H2 Plant Heater F37	582243.2	4209167.7	3.9	41.1	538.7	8.69	3.10
937	S937: H2 Plant Heater F37	582243.2	4209167.7	3.9	41.1	538.7	8.69	3.10
1511	S1511: DCU Heater F78	582079.5	4208870.7	5.1	61.0	643.7	15.24	2.44
1512	S1512: DCU Heater F79	582027.0	4208928.0	5.0	61.0	643.7	15.24	2.44
2000	Sour Water Stripper Off-Gas Thermal Oxidizer	582386.1	4208957.9	3.8	16.0	1144.3	2.86	0.76
AVONWHRF	Avon Wharf vessel hoteling exhaust	579775.1	4211664.2	0.0	43.0	618.0	16.00	0.50
AMRCWHRF	Amorco Wharf vessel hoteling exhaust	576917.7	4210114.4	0.0	43.0	618.0	16.00	0.50

Table B-3 VOLUME Source Parameters – Pre-Project Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
795	#3 Reformer V-307	582059.5	4209191.4	4.3	0.9	0.57	0.85
977	No. 3 Crude Unit Cooling Tower [CT-048]	582338.7	4208884.3	4.3	9.6	4.65	8.93
987	No. 50 Unit Cooling Tower [CT-016]	581292.0	4209475.8	8.4	6.1	4.97	5.67
1025	Bulk Plant; Bottom Loading Facilities	581119.5	4210043.9	3.2	1.5	4.65	1.40

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
1571	Sulfur Loading Truck Terminal, 1200 tons/day, 73000 tons/yr	582821.0	4209022.0	3.3	1.5	2.33	1.40
2001	Stage 1 wastewater treatment fugitives	582048.1	4209475.2	3.3	3.0	9.00	2.83
2025	ARA Feed Pretreatment fugitives	581897.3	4209066.8	3.8	3.0	9.00	2.83
975_1	No. 4 Gas Plant Cooling Tower [CT-007] (1 of 6)	582110.7	4208745.9	5.3	6.4	3.81	5.94
975_2	No. 4 Gas Plant Cooling Tower [CT-007] (2 of 6)	582122.9	4208756.8	5.4	6.4	3.81	5.94
975_3	No. 4 Gas Plant Cooling Tower [CT-007] (3 of 6)	582134.9	4208767.4	5.3	6.4	3.81	5.94
975_4	No. 4 Gas Plant Cooling Tower [CT-007] (4 of 6)	582147.3	4208778.5	5.2	6.4	3.81	5.94
975_5	No. 4 Gas Plant Cooling Tower [CT-007] (5 of 6)	582159.4	4208789.3	5.0	6.4	3.81	5.94
975_6	No. 4 Gas Plant Cooling Tower [CT-007] (6 of 6)	582171.9	4208799.7	4.9	6.4	3.81	5.94
983_1	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (1 of 5)	582113.4	4209373.8	3.4	10.3	2.79	9.63
983_2	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (2 of 5)	582122.0	4209364.1	3.5	10.3	2.79	9.63
983_3	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (3 of 5)	582130.6	4209354.4	3.6	10.3	2.79	9.63
983_4	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (4 of 5)	582139.2	4209344.7	3.6	10.3	2.79	9.63
983_5	Alky/No. 2 Reformer & 2Ref/BSU Cooling Towers [CT-073 & CT-006] (5 of 5)	582147.8	4209335.0	3.7	10.3	2.79	9.63
988_1	No. 3 Reformer Cooling Tower [CT-075] (1 of 3)	582118.3	4209122.5	4.6	2.9	1.49	2.69
988_2	No. 3 Reformer Cooling Tower [CT-075] (2 of 3)	582122.0	4209125.6	4.6	2.9	1.49	2.69
988_3	No. 3 Reformer Cooling Tower [CT-075] (3 of 3)	582125.7	4209128.8	4.6	2.9	1.49	2.69
A001	Cat Cracker (A001)	582313.0	4208768.0	4.1	3.0	18.60	2.83
A003	No.5 Gas Plant fugitives (S-1526)	582207.2	4208707.3	5.4	3.0	32.56	2.83
A004	HDS Plant No. 2 fugitives (S1003)	582154.1	4208936.4	4.5	3.0	23.26	2.83
A005	HDS Plant No. 1 fugitives (S-1002)	582219.2	4208988.1	3.8	3.0	23.26	2.83
A006_1	No. 2 Reformer (A006) (1 of 2)	582197.7	4209202.4	3.8	3.0	15.12	2.83
A006_2	No. 2 Reformer (A006) (2 of 2)	582151.4	4209256.7	3.9	3.0	15.12	2.83

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
A007_1	No.4 Gas Plant (A007) (1 of 2)	582277.9	4208832.6	2.9	3.0	11.63	2.83
A007_2	No.4 Gas Plant (A007) (2 of 2)	582246.2	4208800.1	3.9	3.0	11.63	2.83
A011_1	No.1 Feed Prep (A011) (1 of 2)	582339.1	4208834.0	4.1	3.0	6.28	2.83
A011_2	No.1 Feed Prep (A011) (2 of 2)	582361.8	4208809.5	4.1	3.0	6.28	2.83
A013_1	No.2 Feed Prep (A013) (1 of 2)	582292.9	4208886.3	4.1	3.0	6.28	2.83
A013_2	No.2 Feed Prep (A013) (2 of 2)	582309.7	4208866.9	4.0	3.0	6.28	2.83
A016_1	Unit No. 50 (A016) (1 of 2)	581206.7	4209562.7	9.3	3.0	12.79	2.83
A016_2	Unit No. 50 (A016) (2 of 2)	581250.9	4209515.2	8.5	3.0	12.79	2.83
A018	Foul Water Strippers fugitives	582294.4	4208924.2	4.0	3.0	18.60	2.83
A031	Boiler House No. 6 (A031)	581963.1	4208521.2	7.3	3.0	11.63	2.83
A034	No.1 Gas Plant fugitives (S-500024)	581847.8	4209445.8	3.9	3.0	13.95	2.83
A044	FCCU #7 Boiler (A044)	582313.0	4208768.0	4.1	3.0	18.60	2.83
A048	No. 3 Crude (A048)	582363.4	4208891.0	4.1	3.0	19.77	2.83
A067	Hydrocracker 1st Stage H.D.N fugitives (S-1008)	582258.6	4209102.5	3.9	3.0	24.19	2.83
A068	Hydrocracker 2nd Stage fugitives (S-1007)	582258.6	4209102.5	3.9	3.0	24.19	2.83
A073	Alkylation Plant fugitives (S-1009)	582079.5	4209323.2	3.8	3.0	27.91	2.83
A075	No. 3 Reformer (A075)	582037.2	4209176.4	4.3	3.0	19.77	2.83
A076	No.3 H.D.S. Plant fugitives (S-850)	581974.3	4209126.5	4.6	3.0	27.91	2.83
A078_1	Chemical Plant Scot (A078) (1 of 2)	582752.4	4209029.8	3.3	3.0	3.49	2.83
A078_2	Chemical Plant Scot (A078) (2 of 2)	582763.6	4209039.1	3.2	3.0	9.00	2.83
A080_1	Chemical Plant Ammonia (A080) (1 of 3)	582802.3	4209058.9	3.3	3.0	6.98	2.83
A080_2	Chemical Plant Ammonia (A080) (2 of 3)	582822.4	4209076.3	3.3	3.0	6.98	2.83
A080_3	Chemical Plant Ammonia (A080) (3 of 3)	582842.9	4209092.1	3.3	3.0	6.98	2.83
A091_1	Benzene Saturation (A091) (1 of 2)	582114.4	4209213.2	3.9	3.0	3.95	2.83
A091_2	Benzene Saturation (A091) (2 of 2)	582128.4	4209198.0	3.8	3.0	3.95	2.83
A102	Delayed Coker fugitives (S-1510)	582043.5	4208826.1	3.2	3.0	48.84	2.83
LINE_01 to LINE_08	Railcar - Line Haul (8 total sources)	See modeling files			5.6	4.19	2.60

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
S_D_01 to S_D_42	Railcar - Switcher D (42 total sources)	See modeling files			5.6	4.19	2.60
S_ABC_01 to S_ABC_54	Railcar - Switcher ABC (54 total sources)	See modeling files			5.6	4.19	2.60
S_EF_01 to S_EF_57	Railcar - Switcher EF (57 total sources)	See modeling files			5.6	4.19	2.60

Table B-4 VOLUME Source Parameters – Post-Project Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Init. Horizontal Dimension (m)	Init. Vertical Dimension (m)
LINE_01 to LINE_08	Railcar - Line Haul (8 total sources)	See modeling files			5.6	4.19	2.60
S_ABC_01 to S_ABC_54	Railcar - Switcher ABC (54 total sources)	See modeling files			5.6	4.19	2.60
S_EF_01 to S_EF_57	Railcar - Switcher EF (57 total sources)	See modeling files			5.6	4.19	2.60

Table B-5 AREACIRC Source Parameters – Pre-Project Sources

Source ID	Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Release Height (m)	Radius of Circle (m)
1514	Coke Silo #1	581986.8	4208799.6	5.9	30.5	4.6
1515	Coke Silo #2	581979.0	4208794.5	5.8	30.5	4.6

Table B-6 LINE Source Parameters – Pre-Project Sources

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
GAS_N	Trucks - Gasoline - from north - north of Waterfront Rd	581138.14	4210065.6	3.01	3.4	581199.25	4209899.8	7.62	6.8
GAS_S1	Trucks - Gasoline - from south - north of Waterfront Rd	581138.14	4210065.6	3.01	3.4	581199.25	4209899.8	7.62	6.8
GAS_S2	Trucks - Gasoline - from south - south of Waterfront Rd (1 of 7)	581122.73	4209871	3.38	3.4	581149.83	4209804.5	7.62	6.8
GAS_S3	Trucks - Gasoline - from south - south of Waterfront Rd (2 of 7)	581154.08	4209804	3.8	3.4	581242.82	4209761.5	7.62	6.8
GAS_S4	Trucks - Gasoline - from south - south of Waterfront Rd (3 of 7)	581246.73	4209759.3	3.2	3.4	581686.34	4209245.4	7.62	6.8
GAS_S5	Trucks - Gasoline - from south - south of Waterfront Rd (4 of 7)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	6.8
GAS_S6	Trucks - Gasoline - from south - south of Waterfront Rd (5 of 7)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	6.8
GAS_S7	Trucks - Gasoline - from south - south of Waterfront Rd (6 of 7)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	6.8
GAS_S8	Trucks - Gasoline - from south - south of Waterfront Rd (7 of 7)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	6.8
EMP_N1	Employees from north via Solano Way (1 of 4)	581122.73	4209871	3.38	1.3	581149.83	4209804.5	7.62	2.6
EMP_N2	Employees from north via Solano Way (2 of 4)	581154.08	4209804	3.8	1.3	581242.82	4209761.5	7.62	2.6
EMP_N3	Employees from north via Solano Way (3 of 4)	581246.73	4209759.3	3.2	1.3	581686.34	4209245.4	7.62	2.6
EMP_N4	Employees from north via Solano Way (4 of 4)	581686.34	4209245.4	6.65	1.3	581900.4	4208832.5	7.62	2.6
EMP_N5	Employees from north - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	2.6

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
EMP_S1	Employees from south - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	2.6
EMP_S2	Employees from south via Solano Way (1 of 4)	581900.4	4208832.5	8.59	1.3	582198.83	4208257	7.62	2.6
EMP_S3	Employees from south via Solano Way (2 of 4)	582198.83	4208257	9.84	1.3	582497.25	4207681.6	7.62	2.6
EMP_S4	Employees from south via Solano Way (3 of 4)	582497.25	4207681.6	11.77	1.3	582795.68	4207106.1	7.62	2.6
EMP_S5	Employees from south via Solano Way (4 of 4)	582795.68	4207106.1	8.57	1.3	583094.1	4206530.7	7.62	2.6
MISC1	Trucks - Misc along Solano Way (1 of 4)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	6.8
MISC2	Trucks - Misc along Solano Way (2 of 4)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	6.8
MISC3	Trucks - Misc along Solano Way (3 of 4)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	6.8
MISC4	Trucks - Misc along Solano Way (4 of 4)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	6.8
LNG_LR	Trucks - LNG load rack - north of Waterfront Rd	581138.14	4210065.6	3.01	3.4	581199.25	4209899.8	7.62	6.8
CHEM_S1	Trucks - Chem Plant - road off Solano Way to yard (1 of 4)	582199.7	4208267.8	9.62	3.4	582542.5	4208436.8	7.62	3.2
CHEM_S2	Trucks - Chem Plant - road off Solano Way to yard (2 of 4)	582542.5	4208436.8	4.01	3.4	582585.4	4208487.8	7.62	3.2
CHEM_S3	Trucks - Chem Plant - road off Solano Way to yard (3 of 4)	582585.4	4208487.8	3.83	3.4	582951.3	4208760.4	7.62	3.2
CHEM_S4	Trucks - Chem Plant - road off Solano Way to yard (4 of 4)	582951.3	4208760.4	6.57	3.4	582799.5	4208927	7.62	3.2
CHEM_S5	Trucks - Chem Plant - via Solano Way (1 of 3)	582198.83	4208257	9.84	3.4	582497.25	4207681.6	7.62	3.2

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
CHEM_S6	Trucks - Chem Plant - via Solano Way (2 of 3)	582497.25	4207681.6	11.77	3.4	582795.68	4207106.1	7.62	3.2
CHEM_S7	Trucks - Chem Plant - via Solano Way (3 of 3)	582795.68	4207106.1	8.57	3.4	583094.1	4206530.7	7.62	3.2

Table B-7 LINE Source Parameters – Post-Project Sources

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
GAS_N	Trucks - Gasoline - from north - north of Waterfront Rd	581138.14	4210065.6	3.01	3.4	581199.25	4209899.8	7.62	6.8
GAS_S1	Trucks - Gasoline - from south - north of Waterfront Rd	581138.14	4210065.6	3.01	3.4	581199.25	4209899.8	7.62	6.8
GAS_S2	Trucks - Gasoline - from south - south of Waterfront Rd (1 of 7)	581122.73	4209871	3.38	3.4	581149.83	4209804.5	7.62	6.8
GAS_S3	Trucks - Gasoline - from south - south of Waterfront Rd (2 of 7)	581154.08	4209804	3.8	3.4	581242.82	4209761.5	7.62	6.8
GAS_S4	Trucks - Gasoline - from south - south of Waterfront Rd (3 of 7)	581246.73	4209759.3	3.2	3.4	581686.34	4209245.4	7.62	6.8
GAS_S5	Trucks - Gasoline - from south - south of Waterfront Rd (4 of 7)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	6.8
GAS_S6	Trucks - Gasoline - from south - south of Waterfront Rd (5 of 7)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	6.8
GAS_S7	Trucks - Gasoline - from south - south of Waterfront Rd (6 of 7)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	6.8
GAS_S8	Trucks - Gasoline - from south - south of Waterfront Rd (7 of 7)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	6.8
EMP_N1	Employees from north via Solano Way (1 of 4)	581122.73	4209871	3.38	1.3	581149.83	4209804.5	7.62	2.6

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
EMP_N2	Employees from north via Solano Way (2 of 4)	581154.08	4209804	3.8	1.3	581242.82	4209761.5	7.62	2.6
EMP_N3	Employees from north via Solano Way (3 of 4)	581246.73	4209759.3	3.2	1.3	581686.34	4209245.4	7.62	2.6
EMP_N4	Employees from north via Solano Way (4 of 4)	581686.34	4209245.4	6.65	1.3	581900.4	4208832.5	7.62	2.6
EMP_N5	Employees from north - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	2.6
EMP_S1	Employees from south - road off Solano Way to parking area	581896.41	4208829.9	8.6	1.3	581703.63	4208730.3	7.62	2.6
EMP_S2	Employees from south via Solano Way (1 of 4)	581900.4	4208832.5	8.59	1.3	582198.83	4208257	7.62	2.6
EMP_S3	Employees from south via Solano Way (2 of 4)	582198.83	4208257	9.84	1.3	582497.25	4207681.6	7.62	2.6
EMP_S4	Employees from south via Solano Way (3 of 4)	582497.25	4207681.6	11.77	1.3	582795.68	4207106.1	7.62	2.6
EMP_S5	Employees from south via Solano Way (4 of 4)	582795.68	4207106.1	8.57	1.3	583094.1	4206530.7	7.62	2.6
WW1	Trucks - Wastewater Caustic - Road to WWT off Solano Way (1 of 3)	581909.87	4209663.1	3.18	3.4	581680.61	4209466.1	7.62	6.8
WW2	Trucks - Wastewater Caustic - Road to WWT off Solano Way (2 of 3)	581680.61	4209466.1	4.03	3.4	581666.21	4209359	7.62	6.8
WW3	Trucks - Wastewater Caustic - Road to WWT off Solano Way (3 of 3)	581666.21	4209359	5.21	3.4	581686.34	4209245.4	7.62	6.8
WW4	Trucks - Wastewater Caustic - via Solano Way (1 of 4)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	6.8
WW5	Trucks - Wastewater Caustic - via Solano Way (2 of 4)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	6.8
WW6	Trucks - Wastewater Caustic - via Solano Way (3 of 4)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	6.8

Source ID	Source Description	Start Easting (X) (m)	Start Northing (Y) (m)	Base Elevation (m)	Release Height (m)	End Easting (X) (m)	End Northing (Y) (m)	Line Width (m)	Init. Vertical Dimension (m)
WW7	Trucks - Wastewater Caustic - via Solano Way (4 of 4)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	6.8
DMDS1	Trucks - DMDS - road off Solano Way	581896.66	4208847.4	8.54	3.4	582061.04	4208973.9	7.62	6.8
DMDS2	Trucks - DMDS - via Solano Way (1 of 4)	581893.4	4208845.8	8.48	3.4	582193.58	4208267	7.62	6.8
DMDS3	Trucks - DMDS - via Solano Way (2 of 4)	582193.58	4208267	9.84	3.4	582493.75	4207688.2	7.62	6.8
DMDS4	Trucks - DMDS - via Solano Way (3 of 4)	582493.75	4207688.2	11.69	3.4	582793.93	4207109.5	7.62	6.8
DMDS5	Trucks - DMDS - via Solano Way (4 of 4)	582793.93	4207109.5	8.57	3.4	583094.1	4206530.7	7.62	6.8
MISC1	Trucks - Misc along Solano Way (1 of 4)	581686.34	4209245.4	6.65	3.4	582038.28	4208566.7	7.62	6.8
MISC2	Trucks - Misc along Solano Way (2 of 4)	582038.28	4208566.7	8.93	3.4	582390.22	4207888	7.62	6.8
MISC3	Trucks - Misc along Solano Way (3 of 4)	582390.22	4207888	11.21	3.4	582742.16	4207209.3	7.62	6.8
MISC4	Trucks - Misc along Solano Way (4 of 4)	582742.16	4207209.3	9.49	3.4	583094.1	4206530.7	7.62	6.8

Attachment C

Maps and Diagrams

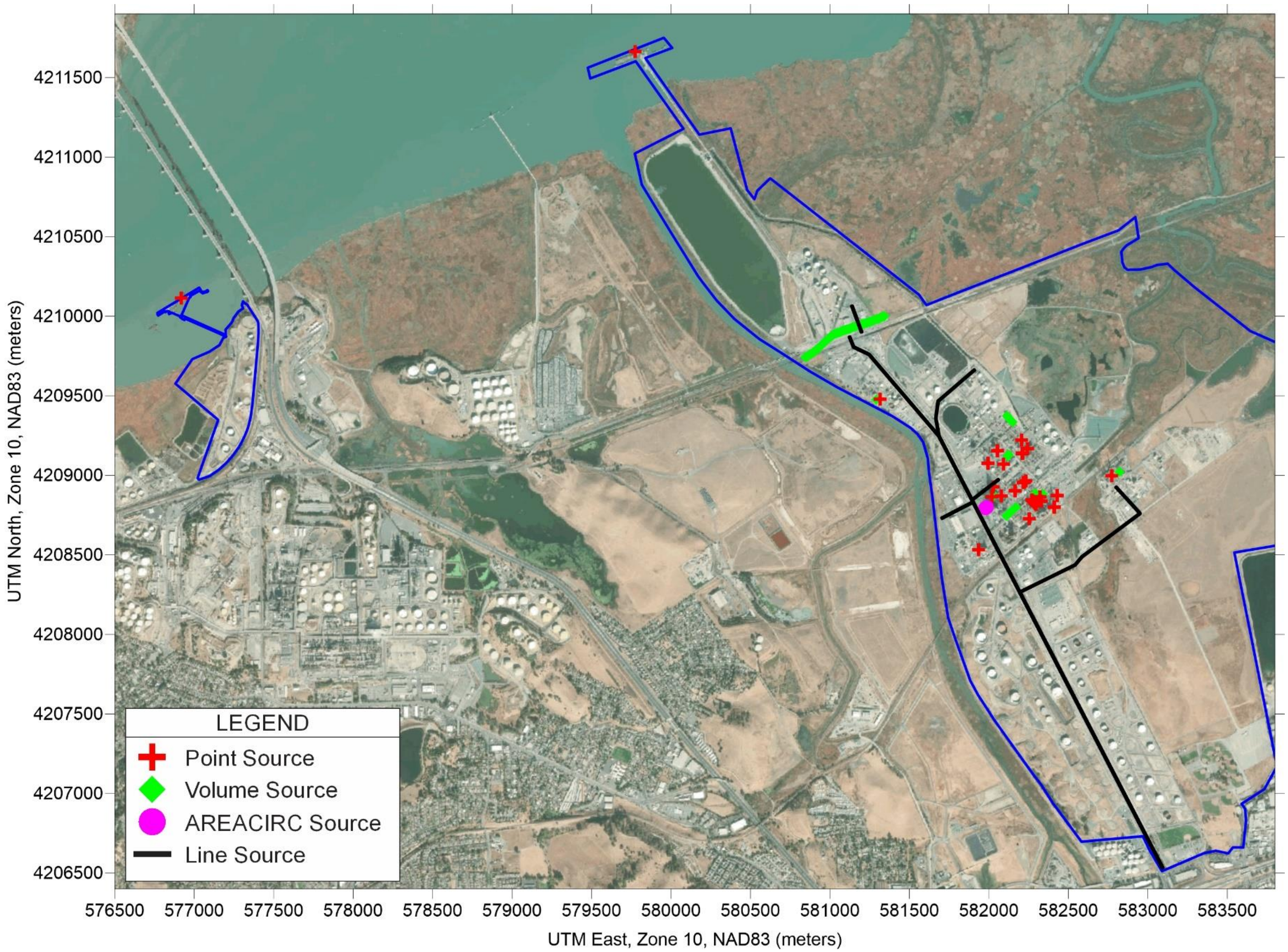


Figure C-1 Modeled Source Locations Diagram – Pre-Project Modeling

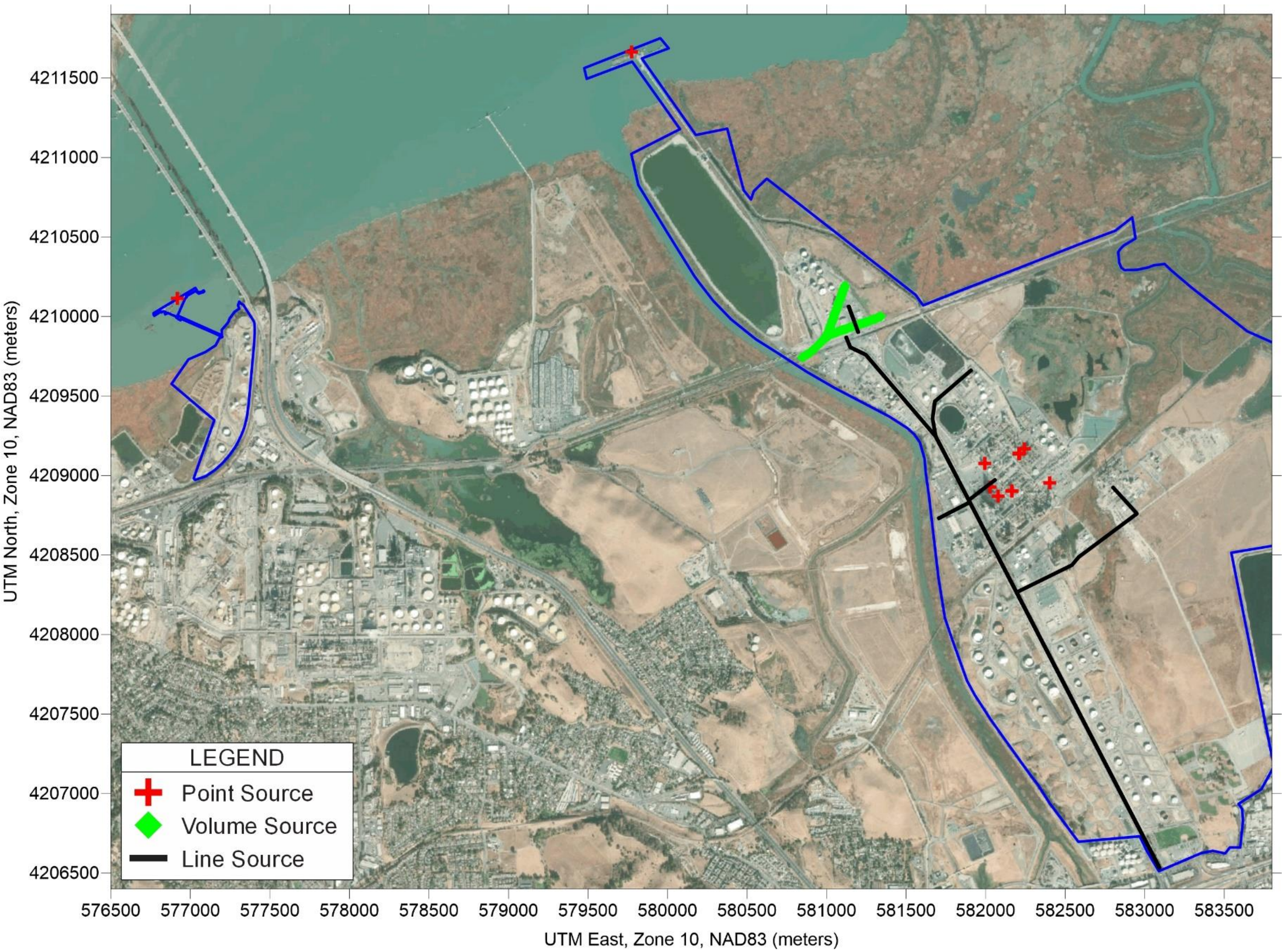


Figure C-2 Modeled Source Locations Diagram – Post-Project Modeling

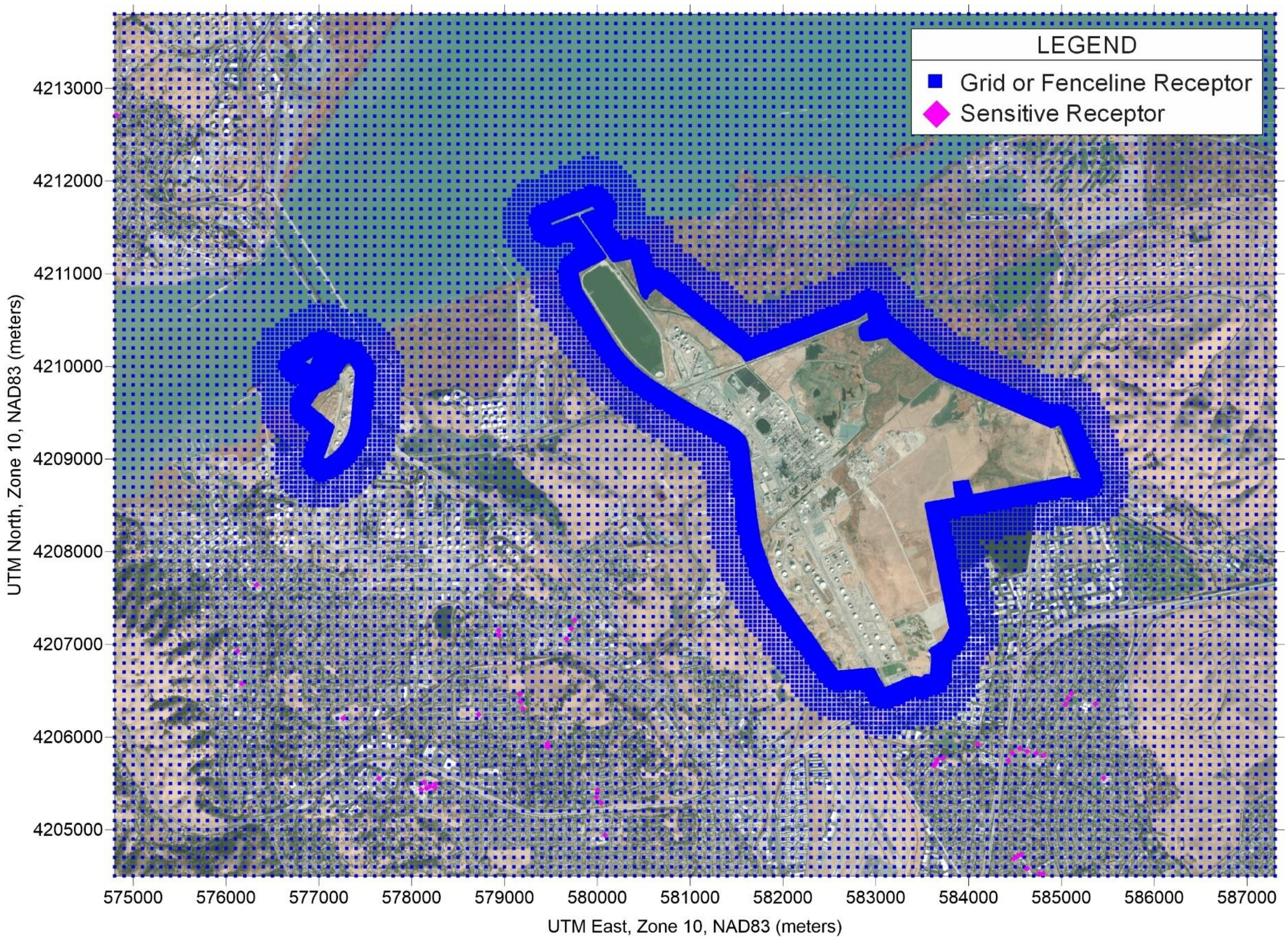
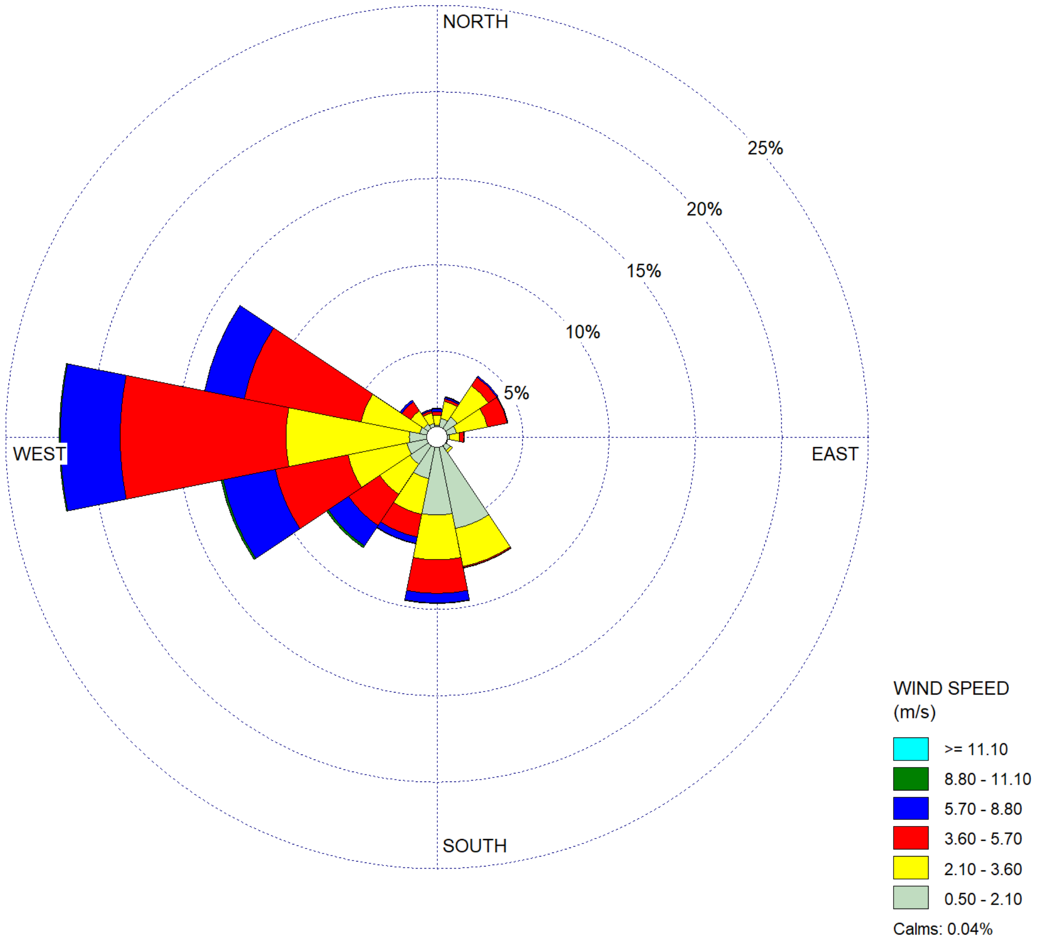


Figure C-3 Receptor Grid Diagram

Attachment D

Windrose

WIND ROSE PLOT:	DISPLAY:
Station #23254 - Golden Eagle Refinery, Martinez, CA	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/1/2012 - 00:00 **End Date: 12/31/2017 - 23:59**	MODELER:	
	CALM WINDS: **0.04%**	TOTAL COUNT: **43777 hrs.**	
	AVG. WIND SPEED: **3.41 m/s**	DATE: **11/4/2020**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure D-1 Windrose

Attachment E

Sensitive Receptors

Table E-1 List of Sensitive Receptors

Description	Receptor Number	Easting (X) (m)	Northing (Y) (m)
VA Medical Center	22682	577647	4205553
John Muir Elementary School	22683	577262	4206201
Martinez Junior High School	22684	576327	4207641
Contra Costa County Martinez Health Center	22685	576125	4206929
Alhambra High School	22686	576172	4206579
Holbrook Elementary School	22687	585453	4205560
Robert Semple Elementary School	22688	574823	4212714
Las Juntas Elementary School 1	22689	579754	4207262
Las Juntas Elementary School 2	22690	579721	4207172
Las Juntas Elementary School 3	22691	579666	4207060
Berean Christian School	22692	578941	4207150
Berean Christian School	22693	578941	4207099
Helping Hands Christian Preschool 1	22694	580004	4205426
Helping Hands Christian Preschool 2	22695	579989	4205354
Helping Hands Christian Preschool 3	22696	580043	4205290
Morelleo Park Elementary School 1	22697	579169	4206381
Morelleo Park Elementary School 2	22698	579166	4206460
Morelleo Park Elementary School 3	22699	579197	4206309
Morello Hills Christian Preschool	22700	578721	4206244
Bayside Montessori Learning Center 1	22701	579464	4205932
Bayside Montessori Learning Center 2	22702	579464	4205914
Bayside Montessori Learning Center 3	22703	579465	4205893
Floyd I. Marchus School 1	22704	583663	4205758
Floyd I. Marchus School 2	22705	583643	4205719
Floyd I. Marchus School 3	22706	583726	4205775
Floyd I. Marchus School 4	22707	583630	4205693
Concord Christian Schools	22708	584099	4205924
Glenbrook Middle School 1	22709	584425	4205750
Glenbrook Middle School 2	22710	584471	4205825
Glenbrook Middle School 3	22711	584551	4205877
Glenbrook Middle School 4	22712	584631	4205847
Glenbrook Middle School 5	22713	584729	4205827
Glenbrook Middle School 6	22714	584811	4205803
Williams School 1	22715	584566	4204734
Williams School 2	22716	584528	4204713
Williams School 3	22717	584486	4204688
John Muir Health Physical Rehabilitation Center	22718	584628	4204583
Contra Costa Imaging Center	22719	584760	4204525
John Muir Medical Center 1	22720	584800	4204526
Sun Terrace Elementary School 1	22721	585044	4206354

Description	Receptor Number	Easting (X) (m)	Northing (Y) (m)
Sun Terrace Elementary School 2	22722	585106	4206471
Sun Terrace Elementary School 3	22723	585076	4206414
Sun Terrace Pre-School	22724	585368	4206359
Contra Costa Juvenile Hall	22725	580083	4204942
Kaiser Permanente 1	22726	578134	4205512
Kaiser Permanente 2	22727	578198	4205472
Kaiser Permanente 3	22728	578254	4205491
Kaiser Permanente 4	22729	578249	4205457
Kaiser Permanente 5	22730	578162	4205449
Kaiser Permanente 6	22731	578099	4205431

Attachment F

Modeling Files

(The AERMOD modeling files are provided under separate cover.)

Appendix E

Construction Emission Summaries

Table E.1-1a. Average Daily Construction Emissions Summary.

Martinez Facility

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	40.03	0.12	747.30	11.40	1.80	1.60	NA			
On-road Motor Vehicles	3.63	0.08	11.16	0.43	6.71	1.08	NA			
Fugitive PM from Material Movement					3.09	1.69	NA			
Asphalt Paving Offgassing				0.01			NA			
Architectural Coating Offgassing				30.66			NA			
Average Daily Onsite Emissions (lb/day)	**43.67**	**0.19**	**758.46**	**42.50**	**11.60**	**4.37**	NA			
Significance Threshold:	54.00	NA	NA	54.00	82.00	54.00	NA			
Threshold Exceeded?	No	No	No	No	No	No				

Table E.1-1b. Total Construction Emissions Summary.

Martinez Facility

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	10.57	0.03	197.29	3.01	0.47	0.42	2,655.30	0.17	0.36	2,770.53
On-road Motor Vehicles	0.96	0.02	2.95	0.11	1.77	0.29	1,899.42	0.01	0.19	1,957.67
Fugitive PM from Material Movement					0.82	0.45				
Asphalt Paving Offgassing				0.00						
Architectural Coating Offgassing				8.09						
Total Construction Emissions	**11.53**	**0.05**	**200.23**	**11.22**	**3.06**	**1.15**	**4,554.72**	**0.18**	**0.55**	**4,728.20**
Significance Threshold:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1. Project construction is expected to take approximately: Months 22
2. BAAQMD CEQA Guidelines define thresholds of significance for construction-related emissions on a daily average basis (See Table 2-4). No annual threshold exists.

3. BAAQMD CEQA Guidelines (Section 2.6.2) have not defined a GHG threshold of significance for construction related emissions.
4. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 1	Aerial Lifts	63	0.31	5	8	0.06	0.90	0.02	0.02	1.71	0.00
Month 1	Air Compressors	78	0.48	6	8	3.95	5.70	0.13	0.10	329.31	0.02
Month 1	Concrete/Industrial Saws	81	0.73	2	8	1.23	2.13	0.08	0.06	100.64	0.01
Month 1	Cranes	231	0.29	2	8	0.16	1.79	0.07	0.07	0.92	0.00
Month 1	Excavators	158	0.38	5	8	0.33	2.73	0.13	0.12	5.60	0.01
Month 1	Forklifts	89	0.2	1	8	0.02	0.18	0.01	0.01	0.22	0.00
Month 1	Generator Sets	84	0.74	6	8	0.32	3.29	0.25	0.23	7.81	0.01
Month 1	Off-Highway Tractors	124	0.44	2	8	0.19	1.73	0.08	0.08	2.98	0.00
Month 1	Other General Industrial Equipment	88	0.34	12	8	1.26	10.29	0.80	0.74	8.56	0.01
Month 1	Rough Terrain Forklifts	100	0.4	5	8	0.17	2.47	0.06	0.06	4.29	0.01
Month 1	Skid Steer Loaders	65	0.37	3	8	0.07	0.96	0.03	0.03	1.53	0.00
Month 1	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**7.77**	**32.18**	**1.68**	**1.51**	**463.56**	**0.08**

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 2	Aerial Lifts	63	0.31	6	8	0.07	1.02	0.02	0.02	1.95	0.00
Month 2	Air Compressors	78	0.48	7	8	4.49	6.49	0.14	0.11	374.51	0.03
Month 2	Concrete/Industrial Saws	81	0.73	2	8	1.59	2.74	0.10	0.08	129.71	0.02
Month 2	Cranes	231	0.29	2	8	0.19	2.05	0.09	0.08	1.05	0.00
Month 2	Excavators	158	0.38	6	8	0.43	3.52	0.17	0.16	7.22	0.01
Month 2	Forklifts	89	0.2	1	8	0.02	0.21	0.01	0.01	0.26	0.00
Month 2	Generator Sets	84	0.74	7	8	0.38	3.90	0.30	0.28	9.25	0.01
Month 2	Off-Highway Tractors	124	0.44	3	8	0.23	2.05	0.10	0.09	3.52	0.01
Month 2	Other General Industrial Equipment	88	0.34	12	8	1.26	10.29	0.80	0.74	8.56	0.01
Month 2	Rough Terrain Forklifts	100	0.4	6	8	0.20	2.93	0.07	0.07	5.08	0.01
Month 2	Skid Steer Loaders	65	0.37	4	8	0.09	1.23	0.04	0.04	1.97	0.00
Month 2	Welders	46	0.45	0	8	0.09	0.15	0.00	0.00	6.54	0.00
		Daily Average Total:				**9.03**	**36.59**	**1.86**	**1.67**	**549.62**	**0.10**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 3	Aerial Lifts	63	0.31	8	8	0.09	1.45	0.03	0.03	2.76	0.00
Month 3	Air Compressors	78	0.48	10	8	6.34	9.17	0.20	0.15	529.47	0.04
Month 3	Concrete/Industrial Saws	81	0.73	3	8	2.27	3.92	0.15	0.11	185.62	0.03
Month 3	Cranes	231	0.29	3	8	0.31	3.43	0.14	0.13	1.76	0.00
Month 3	Excavators	158	0.38	8	8	0.61	5.04	0.25	0.23	10.34	0.02
Month 3	Forklifts	89	0.2	2	8	0.03	0.30	0.02	0.02	0.36	0.00
Month 3	Generator Sets	84	0.74	11	8	0.54	5.54	0.43	0.39	13.13	0.02
Month 3	Off-Highway Tractors	124	0.44	4	8	0.33	2.91	0.14	0.13	5.00	0.01
Month 3	Other General Industrial Equipment	88	0.34	12	8	1.26	10.29	0.80	0.74	8.56	0.01
Month 3	Rough Terrain Forklifts	100	0.4	8	8	0.28	4.15	0.10	0.10	7.21	0.01
Month 3	Skid Steer Loaders	65	0.37	6	8	0.13	1.76	0.06	0.05	2.82	0.00
Month 3	Welders	46	0.45	7	8	1.59	2.70	0.07	0.05	116.11	0.01
		Daily Average Total:				**13.80**	**50.67**	**2.40**	**2.14**	**883.14**	**0.15**
Month 4	Aerial Lifts	63	0.31	10	8	0.11	1.75	0.04	0.03	3.33	0.01
Month 4	Air Compressors	78	0.48	12	8	7.35	10.63	0.24	0.18	613.42	0.04
Month 4	Concrete/Industrial Saws	81	0.73	3	8	2.02	3.50	0.13	0.10	165.49	0.02
Month 4	Cranes	231	0.29	4	8	0.45	4.96	0.21	0.19	2.54	0.01
Month 4	Excavators	158	0.38	7	8	0.54	4.49	0.22	0.20	9.22	0.01
Month 4	Forklifts	89	0.2	2	8	0.04	0.33	0.02	0.02	0.40	0.00
Month 4	Generator Sets	84	0.74	12	8	0.60	6.10	0.47	0.43	14.46	0.02
Month 4	Off-Highway Tractors	124	0.44	4	8	0.36	3.21	0.15	0.14	5.51	0.01
Month 4	Other General Industrial Equipment	88	0.34	30	8	3.16	25.72	2.01	1.85	21.39	0.03
Month 4	Rough Terrain Forklifts	100	0.4	9	8	0.31	4.57	0.12	0.11	7.94	0.01
Month 4	Skid Steer Loaders	65	0.37	5	8	0.12	1.57	0.05	0.05	2.51	0.00
Month 4	Welders	46	0.45	1	8	0.22	0.38	0.01	0.01	16.35	0.00
		Daily Average Total:				**15.28**	**67.21**	**3.67**	**3.31**	**862.55**	**0.16**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 5	Aerial Lifts	63	0.31	22	8	0.25	3.81	0.08	0.07	7.25	0.01
Month 5	Air Compressors	78	0.48	26	8	15.82	22.87	0.51	0.39	1,320.46	0.09
Month 5	Concrete/Industrial Saws	81	0.73	1	8	0.68	1.18	0.04	0.03	55.91	0.01
Month 5	Cranes	231	0.29	10	8	1.03	11.39	0.47	0.44	5.82	0.02
Month 5	Excavators	158	0.38	3	8	0.18	1.52	0.07	0.07	3.11	0.00
Month 5	Forklifts	89	0.2	3	8	0.06	0.55	0.03	0.03	0.67	0.00
Month 5	Generator Sets	84	0.74	19	8	1.00	10.22	0.79	0.73	24.24	0.03
Month 5	Off-Highway Tractors	124	0.44	7	8	0.60	5.38	0.26	0.24	9.23	0.01
Month 5	Other General Industrial Equipment	88	0.34	30	8	3.16	25.72	2.01	1.85	21.39	0.03
Month 5	Rough Terrain Forklifts	100	0.4	15	8	0.52	7.67	0.19	0.18	13.32	0.02
Month 5	Skid Steer Loaders	65	0.37	2	8	0.04	0.53	0.02	0.02	0.85	0.00
Month 5	Welders	46	0.45	22	8	4.81	8.17	0.22	0.16	351.61	0.04
		Daily Average Total:				**28.16**	**99.01**	**4.70**	**4.20**	**1,813.85**	**0.26**

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 6	Aerial Lifts	63	0.31	22	8	0.25	3.82	0.08	0.07	7.28	0.01
Month 6	Air Compressors	78	0.48	22	8	13.85	20.02	0.45	0.34	1,155.80	0.08
Month 6	Concrete/Industrial Saws	81	0.73	1	8	0.46	0.80	0.03	0.02	38.02	0.01
Month 6	Cranes	231	0.29	8	8	0.87	9.66	0.40	0.37	4.94	0.01
Month 6	Excavators	158	0.38	2	8	0.12	1.03	0.05	0.05	2.12	0.00
Month 6	Forklifts	89	0.2	3	8	0.06	0.55	0.03	0.03	0.66	0.00
Month 6	Generator Sets	84	0.74	19	8	0.99	10.09	0.78	0.72	23.92	0.03
Month 6	Off-Highway Tractors	124	0.44	7	8	0.59	5.31	0.25	0.23	9.11	0.01
Month 6	Other General Industrial Equipment	88	0.34	30	8	3.16	25.72	2.01	1.85	21.39	0.03
Month 6	Rough Terrain Forklifts	100	0.4	14	8	0.52	7.57	0.19	0.18	13.14	0.02
Month 6	Skid Steer Loaders	65	0.37	1	8	0.03	0.36	0.01	0.01	0.58	0.00
Month 6	Welders	46	0.45	24	8	5.40	9.16	0.24	0.18	394.13	0.04
		Daily Average Total:				**26.30**	**94.09**	**4.53**	**4.05**	**1,671.08**	**0.25**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 7	Aerial Lifts	63	0.31	24	8	0.28	4.29	0.09	0.08	8.17	0.01
Month 7	Air Compressors	78	0.48	17	8	10.79	15.60	0.35	0.26	900.75	0.06
Month 7	Concrete/Industrial Saws	81	0.73	3	8	1.78	3.07	0.11	0.09	145.37	0.02
Month 7	Cranes	231	0.29	6	8	0.63	6.99	0.29	0.27	3.57	0.01
Month 7	Excavators	158	0.38	7	8	0.48	3.95	0.19	0.18	8.10	0.01
Month 7	Forklifts	89	0.2	4	8	0.07	0.67	0.04	0.04	0.81	0.00
Month 7	Generator Sets	84	0.74	24	8	1.21	12.35	0.96	0.88	29.29	0.04
Month 7	Off-Highway Tractors	124	0.44	8	8	0.73	6.50	0.31	0.29	11.16	0.02
Month 7	Other General Industrial Equipment	88	0.34	30	8	3.16	25.72	2.01	1.85	21.39	0.03
Month 7	Rough Terrain Forklifts	100	0.4	18	8	0.63	9.26	0.23	0.21	16.09	0.02
Month 7	Skid Steer Loaders	65	0.37	4	8	0.10	1.38	0.05	0.04	2.21	0.00
Month 7	Welders	46	0.45	22	8	4.88	8.28	0.22	0.17	356.51	0.04
		Daily Average Total:				**24.74**	**98.07**	**4.86**	**4.36**	**1,503.41**	**0.27**
Month 8	Aerial Lifts	63	0.31	16	8	0.18	2.80	0.06	0.05	5.33	0.01
Month 8	Air Compressors	78	0.48	8	8	4.87	7.05	0.16	0.12	406.79	0.03
Month 8	Concrete/Industrial Saws	81	0.73	3	8	2.02	3.50	0.13	0.10	165.49	0.02
Month 8	Cranes	231	0.29	3	8	0.30	3.26	0.14	0.12	1.67	0.00
Month 8	Excavators	158	0.38	7	8	0.54	4.49	0.22	0.20	9.22	0.01
Month 8	Forklifts	89	0.2	3	8	0.05	0.47	0.03	0.03	0.57	0.00
Month 8	Generator Sets	84	0.74	17	8	0.86	8.76	0.68	0.62	20.78	0.03
Month 8	Off-Highway Tractors	124	0.44	6	8	0.51	4.61	0.22	0.20	7.92	0.01
Month 8	Other General Industrial Equipment	88	0.34	15	8	1.58	12.86	1.01	0.93	10.69	0.01
Month 8	Rough Terrain Forklifts	100	0.4	13	8	0.45	6.57	0.17	0.15	11.42	0.02
Month 8	Skid Steer Loaders	65	0.37	5	8	0.12	1.57	0.05	0.05	2.51	0.00
Month 8	Welders	46	0.45	8	8	1.75	2.96	0.08	0.06	127.56	0.01
		Daily Average Total:				**13.24**	**58.92**	**2.93**	**2.64**	**769.96**	**0.17**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 9	Aerial Lifts	63	0.31	4	8	0.05	0.73	0.02	0.01	1.40	0.00
Month 9	Air Compressors	78	0.48	5	8	3.21	4.64	0.10	0.08	267.97	0.02
Month 9	Concrete/Industrial Saws	81	0.73	1	8	0.41	0.71	0.03	0.02	33.55	0.00
Month 9	Cranes	231	0.29	2	8	0.22	2.44	0.10	0.09	1.25	0.00
Month 9	Excavators	158	0.38	2	8	0.11	0.91	0.04	0.04	1.87	0.00
Month 9	Forklifts	89	0.2	1	8	0.01	0.12	0.01	0.01	0.14	0.00
Month 9	Generator Sets	84	0.74	4	8	0.22	2.20	0.17	0.16	5.21	0.01
Month 9	Off-Highway Tractors	124	0.44	2	8	0.13	1.16	0.06	0.05	1.98	0.00
Month 9	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 9	Rough Terrain Forklifts	100	0.4	3	8	0.11	1.65	0.04	0.04	2.86	0.00
Month 9	Skid Steer Loaders	65	0.37	1	8	0.02	0.32	0.01	0.01	0.51	0.00
Month 9	Welders	46	0.45	4	8	0.83	1.41	0.04	0.03	60.51	0.01
		Daily Average Total:				**5.32**	**16.27**	**0.61**	**0.54**	**377.24**	**0.05**

Month 10	Aerial Lifts	63	0.31	7	8	0.08	1.16	0.02	0.02	2.20	0.00
Month 10	Air Compressors	78	0.48	8	8	5.07	7.33	0.16	0.12	422.93	0.03
Month 10	Concrete/Industrial Saws	81	0.73	1	8	0.38	0.66	0.02	0.02	31.31	0.00
Month 10	Cranes	231	0.29	3	8	0.35	3.85	0.16	0.15	1.97	0.01
Month 10	Excavators	158	0.38	1	8	0.10	0.85	0.04	0.04	1.74	0.00
Month 10	Forklifts	89	0.2	1	8	0.02	0.18	0.01	0.01	0.21	0.00
Month 10	Generator Sets	84	0.74	6	8	0.32	3.25	0.25	0.23	7.71	0.01
Month 10	Off-Highway Tractors	124	0.44	2	8	0.19	1.71	0.08	0.08	2.94	0.00
Month 10	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 10	Rough Terrain Forklifts	100	0.4	5	8	0.17	2.44	0.06	0.06	4.24	0.01
Month 10	Skid Steer Loaders	65	0.37	1	8	0.02	0.30	0.01	0.01	0.48	0.00
Month 10	Welders	46	0.45	9	8	2.02	3.42	0.09	0.07	147.18	0.02
		Daily Average Total:				**8.71**	**25.13**	**0.92**	**0.80**	**622.91**	**0.08**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 11	Aerial Lifts	63	0.31	5	8	0.06	0.96	0.02	0.02	1.83	0.00
Month 11	Air Compressors	78	0.48	7	8	4.22	6.10	0.14	0.10	351.91	0.02
Month 11	Concrete/Industrial Saws	81	0.73	1	8	0.38	0.66	0.02	0.02	31.31	0.00
Month 11	Cranes	231	0.29	3	8	0.28	3.14	0.13	0.12	1.61	0.00
Month 11	Excavators	158	0.38	1	8	0.10	0.85	0.04	0.04	1.74	0.00
Month 11	Forklifts	89	0.2	1	8	0.02	0.15	0.01	0.01	0.18	0.00
Month 11	Generator Sets	84	0.74	5	8	0.27	2.76	0.21	0.20	6.54	0.01
Month 11	Off-Highway Tractors	124	0.44	2	8	0.16	1.45	0.07	0.06	2.49	0.00
Month 11	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 11	Rough Terrain Forklifts	100	0.4	4	8	0.14	2.07	0.05	0.05	3.59	0.01
Month 11	Skid Steer Loaders	65	0.37	1	8	0.02	0.30	0.01	0.01	0.48	0.00
Month 11	Welders	46	0.45	9	8	2.08	3.53	0.09	0.07	152.09	0.02
		Daily Average Total:				**7.74**	**21.97**	**0.80**	**0.70**	**553.77**	**0.07**
Month 12	Aerial Lifts	63	0.31	5	8	0.06	0.94	0.02	0.02	1.78	0.00
Month 12	Air Compressors	78	0.48	7	8	4.10	5.93	0.13	0.10	342.22	0.02
Month 12	Concrete/Industrial Saws	81	0.73	1	8	0.38	0.66	0.02	0.02	31.31	0.00
Month 12	Cranes	231	0.29	2	8	0.24	2.70	0.11	0.10	1.38	0.00
Month 12	Excavators	158	0.38	1	8	0.10	0.85	0.04	0.04	1.74	0.00
Month 12	Forklifts	89	0.2	1	8	0.02	0.15	0.01	0.01	0.18	0.00
Month 12	Generator Sets	84	0.74	5	8	0.26	2.69	0.21	0.19	6.38	0.01
Month 12	Off-Highway Tractors	124	0.44	2	8	0.16	1.42	0.07	0.06	2.43	0.00
Month 12	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 12	Rough Terrain Forklifts	100	0.4	4	8	0.14	2.02	0.05	0.05	3.50	0.01
Month 12	Skid Steer Loaders	65	0.37	1	8	0.02	0.30	0.01	0.01	0.48	0.00
Month 12	Welders	46	0.45	9	8	1.93	3.27	0.09	0.07	140.64	0.02
		Daily Average Total:				**7.41**	**20.91**	**0.76**	**0.66**	**532.04**	**0.07**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 13	Aerial Lifts	63	0.31	8	8	0.09	1.34	0.03	0.03	2.56	0.00
Month 13	Air Compressors	78	0.48	7	8	4.02	5.82	0.13	0.10	335.76	0.02
Month 13	Concrete/Industrial Saws	81	0.73	1	8	0.49	0.85	0.03	0.02	40.26	0.01
Month 13	Cranes	231	0.29	2	8	0.23	2.58	0.11	0.10	1.32	0.00
Month 13	Excavators	158	0.38	2	8	0.13	1.09	0.05	0.05	2.24	0.00
Month 13	Forklifts	89	0.2	1	8	0.02	0.21	0.01	0.01	0.25	0.00
Month 13	Generator Sets	84	0.74	7	8	0.37	3.81	0.29	0.27	9.04	0.01
Month 13	Off-Highway Tractors	124	0.44	3	8	0.22	2.00	0.10	0.09	3.44	0.01
Month 13	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 13	Rough Terrain Forklifts	100	0.4	5	8	0.20	2.86	0.07	0.07	4.97	0.01
Month 13	Skid Steer Loaders	65	0.37	1	8	0.03	0.38	0.01	0.01	0.61	0.00
Month 13	Welders	46	0.45	8	8	1.86	3.15	0.08	0.06	135.74	0.01
		Daily Average Total:				**7.67**	**24.10**	**0.92**	**0.81**	**536.18**	**0.08**

Month 14	Aerial Lifts	63	0.31	7	8	0.08	1.26	0.03	0.02	2.40	0.00
Month 14	Air Compressors	78	0.48	5	8	2.98	4.31	0.10	0.07	248.59	0.02
Month 14	Concrete/Industrial Saws	81	0.73	0	8	0.33	0.57	0.02	0.02	26.84	0.00
Month 14	Cranes	231	0.29	2	8	0.17	1.85	0.08	0.07	0.95	0.00
Month 14	Excavators	158	0.38	1	8	0.09	0.73	0.04	0.03	1.49	0.00
Month 14	Forklifts	89	0.2	1	8	0.02	0.19	0.01	0.01	0.23	0.00
Month 14	Generator Sets	84	0.74	7	8	0.34	3.47	0.27	0.25	8.24	0.01
Month 14	Off-Highway Tractors	124	0.44	2	8	0.20	1.83	0.09	0.08	3.14	0.00
Month 14	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 14	Rough Terrain Forklifts	100	0.4	5	8	0.18	2.61	0.07	0.06	4.53	0.01
Month 14	Skid Steer Loaders	65	0.37	1	8	0.02	0.26	0.01	0.01	0.41	0.00
Month 14	Welders	46	0.45	3	8	0.74	1.25	0.03	0.03	53.97	0.01
		Daily Average Total:				**5.15**	**18.32**	**0.73**	**0.65**	**350.78**	**0.06**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 15	Aerial Lifts	63	0.31	6	8	0.07	1.04	0.02	0.02	1.98	0.00
Month 15	Air Compressors	78	0.48	3	8	1.78	2.57	0.06	0.04	148.51	0.01
Month 15	Concrete/Industrial Saws	81	0.73	0	8	0.33	0.57	0.02	0.02	26.84	0.00
Month 15	Cranes	231	0.29	1	8	0.12	1.29	0.05	0.05	0.66	0.00
Month 15	Excavators	158	0.38	1	8	0.09	0.73	0.04	0.03	1.49	0.00
Month 15	Forklifts	89	0.2	1	8	0.02	0.16	0.01	0.01	0.19	0.00
Month 15	Generator Sets	84	0.74	6	8	0.29	2.91	0.23	0.21	6.91	0.01
Month 15	Off-Highway Tractors	124	0.44	2	8	0.17	1.53	0.07	0.07	2.63	0.00
Month 15	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 15	Rough Terrain Forklifts	100	0.4	4	8	0.15	2.19	0.06	0.05	3.80	0.01
Month 15	Skid Steer Loaders	65	0.37	1	8	0.02	0.26	0.01	0.01	0.41	0.00
Month 15	Welders	46	0.45	1	8	0.29	0.49	0.01	0.01	21.26	0.00
		Daily Average Total:				**3.31**	**13.74**	**0.58**	**0.51**	**214.68**	**0.04**

Month 16	Aerial Lifts	63	0.31	11	8	0.12	1.92	0.04	0.04	3.65	0.01
Month 16	Air Compressors	78	0.48	10	8	6.27	9.06	0.20	0.15	523.02	0.04
Month 16	Concrete/Industrial Saws	81	0.73	0	8	0.03	0.05	0.00	0.00	2.24	0.00
Month 16	Cranes	231	0.29	4	8	0.43	4.75	0.20	0.18	2.43	0.01
Month 16	Excavators	158	0.38	0	8	0.01	0.06	0.00	0.00	0.12	0.00
Month 16	Forklifts	89	0.2	1	8	0.03	0.26	0.02	0.02	0.32	0.00
Month 16	Generator Sets	84	0.74	9	8	0.48	4.89	0.38	0.35	11.59	0.02
Month 16	Off-Highway Tractors	124	0.44	3	8	0.29	2.57	0.12	0.11	4.41	0.01
Month 16	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 16	Rough Terrain Forklifts	100	0.4	7	8	0.25	3.67	0.09	0.08	6.37	0.01
Month 16	Skid Steer Loaders	65	0.37	0	8	0.00	0.02	0.00	0.00	0.03	0.00
Month 16	Welders	46	0.45	9	8	1.93	3.27	0.09	0.07	140.64	0.02
		Daily Average Total:				**9.83**	**30.52**	**1.14**	**1.00**	**694.82**	**0.10**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 17	Aerial Lifts	63	0.31	10	8	0.11	1.72	0.04	0.03	3.28	0.01
Month 17	Air Compressors	78	0.48	10	8	6.11	8.84	0.20	0.15	510.10	0.03
Month 17	Concrete/Industrial Saws	81	0.73	1	8	0.49	0.85	0.03	0.02	40.26	0.01
Month 17	Cranes	231	0.29	4	8	0.42	4.61	0.19	0.18	2.36	0.01
Month 17	Excavators	158	0.38	2	8	0.13	1.09	0.05	0.05	2.24	0.00
Month 17	Forklifts	89	0.2	1	8	0.03	0.26	0.02	0.01	0.31	0.00
Month 17	Generator Sets	84	0.74	9	8	0.47	4.77	0.37	0.34	11.32	0.01
Month 17	Off-Highway Tractors	124	0.44	3	8	0.28	2.51	0.12	0.11	4.31	0.01
Month 17	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 17	Rough Terrain Forklifts	100	0.4	7	8	0.24	3.58	0.09	0.08	6.22	0.01
Month 17	Skid Steer Loaders	65	0.37	1	8	0.03	0.38	0.01	0.01	0.61	0.00
Month 17	Welders	46	0.45	11	8	2.35	3.99	0.11	0.08	171.71	0.02
		Daily Average Total:				**10.67**	**32.61**	**1.22**	**1.07**	**752.73**	**0.11**

Month 18	Aerial Lifts	63	0.31	12	8	0.14	2.09	0.04	0.04	3.98	0.01
Month 18	Air Compressors	78	0.48	13	8	7.89	11.41	0.25	0.19	658.61	0.04
Month 18	Concrete/Industrial Saws	81	0.73	0	8	--	--	--	--	--	--
Month 18	Cranes	231	0.29	5	8	0.53	5.84	0.24	0.22	2.99	0.01
Month 18	Excavators	158	0.38	0	8	--	--	--	--	--	--
Month 18	Forklifts	89	0.2	2	8	0.03	0.29	0.02	0.02	0.35	0.00
Month 18	Generator Sets	84	0.74	10	8	0.52	5.31	0.41	0.38	12.60	0.02
Month 18	Off-Highway Tractors	124	0.44	4	8	0.31	2.79	0.13	0.12	4.80	0.01
Month 18	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 18	Rough Terrain Forklifts	100	0.4	8	8	0.27	3.98	0.10	0.09	6.92	0.01
Month 18	Skid Steer Loaders	65	0.37	0	8	--	--	--	--	--	--
Month 18	Welders	46	0.45	17	8	3.85	6.54	0.17	0.13	281.29	0.03
		Daily Average Total:				**13.54**	**38.26**	**1.38**	**1.20**	**971.54**	**0.12**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 19	Aerial Lifts	63	0.31	11	8	0.12	1.86	0.04	0.04	3.55	0.01
Month 19	Air Compressors	78	0.48	11	8	6.77	9.79	0.22	0.17	564.99	0.04
Month 19	Concrete/Industrial Saws	81	0.73	0	8	--	--	--	--	--	--
Month 19	Cranes	231	0.29	4	8	0.45	4.96	0.21	0.19	2.54	0.01
Month 19	Excavators	158	0.38	0	8	--	--	--	--	--	--
Month 19	Forklifts	89	0.2	1	8	0.03	0.26	0.02	0.01	0.31	0.00
Month 19	Generator Sets	84	0.74	9	8	0.46	4.73	0.37	0.34	11.21	0.01
Month 19	Off-Highway Tractors	124	0.44	3	8	0.28	2.49	0.12	0.11	4.27	0.01
Month 19	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 19	Rough Terrain Forklifts	100	0.4	7	8	0.24	3.55	0.09	0.08	6.16	0.01
Month 19	Skid Steer Loaders	65	0.37	0	8	--	--	--	--	--	--
Month 19	Welders	46	0.45	16	8	3.56	6.04	0.16	0.12	260.03	0.03
		Daily Average Total:				**11.91**	**33.67**	**1.21**	**1.05**	**853.06**	**0.11**

Month 20	Aerial Lifts	63	0.31	13	8	0.15	2.29	0.05	0.04	4.35	0.01
Month 20	Air Compressors	78	0.48	11	8	6.50	9.40	0.21	0.16	542.39	0.04
Month 20	Concrete/Industrial Saws	81	0.73	0	8	--	--	--	--	--	--
Month 20	Cranes	231	0.29	4	8	0.43	4.75	0.20	0.18	2.43	0.01
Month 20	Excavators	158	0.38	0	8	--	--	--	--	--	--
Month 20	Forklifts	89	0.2	2	8	0.03	0.31	0.02	0.02	0.38	0.00
Month 20	Generator Sets	84	0.74	11	8	0.57	5.81	0.45	0.41	13.77	0.02
Month 20	Off-Highway Tractors	124	0.44	4	8	0.34	3.05	0.15	0.13	5.24	0.01
Month 20	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 20	Rough Terrain Forklifts	100	0.4	8	8	0.30	4.35	0.11	0.10	7.56	0.01
Month 20	Skid Steer Loaders	65	0.37	0	8	--	--	--	--	--	--
Month 20	Welders	46	0.45	16	8	3.63	6.16	0.16	0.12	264.93	0.03
		Daily Average Total:				**11.95**	**36.12**	**1.34**	**1.17**	**841.06**	**0.12**

Table E.1-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 21	Aerial Lifts	63	0.31	10	8	0.12	1.78	0.04	0.03	3.40	0.01
Month 21	Air Compressors	78	0.48	7	8	4.45	6.43	0.14	0.11	371.28	0.03
Month 21	Concrete/Industrial Saws	81	0.73	0	8	0.05	0.09	0.00	0.00	4.47	0.00
Month 21	Cranes	231	0.29	3	8	0.29	3.23	0.13	0.12	1.65	0.00
Month 21	Excavators	158	0.38	0	8	0.01	0.12	0.01	0.01	0.25	0.00
Month 21	Forklifts	89	0.2	1	8	0.03	0.25	0.02	0.01	0.30	0.00
Month 21	Generator Sets	84	0.74	9	8	0.45	4.57	0.35	0.33	10.84	0.01
Month 21	Off-Highway Tractors	124	0.44	3	8	0.27	2.41	0.12	0.11	4.13	0.01
Month 21	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 21	Rough Terrain Forklifts	100	0.4	7	8	0.23	3.43	0.09	0.08	5.96	0.01
Month 21	Skid Steer Loaders	65	0.37	0	8	0.00	0.04	0.00	0.00	0.07	0.00
Month 21	Welders	46	0.45	11	8	2.46	4.18	0.11	0.08	179.89	0.02
		Daily Average Total:				**8.37**	**26.54**	**1.01**	**0.88**	**582.24**	**0.09**
Month 22	Aerial Lifts	63	0.31	3	8	0.04	0.61	0.01	0.01	1.16	0.00
Month 22	Air Compressors	78	0.48	0	8	0.12	0.17	0.00	0.00	9.69	0.00
Month 22	Concrete/Industrial Saws	81	0.73	0	8	0.19	0.33	0.01	0.01	15.65	0.00
Month 22	Cranes	231	0.29	0	8	0.01	0.09	0.00	0.00	0.05	0.00
Month 22	Excavators	158	0.38	1	8	0.05	0.43	0.02	0.02	0.87	0.00
Month 22	Forklifts	89	0.2	0	8	0.01	0.09	0.01	0.01	0.11	0.00
Month 22	Generator Sets	84	0.74	3	8	0.17	1.70	0.13	0.12	4.04	0.01
Month 22	Off-Highway Tractors	124	0.44	1	8	0.10	0.90	0.04	0.04	1.54	0.00
Month 22	Other General Industrial Equipment	88	0.34	0	8	--	--	--	--	--	--
Month 22	Rough Terrain Forklifts	100	0.4	2	8	0.09	1.28	0.03	0.03	2.22	0.00
Month 22	Skid Steer Loaders	65	0.37	0	8	0.01	0.15	0.01	0.00	0.24	0.00
Month 22	Welders	46	0.45	0	8	0.07	0.11	0.00	0.00	4.91	0.00
		Daily Average Total:				**0.85**	**5.85**	**0.27**	**0.25**	**40.47**	**0.02**
		Daily Average				**11.40**	**40.03**	**1.80**	**1.60**	**747.30**	**0.12**

Notes:
1. Average daily emissions are based on the equipment list and usage provided by the facility.
2. Source for equipment load factors and HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
3. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

							Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 1	Aerial Lifts	63	0.31	5	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.11	0.00	0.00	3.31
Month 1	Air Compressors	78	0.48	6	24	8	0.05	0.07	0.00	0.00	3.95	0.00	20.11	0.00	0.00	20.59
Month 1	Concrete/Industrial Saws	81	0.73	2	24	8	0.01	0.03	0.00	0.00	1.21	0.00	12.49	0.00	0.00	12.70
Month 1	Cranes	231	0.29	2	24	8	0.00	0.02	0.00	0.00	0.01	0.00	2.98	0.00	0.00	3.18
Month 1	Excavators	158	0.38	5	24	8	0.00	0.03	0.00	0.00	0.07	0.00	10.46	0.00	0.00	10.98
Month 1	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.37
Month 1	Generator Sets	84	0.74	6	24	8	0.00	0.04	0.00	0.00	0.09	0.00	11.95	0.00	0.00	12.74
Month 1	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.04	0.00	5.44	0.00	0.00	5.67
Month 1	Other General Industrial Equipment	88	0.34	12	24	8	0.02	0.12	0.01	0.01	0.10	0.00	12.48	0.00	0.00	13.21
Month 1	Rough Terrain Forklifts	100	0.4	5	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.67	0.00	0.00	8.05
Month 1	Skid Steer Loaders	65	0.37	3	24	8	0.00	0.01	0.00	0.00	0.02	0.00	2.70	0.00	0.00	2.84
Month 1	Welders	46	0.45	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Month Total:					**0.09**	**0.39**	**0.02**	**0.02**	**5.56**	**0.00**	**89.73**	**0.01**	**0.01**	**93.66**
Month 2	Aerial Lifts	63	0.31	6	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.54	0.00	0.00	3.77
Month 2	Air Compressors	78	0.48	7	24	8	0.05	0.08	0.00	0.00	4.49	0.00	22.87	0.00	0.00	23.42
Month 2	Concrete/Industrial Saws	81	0.73	2	24	8	0.02	0.03	0.00	0.00	1.56	0.00	16.09	0.00	0.00	16.37
Month 2	Cranes	231	0.29	2	24	8	0.00	0.02	0.00	0.00	0.01	0.00	3.42	0.00	0.00	3.65
Month 2	Excavators	158	0.38	6	24	8	0.01	0.04	0.00	0.00	0.09	0.00	13.48	0.00	0.00	14.16
Month 2	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.44
Month 2	Generator Sets	84	0.74	7	24	8	0.00	0.05	0.00	0.00	0.11	0.00	14.15	0.00	0.00	15.08
Month 2	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.43	0.00	0.00	6.72
Month 2	Other General Industrial Equipment	88	0.34	12	24	8	0.02	0.12	0.01	0.01	0.10	0.00	12.48	0.00	0.00	13.21
Month 2	Rough Terrain Forklifts	100	0.4	6	24	8	0.00	0.04	0.00	0.00	0.06	0.00	9.08	0.00	0.00	9.53
Month 2	Skid Steer Loaders	65	0.37	4	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.47	0.00	0.00	3.66
Month 2	Welders	46	0.45	0	24	8	0.00	0.00	0.00	0.00	0.08	0.00	0.64	0.00	0.00	0.65
		Month Total:					**0.11**	**0.44**	**0.02**	**0.02**	**6.60**	**0.00**	**106.06**	**0.01**	**0.01**	**110.66**
Month 3	Aerial Lifts	63	0.31	8	24	8	0.00	0.02	0.00	0.00	0.03	0.00	5.00	0.00	0.00	5.33
Month 3	Air Compressors	78	0.48	10	24	8	0.08	0.11	0.00	0.00	6.35	0.00	32.33	0.00	0.00	33.11
Month 3	Concrete/Industrial Saws	81	0.73	3	24	8	0.03	0.05	0.00	0.00	2.23	0.00	23.03	0.00	0.00	23.43
Month 3	Cranes	231	0.29	3	24	8	0.00	0.04	0.00	0.00	0.02	0.00	5.72	0.00	0.00	6.10
Month 3	Excavators	158	0.38	8	24	8	0.01	0.06	0.00	0.00	0.12	0.00	19.29	0.00	0.00	20.26
Month 3	Forklifts	89	0.2	2	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.63
Month 3	Generator Sets	84	0.74	11	24	8	0.01	0.07	0.01	0.00	0.16	0.00	20.09	0.00	0.00	21.41
Month 3	Off-Highway Tractors	124	0.44	4	24	8	0.00	0.03	0.00	0.00	0.06	0.00	9.13	0.00	0.00	9.53
Month 3	Other General Industrial Equipment	88	0.34	12	24	8	0.02	0.12	0.01	0.01	0.10	0.00	12.48	0.00	0.00	13.21
Month 3	Rough Terrain Forklifts	100	0.4	8	24	8	0.00	0.05	0.00	0.00	0.09	0.00	12.89	0.00	0.00	13.53
Month 3	Skid Steer Loaders	65	0.37	6	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.97	0.00	0.00	5.24
Month 3	Welders	46	0.45	7	24	8	0.02	0.03	0.00	0.00	1.39	0.00	11.27	0.00	0.00	11.60
		Month Total:					**0.17**	**0.61**	**0.03**	**0.03**	**10.60**	**0.00**	**156.78**	**0.01**	**0.02**	**163.37**

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

							Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	**Avg HP**	**Load Factor**	**Number of Units**	**Number of Days**	**Hours/Day**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO2**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Month 4	Aerial Lifts	63	0.31	10	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.04	0.00	0.00	6.43
Month 4	Air Compressors	78	0.48	12	24	8	0.09	0.13	0.00	0.00	7.36	0.00	37.46	0.00	0.00	38.36
Month 4	Concrete/Industrial Saws	81	0.73	3	24	8	0.02	0.04	0.00	0.00	1.99	0.00	20.53	0.00	0.00	20.89
Month 4	Cranes	231	0.29	4	24	8	0.01	0.06	0.00	0.00	0.03	0.00	8.26	0.00	0.00	8.81
Month 4	Excavators	158	0.38	7	24	8	0.01	0.05	0.00	0.00	0.11	0.00	17.20	0.00	0.00	18.06
Month 4	Forklifts	89	0.2	2	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.69
Month 4	Generator Sets	84	0.74	12	24	8	0.01	0.07	0.01	0.01	0.17	0.00	22.12	0.00	0.00	23.58
Month 4	Off-Highway Tractors	124	0.44	4	24	8	0.00	0.04	0.00	0.00	0.07	0.00	10.06	0.00	0.00	10.50
Month 4	Other General Industrial Equipment	88	0.34	30	24	8	0.04	0.31	0.02	0.02	0.26	0.00	31.20	0.00	0.01	33.02
Month 4	Rough Terrain Forklifts	100	0.4	9	24	8	0.00	0.05	0.00	0.00	0.10	0.00	14.20	0.00	0.00	14.90
Month 4	Skid Steer Loaders	65	0.37	5	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.43	0.00	0.00	4.67
Month 4	Welders	46	0.45	1	24	8	0.00	0.00	0.00	0.00	0.20	0.00	1.59	0.00	0.00	1.63
		Month Total:					**0.18**	**0.81**	**0.04**	**0.04**	**10.35**	**0.00**	**173.72**	**0.01**	**0.02**	**181.53**
Month 5	Aerial Lifts	63	0.31	22	24	8	0.00	0.05	0.00	0.00	0.09	0.00	13.15	0.00	0.00	14.00
Month 5	Air Compressors	78	0.48	26	24	8	0.19	0.27	0.01	0.00	15.85	0.00	80.63	0.00	0.01	82.56
Month 5	Concrete/Industrial Saws	81	0.73	1	24	8	0.01	0.01	0.00	0.00	0.67	0.00	6.94	0.00	0.00	7.06
Month 5	Cranes	231	0.29	10	24	8	0.01	0.14	0.01	0.01	0.07	0.00	18.96	0.00	0.00	20.22
Month 5	Excavators	158	0.38	3	24	8	0.00	0.02	0.00	0.00	0.04	0.00	5.81	0.00	0.00	6.10
Month 5	Forklifts	89	0.2	3	24	8	0.00	0.01	0.00	0.00	0.01	0.00	1.06	0.00	0.00	1.16
Month 5	Generator Sets	84	0.74	19	24	8	0.01	0.12	0.01	0.01	0.29	0.00	37.08	0.00	0.01	39.53
Month 5	Off-Highway Tractors	124	0.44	7	24	8	0.01	0.06	0.00	0.00	0.11	0.00	16.86	0.00	0.00	17.60
Month 5	Other General Industrial Equipment	88	0.34	30	24	8	0.04	0.31	0.02	0.02	0.26	0.00	31.20	0.00	0.01	33.02
Month 5	Rough Terrain Forklifts	100	0.4	15	24	8	0.01	0.09	0.00	0.00	0.16	0.00	23.80	0.00	0.00	24.98
Month 5	Skid Steer Loaders	65	0.37	2	24	8	0.00	0.01	0.00	0.00	0.01	0.00	1.50	0.00	0.00	1.58
Month 5	Welders	46	0.45	22	24	8	0.06	0.10	0.00	0.00	4.22	0.00	34.13	0.00	0.00	35.12
		Month Total:					**0.34**	**1.19**	**0.06**	**0.05**	**21.77**	**0.00**	**271.12**	**0.02**	**0.04**	**282.93**
Month 6	Aerial Lifts	63	0.31	22	24	8	0.00	0.05	0.00	0.00	0.09	0.00	13.21	0.00	0.00	14.06
Month 6	Air Compressors	78	0.48	22	24	8	0.17	0.24	0.01	0.00	13.87	0.00	70.58	0.00	0.01	72.27
Month 6	Concrete/Industrial Saws	81	0.73	1	24	8	0.01	0.01	0.00	0.00	0.46	0.00	4.72	0.00	0.00	4.80
Month 6	Cranes	231	0.29	8	24	8	0.01	0.12	0.00	0.00	0.06	0.00	16.08	0.00	0.00	17.14
Month 6	Excavators	158	0.38	2	24	8	0.00	0.01	0.00	0.00	0.03	0.00	3.95	0.00	0.00	4.15
Month 6	Forklifts	89	0.2	3	24	8	0.00	0.01	0.00	0.00	0.01	0.00	1.04	0.00	0.00	1.15
Month 6	Generator Sets	84	0.74	19	24	8	0.01	0.12	0.01	0.01	0.29	0.00	36.59	0.00	0.01	39.01
Month 6	Off-Highway Tractors	124	0.44	7	24	8	0.01	0.06	0.00	0.00	0.11	0.00	16.64	0.00	0.00	17.37
Month 6	Other General Industrial Equipment	88	0.34	30	24	8	0.04	0.31	0.02	0.02	0.26	0.00	31.20	0.00	0.01	33.02
Month 6	Rough Terrain Forklifts	100	0.4	14	24	8	0.01	0.09	0.00	0.00	0.16	0.00	23.49	0.00	0.00	24.65
Month 6	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	1.02	0.00	0.00	1.07
Month 6	Welders	46	0.45	24	24	8	0.06	0.11	0.00	0.00	4.73	0.00	38.26	0.00	0.00	39.37
		Month Total:					**0.32**	**1.13**	**0.05**	**0.05**	**20.05**	**0.00**	**256.78**	**0.02**	**0.04**	**268.06**

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
							POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 7	Aerial Lifts	63	0.31	24	24	8	0.00	0.05	0.00	0.00	0.10	0.00	14.82	0.00	0.00	15.78
Month 7	Air Compressors	78	0.48	17	24	8	0.13	0.19	0.00	0.00	10.81	0.00	55.00	0.00	0.00	56.32
Month 7	Concrete/Industrial Saws	81	0.73	3	24	8	0.02	0.04	0.00	0.00	1.74	0.00	18.04	0.00	0.00	18.35
Month 7	Cranes	231	0.29	6	24	8	0.01	0.08	0.00	0.00	0.04	0.00	11.63	0.00	0.00	12.40
Month 7	Excavators	158	0.38	7	24	8	0.01	0.05	0.00	0.00	0.10	0.00	15.11	0.00	0.00	15.87
Month 7	Forklifts	89	0.2	4	24	8	0.00	0.01	0.00	0.00	0.01	0.00	1.28	0.00	0.00	1.40
Month 7	Generator Sets	84	0.74	24	24	8	0.01	0.15	0.01	0.01	0.35	0.00	44.81	0.00	0.01	47.76
Month 7	Off-Highway Tractors	124	0.44	8	24	8	0.01	0.08	0.00	0.00	0.13	0.00	20.37	0.00	0.00	21.27
Month 7	Other General Industrial Equipment	88	0.34	30	24	8	0.04	0.31	0.02	0.02	0.26	0.00	31.20	0.00	0.01	33.02
Month 7	Rough Terrain Forklifts	100	0.4	18	24	8	0.01	0.11	0.00	0.00	0.19	0.00	28.76	0.00	0.00	30.19
Month 7	Skid Steer Loaders	65	0.37	4	24	8	0.00	0.02	0.00	0.00	0.03	0.00	3.89	0.00	0.00	4.10
Month 7	Welders	46	0.45	22	24	8	0.06	0.10	0.00	0.00	4.28	0.00	34.61	0.00	0.00	35.61
		Month Total:					**0.30**	**1.18**	**0.06**	**0.05**	**18.04**	**0.00**	**279.53**	**0.02**	**0.04**	**292.07**
Month 8	Aerial Lifts	63	0.31	16	24	8	0.00	0.03	0.00	0.00	0.06	0.00	9.67	0.00	0.00	10.29
Month 8	Air Compressors	78	0.48	8	24	8	0.06	0.08	0.00	0.00	4.88	0.00	24.84	0.00	0.00	25.44
Month 8	Concrete/Industrial Saws	81	0.73	3	24	8	0.02	0.04	0.00	0.00	1.99	0.00	20.53	0.00	0.00	20.89
Month 8	Cranes	231	0.29	3	24	8	0.00	0.04	0.00	0.00	0.02	0.00	5.42	0.00	0.00	5.78
Month 8	Excavators	158	0.38	7	24	8	0.01	0.05	0.00	0.00	0.11	0.00	17.20	0.00	0.00	18.06
Month 8	Forklifts	89	0.2	3	24	8	0.00	0.01	0.00	0.00	0.01	0.00	0.91	0.00	0.00	1.00
Month 8	Generator Sets	84	0.74	17	24	8	0.01	0.11	0.01	0.01	0.25	0.00	31.80	0.00	0.01	33.89
Month 8	Off-Highway Tractors	124	0.44	6	24	8	0.01	0.06	0.00	0.00	0.09	0.00	14.46	0.00	0.00	15.09
Month 8	Other General Industrial Equipment	88	0.34	15	24	8	0.02	0.15	0.01	0.01	0.13	0.00	15.60	0.00	0.00	16.51
Month 8	Rough Terrain Forklifts	100	0.4	13	24	8	0.01	0.08	0.00	0.00	0.14	0.00	20.41	0.00	0.00	21.42
Month 8	Skid Steer Loaders	65	0.37	5	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.43	0.00	0.00	4.67
Month 8	Welders	46	0.45	8	24	8	0.02	0.04	0.00	0.00	1.53	0.00	12.38	0.00	0.00	12.74
		Month Total:					**0.16**	**0.71**	**0.04**	**0.03**	**9.24**	**0.00**	**177.65**	**0.01**	**0.03**	**185.79**
Month 9	Aerial Lifts	63	0.31	4	24	8	0.00	0.01	0.00	0.00	0.02	0.00	2.53	0.00	0.00	2.70
Month 9	Air Compressors	78	0.48	5	24	8	0.04	0.06	0.00	0.00	3.22	0.00	16.36	0.00	0.00	16.76
Month 9	Concrete/Industrial Saws	81	0.73	1	24	8	0.00	0.01	0.00	0.00	0.40	0.00	4.16	0.00	0.00	4.23
Month 9	Cranes	231	0.29	2	24	8	0.00	0.03	0.00	0.00	0.01	0.00	4.06	0.00	0.00	4.32
Month 9	Excavators	158	0.38	2	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.49	0.00	0.00	3.66
Month 9	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.25
Month 9	Generator Sets	84	0.74	4	24	8	0.00	0.03	0.00	0.00	0.06	0.00	7.97	0.00	0.00	8.49
Month 9	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.62	0.00	0.00	3.78
Month 9	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 9	Rough Terrain Forklifts	100	0.4	3	24	8	0.00	0.02	0.00	0.00	0.03	0.00	5.12	0.00	0.00	5.37
Month 9	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	0.90	0.00	0.00	0.95
Month 9	Welders	46	0.45	4	24	8	0.01	0.02	0.00	0.00	0.73	0.00	5.87	0.00	0.00	6.04
		Month Total:					**0.06**	**0.20**	**0.01**	**0.01**	**4.53**	**0.00**	**54.31**	**0.00**	**0.01**	**56.56**

Marathon - Martinez
Renewable Fuels Project
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Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

							Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	**Avg HP**	**Load Factor**	**Number of Units**	**Number of Days**	**Hours/Day**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO2**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Month 10	Aerial Lifts	63	0.31	7	24	8	0.00	0.01	0.00	0.00	0.03	0.00	4.00	0.00	0.00	4.25
Month 10	Air Compressors	78	0.48	8	24	8	0.06	0.09	0.00	0.00	5.08	0.00	25.83	0.00	0.00	26.44
Month 10	Concrete/Industrial Saws	81	0.73	1	24	8	0.00	0.01	0.00	0.00	0.38	0.00	3.88	0.00	0.00	3.95
Month 10	Cranes	231	0.29	3	24	8	0.00	0.05	0.00	0.00	0.02	0.00	6.40	0.00	0.00	6.83
Month 10	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.25	0.00	0.00	3.42
Month 10	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.37
Month 10	Generator Sets	84	0.74	6	24	8	0.00	0.04	0.00	0.00	0.09	0.00	11.79	0.00	0.00	12.57
Month 10	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.04	0.00	5.36	0.00	0.00	5.60
Month 10	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 10	Rough Terrain Forklifts	100	0.4	5	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.57	0.00	0.00	7.94
Month 10	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	0.84	0.00	0.00	0.88
Month 10	Welders	46	0.45	9	24	8	0.02	0.04	0.00	0.00	1.77	0.00	14.29	0.00	0.00	14.70
		Month Total:					**0.10**	**0.30**	**0.01**	**0.01**	**7.47**	**0.00**	**83.55**	**0.01**	**0.01**	**86.96**
Month 11	Aerial Lifts	63	0.31	5	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.32	0.00	0.00	3.54
Month 11	Air Compressors	78	0.48	7	24	8	0.05	0.07	0.00	0.00	4.22	0.00	21.49	0.00	0.00	22.00
Month 11	Concrete/Industrial Saws	81	0.73	1	24	8	0.00	0.01	0.00	0.00	0.38	0.00	3.88	0.00	0.00	3.95
Month 11	Cranes	231	0.29	3	24	8	0.00	0.04	0.00	0.00	0.02	0.00	5.23	0.00	0.00	5.58
Month 11	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.25	0.00	0.00	3.42
Month 11	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.31
Month 11	Generator Sets	84	0.74	5	24	8	0.00	0.03	0.00	0.00	0.08	0.00	10.00	0.00	0.00	10.66
Month 11	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.55	0.00	0.00	4.75
Month 11	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 11	Rough Terrain Forklifts	100	0.4	4	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.42	0.00	0.00	6.74
Month 11	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	0.84	0.00	0.00	0.88
Month 11	Welders	46	0.45	9	24	8	0.02	0.04	0.00	0.00	1.83	0.00	14.76	0.00	0.00	15.19
		Month Total:					**0.09**	**0.26**	**0.01**	**0.01**	**6.65**	**0.00**	**74.04**	**0.00**	**0.01**	**77.03**
Month 12	Aerial Lifts	63	0.31	5	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.23	0.00	0.00	3.44
Month 12	Air Compressors	78	0.48	7	24	8	0.05	0.07	0.00	0.00	4.11	0.00	20.90	0.00	0.00	21.40
Month 12	Concrete/Industrial Saws	81	0.73	1	24	8	0.00	0.01	0.00	0.00	0.38	0.00	3.88	0.00	0.00	3.95
Month 12	Cranes	231	0.29	2	24	8	0.00	0.03	0.00	0.00	0.02	0.00	4.50	0.00	0.00	4.79
Month 12	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.25	0.00	0.00	3.42
Month 12	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.31
Month 12	Generator Sets	84	0.74	5	24	8	0.00	0.03	0.00	0.00	0.08	0.00	9.76	0.00	0.00	10.40
Month 12	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.44	0.00	0.00	4.63
Month 12	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 12	Rough Terrain Forklifts	100	0.4	4	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.26	0.00	0.00	6.57
Month 12	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	0.84	0.00	0.00	0.88
Month 12	Welders	46	0.45	9	24	8	0.02	0.04	0.00	0.00	1.69	0.00	13.65	0.00	0.00	14.05
		Month Total:					**0.09**	**0.25**	**0.01**	**0.01**	**6.38**	**0.00**	**70.99**	**0.00**	**0.01**	**73.85**

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

							Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 13	Aerial Lifts	63	0.31	8	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.64	0.00	0.00	4.94
Month 13	Air Compressors	78	0.48	7	24	8	0.05	0.07	0.00	0.00	4.03	0.00	20.50	0.00	0.00	20.99
Month 13	Concrete/Industrial Saws	81	0.73	1	24	8	0.01	0.01	0.00	0.00	0.48	0.00	4.99	0.00	0.00	5.08
Month 13	Cranes	231	0.29	2	24	8	0.00	0.03	0.00	0.00	0.02	0.00	4.30	0.00	0.00	4.59
Month 13	Excavators	158	0.38	2	24	8	0.00	0.01	0.00	0.00	0.03	0.00	4.18	0.00	0.00	4.39
Month 13	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.43
Month 13	Generator Sets	84	0.74	7	24	8	0.00	0.05	0.00	0.00	0.11	0.00	13.82	0.00	0.00	14.74
Month 13	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.29	0.00	0.00	6.56
Month 13	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 13	Rough Terrain Forklifts	100	0.4	5	24	8	0.00	0.03	0.00	0.00	0.06	0.00	8.87	0.00	0.00	9.31
Month 13	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	1.08	0.00	0.00	1.14
Month 13	Welders	46	0.45	8	24	8	0.02	0.04	0.00	0.00	1.63	0.00	13.18	0.00	0.00	13.56
		Month Total:					**0.09**	**0.29**	**0.01**	**0.01**	**6.43**	**0.00**	**82.25**	**0.01**	**0.01**	**85.73**
Month 14	Aerial Lifts	63	0.31	7	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.36	0.00	0.00	4.64
Month 14	Air Compressors	78	0.48	5	24	8	0.04	0.05	0.00	0.00	2.98	0.00	15.18	0.00	0.00	15.54
Month 14	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.01	0.00	0.00	0.32	0.00	3.33	0.00	0.00	3.39
Month 14	Cranes	231	0.29	2	24	8	0.00	0.02	0.00	0.00	0.01	0.00	3.08	0.00	0.00	3.28
Month 14	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	2.79	0.00	0.00	2.93
Month 14	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.39
Month 14	Generator Sets	84	0.74	7	24	8	0.00	0.04	0.00	0.00	0.10	0.00	12.60	0.00	0.00	13.44
Month 14	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.04	0.00	5.73	0.00	0.00	5.98
Month 14	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 14	Rough Terrain Forklifts	100	0.4	5	24	8	0.00	0.03	0.00	0.00	0.05	0.00	8.09	0.00	0.00	8.49
Month 14	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.76
Month 14	Welders	46	0.45	3	24	8	0.01	0.02	0.00	0.00	0.65	0.00	5.24	0.00	0.00	5.39
		Month Total:					**0.06**	**0.22**	**0.01**	**0.01**	**4.21**	**0.00**	**61.48**	**0.00**	**0.01**	**64.24**
Month 15	Aerial Lifts	63	0.31	6	24	8	0.00	0.01	0.00	0.00	0.02	0.00	3.60	0.00	0.00	3.83
Month 15	Air Compressors	78	0.48	3	24	8	0.02	0.03	0.00	0.00	1.78	0.00	9.07	0.00	0.00	9.29
Month 15	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.01	0.00	0.00	0.32	0.00	3.33	0.00	0.00	3.39
Month 15	Cranes	231	0.29	1	24	8	0.00	0.02	0.00	0.00	0.01	0.00	2.15	0.00	0.00	2.29
Month 15	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	2.79	0.00	0.00	2.93
Month 15	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.33
Month 15	Generator Sets	84	0.74	6	24	8	0.00	0.03	0.00	0.00	0.08	0.00	10.57	0.00	0.00	11.27
Month 15	Off-Highway Tractors	124	0.44	2	24	8	0.00	0.02	0.00	0.00	0.03	0.00	4.81	0.00	0.00	5.02
Month 15	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 15	Rough Terrain Forklifts	100	0.4	4	24	8	0.00	0.03	0.00	0.00	0.05	0.00	6.79	0.00	0.00	7.12
Month 15	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.76
Month 15	Welders	46	0.45	1	24	8	0.00	0.01	0.00	0.00	0.26	0.00	2.06	0.00	0.00	2.12
		Month Total:					**0.04**	**0.16**	**0.01**	**0.01**	**2.58**	**0.00**	**46.19**	**0.00**	**0.01**	**48.35**

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
							POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 16	Aerial Lifts	63	0.31	11	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.62	0.00	0.00	7.05
Month 16	Air Compressors	78	0.48	10	24	8	0.08	0.11	0.00	0.00	6.28	0.00	31.94	0.00	0.00	32.70
Month 16	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.03	0.00	0.28	0.00	0.00	0.28
Month 16	Cranes	231	0.29	4	24	8	0.01	0.06	0.00	0.00	0.03	0.00	7.92	0.00	0.00	8.44
Month 16	Excavators	158	0.38	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.24
Month 16	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.56
Month 16	Generator Sets	84	0.74	9	24	8	0.01	0.06	0.00	0.00	0.14	0.00	17.73	0.00	0.00	18.90
Month 16	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.03	0.00	0.00	0.05	0.00	8.06	0.00	0.00	8.41
Month 16	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 16	Rough Terrain Forklifts	100	0.4	7	24	8	0.00	0.04	0.00	0.00	0.08	0.00	11.38	0.00	0.00	11.94
Month 16	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.06
Month 16	Welders	46	0.45	9	24	8	0.02	0.04	0.00	0.00	1.69	0.00	13.65	0.00	0.00	14.05
		Month Total:					**0.12**	**0.37**	**0.01**	**0.01**	**8.34**	**0.00**	**98.37**	**0.01**	**0.01**	**102.64**
Month 17	Aerial Lifts	63	0.31	10	24	8	0.00	0.02	0.00	0.00	0.04	0.00	5.95	0.00	0.00	6.33
Month 17	Air Compressors	78	0.48	10	24	8	0.07	0.11	0.00	0.00	6.12	0.00	31.15	0.00	0.00	31.90
Month 17	Concrete/Industrial Saws	81	0.73	1	24	8	0.01	0.01	0.00	0.00	0.48	0.00	4.99	0.00	0.00	5.08
Month 17	Cranes	231	0.29	4	24	8	0.01	0.06	0.00	0.00	0.03	0.00	7.67	0.00	0.00	8.18
Month 17	Excavators	158	0.38	2	24	8	0.00	0.01	0.00	0.00	0.03	0.00	4.18	0.00	0.00	4.39
Month 17	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.54
Month 17	Generator Sets	84	0.74	9	24	8	0.01	0.06	0.00	0.00	0.14	0.00	17.32	0.00	0.00	18.46
Month 17	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.88	0.00	0.00	8.22
Month 17	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 17	Rough Terrain Forklifts	100	0.4	7	24	8	0.00	0.04	0.00	0.00	0.07	0.00	11.12	0.00	0.00	11.67
Month 17	Skid Steer Loaders	65	0.37	1	24	8	0.00	0.00	0.00	0.00	0.01	0.00	1.08	0.00	0.00	1.14
Month 17	Welders	46	0.45	11	24	8	0.03	0.05	0.00	0.00	2.06	0.00	16.67	0.00	0.00	17.15
		Month Total:					**0.13**	**0.39**	**0.01**	**0.01**	**9.03**	**0.00**	**108.50**	**0.01**	**0.01**	**113.07**
Month 18	Aerial Lifts	63	0.31	12	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.23	0.00	0.00	7.70
Month 18	Air Compressors	78	0.48	13	24	8	0.09	0.14	0.00	0.00	7.90	0.00	40.22	0.00	0.00	41.18
Month 18	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Cranes	231	0.29	5	24	8	0.01	0.07	0.00	0.00	0.04	0.00	9.72	0.00	0.00	10.37
Month 18	Excavators	158	0.38	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Forklifts	89	0.2	2	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.60
Month 18	Generator Sets	84	0.74	10	24	8	0.01	0.06	0.00	0.00	0.15	0.00	19.27	0.00	0.00	20.54
Month 18	Off-Highway Tractors	124	0.44	4	24	8	0.00	0.03	0.00	0.00	0.06	0.00	8.76	0.00	0.00	9.15
Month 18	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Rough Terrain Forklifts	100	0.4	8	24	8	0.00	0.05	0.00	0.00	0.08	0.00	12.37	0.00	0.00	12.98
Month 18	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Welders	46	0.45	17	24	8	0.05	0.08	0.00	0.00	3.38	0.00	27.31	0.00	0.00	28.10
		Month Total:					**0.16**	**0.46**	**0.02**	**0.01**	**11.66**	**0.00**	**125.43**	**0.01**	**0.02**	**130.63**

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

							Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 19	Aerial Lifts	63	0.31	11	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.44	0.00	0.00	6.85
Month 19	Air Compressors	78	0.48	11	24	8	0.08	0.12	0.00	0.00	6.78	0.00	34.50	0.00	0.00	35.33
Month 19	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Cranes	231	0.29	4	24	8	0.01	0.06	0.00	0.00	0.03	0.00	8.26	0.00	0.00	8.81
Month 19	Excavators	158	0.38	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.54
Month 19	Generator Sets	84	0.74	9	24	8	0.01	0.06	0.00	0.00	0.13	0.00	17.16	0.00	0.00	18.29
Month 19	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.80	0.00	0.00	8.14
Month 19	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Rough Terrain Forklifts	100	0.4	7	24	8	0.00	0.04	0.00	0.00	0.07	0.00	11.01	0.00	0.00	11.56
Month 19	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Welders	46	0.45	16	24	8	0.04	0.07	0.00	0.00	3.12	0.00	25.24	0.00	0.00	25.98
		Month Total:					**0.14**	**0.40**	**0.01**	**0.01**	**10.24**	**0.00**	**110.90**	**0.01**	**0.01**	**115.49**
Month 20	Aerial Lifts	63	0.31	13	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.90	0.00	0.00	8.41
Month 20	Air Compressors	78	0.48	11	24	8	0.08	0.11	0.00	0.00	6.51	0.00	33.12	0.00	0.00	33.91
Month 20	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Cranes	231	0.29	4	24	8	0.01	0.06	0.00	0.00	0.03	0.00	7.92	0.00	0.00	8.44
Month 20	Excavators	158	0.38	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Forklifts	89	0.2	2	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.66
Month 20	Generator Sets	84	0.74	11	24	8	0.01	0.07	0.01	0.00	0.17	0.00	21.06	0.00	0.00	22.45
Month 20	Off-Highway Tractors	124	0.44	4	24	8	0.00	0.04	0.00	0.00	0.06	0.00	9.58	0.00	0.00	10.00
Month 20	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Rough Terrain Forklifts	100	0.4	8	24	8	0.00	0.05	0.00	0.00	0.09	0.00	13.52	0.00	0.00	14.19
Month 20	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Welders	46	0.45	16	24	8	0.04	0.07	0.00	0.00	3.18	0.00	25.72	0.00	0.00	26.47
		Month Total:					**0.14**	**0.43**	**0.02**	**0.01**	**10.09**	**0.00**	**119.41**	**0.01**	**0.02**	**124.53**
Month 21	Aerial Lifts	63	0.31	10	24	8	0.00	0.02	0.00	0.00	0.04	0.00	6.16	0.00	0.00	6.56
Month 21	Air Compressors	78	0.48	7	24	8	0.05	0.08	0.00	0.00	4.46	0.00	22.67	0.00	0.00	23.21
Month 21	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.05	0.00	0.55	0.00	0.00	0.56
Month 21	Cranes	231	0.29	3	24	8	0.00	0.04	0.00	0.00	0.02	0.00	5.37	0.00	0.00	5.73
Month 21	Excavators	158	0.38	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.49
Month 21	Forklifts	89	0.2	1	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.52
Month 21	Generator Sets	84	0.74	9	24	8	0.01	0.05	0.00	0.00	0.13	0.00	16.59	0.00	0.00	17.68
Month 21	Off-Highway Tractors	124	0.44	3	24	8	0.00	0.03	0.00	0.00	0.05	0.00	7.54	0.00	0.00	7.87
Month 21	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 21	Rough Terrain Forklifts	100	0.4	7	24	8	0.00	0.04	0.00	0.00	0.07	0.00	10.65	0.00	0.00	11.18
Month 21	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.13
Month 21	Welders	46	0.45	11	24	8	0.03	0.05	0.00	0.00	2.16	0.00	17.46	0.00	0.00	17.97
		Month Total:					**0.10**	**0.32**	**0.01**	**0.01**	**6.99**	**0.00**	**88.06**	**0.01**	**0.01**	**91.91**

Table E.1-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
							POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Month 22	Aerial Lifts	63	0.31	3	24	8	0.00	0.01	0.00	0.00	0.01	0.00	2.10	0.00	0.00	2.24
Month 22	Air Compressors	78	0.48	0	24	8	0.00	0.00	0.00	0.00	0.12	0.00	0.59	0.00	0.00	0.61
Month 22	Concrete/Industrial Saws	81	0.73	0	24	8	0.00	0.00	0.00	0.00	0.19	0.00	1.94	0.00	0.00	1.98
Month 22	Cranes	231	0.29	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.16
Month 22	Excavators	158	0.38	1	24	8	0.00	0.01	0.00	0.00	0.01	0.00	1.63	0.00	0.00	1.71
Month 22	Forklifts	89	0.2	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.19
Month 22	Generator Sets	84	0.74	3	24	8	0.00	0.02	0.00	0.00	0.05	0.00	6.18	0.00	0.00	6.59
Month 22	Off-Highway Tractors	124	0.44	1	24	8	0.00	0.01	0.00	0.00	0.02	0.00	2.81	0.00	0.00	2.93
Month 22	Other General Industrial Equipment	88	0.34	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 22	Rough Terrain Forklifts	100	0.4	2	24	8	0.00	0.02	0.00	0.00	0.03	0.00	3.97	0.00	0.00	4.16
Month 22	Skid Steer Loaders	65	0.37	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.44
Month 22	Welders	46	0.45	0	24	8	0.00	0.00	0.00	0.00	0.06	0.00	0.48	0.00	0.00	0.49
		Month Total:					**0.01**	**0.07**	**0.00**	**0.00**	**0.49**	**0.00**	**20.44**	**0.00**	**0.00**	**21.50**
		Total Off-Road Emissions:					**3.01**	**10.57**	**0.47**	**0.42**	**197.29**	**0.03**	**2,655.30**	**0.17**	**0.36**	**2,770.53**

Notes:
1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/

3. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310
   2,000 pounds/ton
   0.45359 kilograms/pound)
   1,000 kilograms/metric ton

Table E.1-4. On-Road Construction Equipment - Daily Average Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Trips Per Day	Trip Length Two-Way	Round Trip Miles/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	189	1	20	20	0.07	0.30	2.00	0.31	4.90	0.02
Month 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	189	1	20	20	0.12	0.33	2.03	0.34	1.14	0.02
Month 1	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	7	1	11	11	0.04	0.84	0.15	0.02	0.53	0.00
Month 1	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	5	1	11	11	0.03	0.60	0.10	0.02	0.38	0.00
Month 1	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	1	9	9	0.06	1.23	0.19	0.03	0.85	0.00
				Daily Average Total:					**0.33**	**3.38**	**4.50**	**0.73**	**7.81**	**0.05**
Month 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	223	1	20	20	0.08	0.35	2.36	0.36	5.78	0.02
Month 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	223	1	20	20	0.15	0.39	2.39	0.40	1.34	0.03
Month 2	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	1	11	11	0.05	1.08	0.19	0.03	0.69	0.00
Month 2	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	7	1	11	11	0.04	0.84	0.15	0.02	0.53	0.00
Month 2	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	13	1	9	9	0.08	1.46	0.23	0.04	1.00	0.01
				Daily Average Total:					**0.40**	**4.20**	**5.35**	**0.86**	**9.36**	**0.06**
Month 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	317	1	20	20	0.11	0.50	3.35	0.52	8.22	0.04
Month 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	317	1	20	20	0.21	0.56	3.40	0.57	1.90	0.04
Month 3	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	12	1	11	11	0.07	1.44	0.25	0.04	0.92	0.01
Month 3	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	1	11	11	0.06	1.20	0.21	0.04	0.76	0.00
Month 3	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	19	1	9	9	0.11	2.07	0.32	0.05	1.42	0.01
				Daily Average Total:					**0.56**	**5.85**	**7.57**	**1.22**	**13.24**	**0.09**
Month 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	349	1	20	20	0.13	0.55	3.69	0.57	9.05	0.04
Month 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	349	1	20	20	0.23	0.61	3.74	0.62	2.10	0.04
Month 4	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	1	11	11	0.07	1.32	0.23	0.04	0.84	0.01
Month 4	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	4	1	11	11	0.02	0.48	0.08	0.01	0.31	0.00
Month 4	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	21	1	9	9	0.12	2.28	0.36	0.06	1.57	0.01
				Daily Average Total:					**0.56**	**5.32**	**8.14**	**1.31**	**13.87**	**0.09**
Month 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	584	1	20	20	0.21	0.91	6.18	0.95	15.14	0.06
Month 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	584	1	20	20	0.38	1.02	6.27	1.04	3.51	0.07
Month 5	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	4	1	11	11	0.02	0.48	0.08	0.01	0.31	0.00
Month 5	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	1	11	11	0.02	0.36	0.06	0.01	0.23	0.00
Month 5	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	35	1	9	9	0.20	3.83	0.60	0.10	2.63	0.01
				Daily Average Total:					**0.84**	**6.69**	**13.22**	**2.13**	**21.83**	**0.15**
Month 6	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	576	1	20	20	0.21	0.90	6.09	0.94	14.93	0.06
Month 6	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	576	1	20	20	0.38	1.01	6.18	1.03	3.46	0.07
Month 6	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	1	11	11	0.02	0.36	0.06	0.01	0.23	0.00
Month 6	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	1	11	11	0.01	0.24	0.04	0.01	0.15	0.00
Month 6	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 6	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	35	1	9	9	0.20	3.78	0.59	0.10	2.59	0.01
				Daily Average Total:					**0.81**	**6.37**	**13.00**	**2.09**	**21.38**	**0.15**

Table E.1-4. On-Road Construction Equipment - Daily Average Emissions

				EMFAC	Number of	Trips Per	Trip Length	Round Trip	Emissions (lb/day)					
	Category	Representative Equipment Model	Fuel	Category	Vehicles	Day	Two-Way	Miles/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 7	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	706	1	20	20	0.25	1.11	7.47	1.15	18.30	0.08
Month 7	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	706	1	20	20	0.46	1.24	7.57	1.26	4.24	0.08
Month 7	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	1	11	11	0.06	1.20	0.21	0.04	0.76	0.00
Month 7	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	6	1	11	11	0.04	0.72	0.13	0.02	0.46	0.00
Month 7	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 7	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	42	1	9	9	0.24	4.63	0.72	0.12	3.18	0.02
				Daily Average Total:					**1.06**	**8.97**	**16.13**	**2.60**	**26.96**	**0.18**
Month 8	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	501	1	20	20	0.18	0.78	5.30	0.82	12.99	0.06
Month 8	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	501	1	20	20	0.33	0.88	5.38	0.89	3.01	0.06
Month 8	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	1	11	11	0.07	1.32	0.23	0.04	0.84	0.01
Month 8	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	5	1	11	11	0.03	0.60	0.10	0.02	0.38	0.00
Month 8	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	1	9	9	0.00	0.08	0.03	0.01	0.01	0.00
Month 8	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	30	1	9	9	0.17	3.28	0.51	0.09	2.25	0.01
				Daily Average Total:					**0.78**	**6.95**	**11.55**	**1.86**	**19.49**	**0.13**
Month 9	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	126	1	20	20	0.05	0.20	1.33	0.21	3.27	0.01
Month 9	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	126	1	20	20	0.08	0.22	1.35	0.22	0.76	0.01
Month 9	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	1	11	11	0.02	0.36	0.06	0.01	0.23	0.00
Month 9	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	1	11	11	0.01	0.24	0.04	0.01	0.15	0.00
Month 9	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 9	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	8	1	9	9	0.04	0.82	0.13	0.02	0.56	0.00
				Daily Average Total:					**0.20**	**1.88**	**2.93**	**0.47**	**4.98**	**0.03**
Month 10	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	186	1	20	20	0.07	0.29	1.97	0.30	4.82	0.02
Month 10	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	186	1	20	20	0.12	0.33	2.00	0.33	1.12	0.02
Month 10	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	1	11	11	0.01	0.24	0.04	0.01	0.15	0.00
Month 10	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 10	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 10	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	1	9	9	0.06	1.22	0.19	0.03	0.84	0.00
				Daily Average Total:					**0.27**	**2.23**	**4.23**	**0.68**	**7.01**	**0.05**
Month 11	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	158	1	20	20	0.06	0.25	1.67	0.26	4.10	0.02
Month 11	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	158	1	20	20	0.10	0.28	1.70	0.28	0.95	0.02
Month 11	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	1	11	11	0.01	0.24	0.04	0.01	0.15	0.00
Month 11	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 11	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 11	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	1	9	9	0.05	1.03	0.16	0.03	0.71	0.00
				Daily Average Total:					**0.23**	**1.96**	**3.61**	**0.58**	**5.99**	**0.04**
Month 12	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	154	1	20	20	0.06	0.24	1.63	0.25	3.99	0.02
Month 12	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	154	1	20	20	0.10	0.27	1.65	0.27	0.93	0.02
Month 12	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 12	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 12	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 12	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	1	9	9	0.05	1.01	0.16	0.03	0.69	0.00
				Daily Average Total:					**0.22**	**1.80**	**3.50**	**0.56**	**5.77**	**0.04**

Table E.1-4. On-Road Construction Equipment - Daily Average Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Trips Per Day	Trip Length Two-Way	Round Trip Miles/Day	Emissions (lb/day)					
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 13	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	218	1	20	20	0.08	0.34	2.31	0.36	5.65	0.02
Month 13	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	218	1	20	20	0.14	0.38	2.34	0.39	1.31	0.03
Month 13	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 13	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	11	11	0.01	0.12	0.02	0.00	0.08	0.00
Month 13	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 13	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	13	1	9	9	0.07	1.43	0.22	0.04	0.98	0.01
				Daily Average Total:					**0.31**	**2.43**	**4.93**	**0.79**	**8.10**	**0.06**
Month 14	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	199	1	20	20	0.07	0.31	2.10	0.33	5.16	0.02
Month 14	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	199	1	20	20	0.13	0.35	2.14	0.36	1.20	0.02
Month 14	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 14	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 14	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 14	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	12	1	9	9	0.07	1.30	0.20	0.03	0.89	0.00
				Daily Average Total:					**0.27**	**2.00**	**4.46**	**0.72**	**7.26**	**0.05**
Month 15	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	167	1	20	20	0.06	0.26	1.77	0.27	4.33	0.02
Month 15	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	167	1	20	20	0.11	0.29	1.79	0.30	1.00	0.02
Month 15	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 15	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 15	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 15	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	1	9	9	0.06	1.09	0.17	0.03	0.75	0.00
				Daily Average Total:					**0.23**	**1.68**	**3.75**	**0.60**	**6.09**	**0.04**
Month 16	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	280	1	20	20	0.10	0.44	2.96	0.46	7.26	0.03
Month 16	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	280	1	20	20	0.18	0.49	3.00	0.50	1.68	0.03
Month 16	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 16	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 16	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 16	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	17	1	9	9	0.10	1.83	0.29	0.05	1.26	0.01
				Daily Average Total:					**0.38**	**2.80**	**6.27**	**1.01**	**10.21**	**0.07**
Month 17	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	273	1	20	20	0.10	0.43	2.89	0.45	7.08	0.03
Month 17	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	273	1	20	20	0.18	0.48	2.93	0.49	1.64	0.03
Month 17	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 17	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 17	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 17	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	1	9	9	0.09	1.79	0.28	0.05	1.23	0.01
				Daily Average Total:					**0.37**	**2.73**	**6.11**	**0.98**	**9.95**	**0.07**
Month 18	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	304	1	20	20	0.11	0.48	3.21	0.50	7.88	0.03
Month 18	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	304	1	20	20	0.20	0.53	3.26	0.54	1.83	0.04
Month 18	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 18	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 18	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 18	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	18	1	9	9	0.10	1.99	0.31	0.05	1.37	0.01
				Daily Average Total:					**0.41**	**3.04**	**6.80**	**1.09**	**11.08**	**0.08**

Table E.1-4. On-Road Construction Equipment - Daily Average Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Trips Per Day	Trip Length Two-Way	Round Trip Miles/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Month 19	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	271	1	20	20	0.10	0.42	2.87	0.44	7.03	0.03
Month 19	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	271	1	20	20	0.18	0.48	2.91	0.48	1.63	0.03
Month 19	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 19	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 19	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 19	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	1	9	9	0.09	1.77	0.28	0.05	1.22	0.01
				Daily Average Total:					**0.37**	**2.71**	**6.07**	**0.98**	**9.88**	**0.07**
Month 20	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	332	1	20	20	0.12	0.52	3.51	0.54	8.61	0.04
Month 20	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	332	1	20	20	0.22	0.58	3.56	0.59	2.00	0.04
Month 20	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 20	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 20	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 20	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	20	1	9	9	0.11	2.17	0.34	0.06	1.49	0.01
				Daily Average Total:					**0.45**	**3.31**	**7.43**	**1.19**	**12.10**	**0.08**
Month 21	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	262	1	20	20	0.09	0.41	2.77	0.43	6.79	0.03
Month 21	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	262	1	20	20	0.17	0.46	2.81	0.47	1.57	0.03
Month 21	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 21	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 21	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 21	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	1	9	9	0.09	1.71	0.27	0.05	1.18	0.01
				Daily Average Total:					**0.36**	**2.62**	**5.87**	**0.94**	**9.55**	**0.07**
Month 22	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	98	1	20	20	0.04	0.15	1.04	0.16	2.54	0.01
Month 22	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	98	1	20	20	0.06	0.17	1.05	0.17	0.59	0.01
Month 22	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 22	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	1	11	11	-	-	-	-	-	-
Month 22	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	1	9	9	0.00	0.04	0.02	0.00	0.01	0.00
Month 22	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	6	1	9	9	0.03	0.64	0.10	0.02	0.44	0.00
				Daily Average Total:					**0.13**	**1.00**	**2.20**	**0.35**	**3.57**	**0.02**
				Daily Average					**0.43**	**3.63**	**6.71**	**1.08**	**11.16**	**0.08**

Notes:
1. Average daily emissions are based on the equipment list and estimated trip distances provided by the facility.

2. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

Table E.1-5. On-Road Construction Equipment - Total Construction Emissions

				EMFAC	Number of	Total Project	Trip Length	Round Trip	Criteria Pollutant Emissions (Ton/Month)						GHG Emissions (MT/Month)			
	Category	**Representative Equipment Model**	**Fuel**	**Category**	**Vehicles**	**Trips**	**Two-Way**	**Miles/Project**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Month 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	189	24	20	480	0.00	0.00	0.02	0.00	0.06	0.00	23.11	0.00	0.00	23.23
Month 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	189	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	25.10	0.00	0.00	26.33
Month 1	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	7	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	3.68	0.00	0.00	3.86
Month 1	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	5	24	11	264	0.00	0.01	0.00	0.00	0.00	0.00	2.63	0.00	0.00	2.76
Month 1	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	5.14	0.00	0.00	5.39
				Month Total:					**0.00**	**0.04**	**0.05**	**0.01**	**0.09**	**0.00**	**60.11**	**0.00**	**0.01**	**62.03**
Month 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	223	24	20	480	0.00	0.00	0.03	0.00	0.07	0.00	27.27	0.00	0.00	27.41
Month 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	223	24	20	480	0.00	0.00	0.03	0.00	0.02	0.00	29.62	0.00	0.00	31.06
Month 2	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	4.74	0.00	0.00	4.97
Month 2	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	7	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	3.68	0.00	0.00	3.86
Month 2	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	13	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	6.08	0.00	0.00	6.38
				Month Total:					**0.00**	**0.05**	**0.06**	**0.01**	**0.11**	**0.00**	**71.83**	**0.00**	**0.01**	**74.15**
Month 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	317	24	20	480	0.00	0.01	0.04	0.01	0.10	0.00	38.76	0.00	0.00	38.97
Month 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	317	24	20	480	0.00	0.01	0.04	0.01	0.02	0.00	42.10	0.00	0.01	44.15
Month 3	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	12	24	11	264	0.00	0.02	0.00	0.00	0.01	0.00	6.31	0.00	0.00	6.62
Month 3	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	5.26	0.00	0.00	5.52
Month 3	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	19	24	9	216	0.00	0.02	0.00	0.00	0.02	0.00	8.63	0.00	0.00	9.05
				Month Total:					**0.01**	**0.07**	**0.09**	**0.01**	**0.16**	**0.00**	**101.51**	**0.00**	**0.01**	**104.78**
Month 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	349	24	20	480	0.00	0.01	0.04	0.01	0.11	0.00	42.67	0.00	0.00	42.90
Month 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	349	24	20	480	0.00	0.01	0.04	0.01	0.03	0.00	46.35	0.00	0.01	48.61
Month 4	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	24	11	264	0.00	0.02	0.00	0.00	0.01	0.00	5.79	0.00	0.00	6.07
Month 4	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	4	24	11	264	0.00	0.01	0.00	0.00	0.00	0.00	2.10	0.00	0.00	2.21
Month 4	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	21	24	9	216	0.00	0.03	0.00	0.00	0.02	0.00	9.51	0.00	0.00	9.97
				Month Total:					**0.01**	**0.06**	**0.10**	**0.02**	**0.17**	**0.00**	**106.87**	**0.00**	**0.01**	**110.22**
Month 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	584	24	20	480	0.00	0.01	0.07	0.01	0.18	0.00	71.41	0.00	0.00	71.79
Month 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	584	24	20	480	0.00	0.01	0.08	0.01	0.04	0.00	77.56	0.00	0.01	81.34
Month 5	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	4	24	11	264	0.00	0.01	0.00	0.00	0.00	0.00	2.10	0.00	0.00	2.21
Month 5	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.00	1.66
Month 5	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	35	24	9	216	0.00	0.05	0.01	0.00	0.03	0.00	15.94	0.00	0.00	16.71
				Month Total:					**0.01**	**0.08**	**0.16**	**0.03**	**0.26**	**0.00**	**169.03**	**0.00**	**0.02**	**174.17**
Month 6	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	576	24	20	480	0.00	0.01	0.07	0.01	0.18	0.00	70.43	0.00	0.00	70.80
Month 6	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	576	24	20	480	0.00	0.01	0.07	0.01	0.04	0.00	76.50	0.00	0.01	80.23
Month 6	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.00	1.66
Month 6	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	0.00	1.10
Month 6	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 6	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	35	24	9	216	0.00	0.05	0.01	0.00	0.03	0.00	15.73	0.00	0.00	16.49
				Month Total:					**0.01**	**0.08**	**0.16**	**0.03**	**0.26**	**0.00**	**165.73**	**0.00**	**0.02**	**170.75**
Month 7	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	706	24	20	480	0.00	0.01	0.09	0.01	0.22	0.00	86.33	0.00	0.00	86.78
Month 7	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	706	24	20	480	0.01	0.01	0.09	0.02	0.05	0.00	93.76	0.00	0.01	98.34
Month 7	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	5.26	0.00	0.00	5.52
Month 7	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	6	24	11	264	0.00	0.01	0.00	0.00	0.01	0.00	3.16	0.00	0.00	3.31
Month 7	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 7	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	42	24	9	216	0.00	0.06	0.01	0.00	0.04	0.00	19.26	0.00	0.00	20.20
				Month Total:					**0.01**	**0.11**	**0.19**	**0.03**	**0.32**	**0.00**	**208.21**	**0.00**	**0.02**	**214.61**

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Table E.1-5. On-Road Construction Equipment - Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Month) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	GHG Emissions (MT/Month) CO_2	CH_4	N_2O	CO_2e
Month 8	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	501	24	20	480	0.00	0.01	0.06	0.01	0.16	0.00	61.26	0.00	0.00	61.58
Month 8	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	501	24	20	480	0.00	0.01	0.06	0.01	0.04	0.00	66.54	0.00	0.01	69.78
Month 8	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	24	11	264	0.00	0.02	0.00	0.00	0.01	0.00	5.79	0.00	0.00	6.07
Month 8	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	5	24	11	264	0.00	0.01	0.00	0.00	0.00	0.00	2.63	0.00	0.00	2.76
Month 8	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	2	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00	0.46
Month 8	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	30	24	9	216	0.00	0.04	0.01	0.00	0.03	0.00	13.66	0.00	0.00	14.33
				Month Total:					**0.01**	**0.08**	**0.14**	**0.02**	**0.23**	**0.00**	**150.32**	**0.00**	**0.02**	**154.99**
Month 9	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	126	24	20	480	0.00	0.00	0.02	0.00	0.04	0.00	15.41	0.00	0.00	15.49
Month 9	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	126	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	16.73	0.00	0.00	17.55
Month 9	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	3	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.58	0.00	0.00	1.66
Month 9	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	0.00	1.10
Month 9	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 9	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	8	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	3.42	0.00	0.00	3.59
				Month Total:					**0.00**	**0.02**	**0.04**	**0.01**	**0.06**	**0.00**	**38.42**	**0.00**	**0.00**	**39.62**
Month 10	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	186	24	20	480	0.00	0.00	0.02	0.00	0.06	0.00	22.74	0.00	0.00	22.86
Month 10	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	186	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	24.70	0.00	0.00	25.91
Month 10	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	0.00	1.10
Month 10	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 10	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 10	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	11	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	5.07	0.00	0.00	5.31
				Month Total:					**0.00**	**0.03**	**0.05**	**0.01**	**0.08**	**0.00**	**54.31**	**0.00**	**0.01**	**55.97**
Month 11	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	158	24	20	480	0.00	0.00	0.02	0.00	0.05	0.00	19.32	0.00	0.00	19.42
Month 11	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	158	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	20.98	0.00	0.00	22.01
Month 11	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	0.00	1.10
Month 11	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 11	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 11	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	4.30	0.00	0.00	4.51
				Month Total:					**0.00**	**0.02**	**0.04**	**0.01**	**0.07**	**0.00**	**46.40**	**0.00**	**0.00**	**47.83**
Month 12	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	154	24	20	480	0.00	0.00	0.02	0.00	0.05	0.00	18.83	0.00	0.00	18.93
Month 12	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	154	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	20.45	0.00	0.00	21.45
Month 12	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 12	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 12	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 12	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	9	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	4.19	0.00	0.00	4.40
				Month Total:					**0.00**	**0.02**	**0.04**	**0.01**	**0.07**	**0.00**	**44.75**	**0.00**	**0.00**	**46.11**
Month 13	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	218	24	20	480	0.00	0.00	0.03	0.00	0.07	0.00	26.66	0.00	0.00	26.80
Month 13	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	218	24	20	480	0.00	0.00	0.03	0.00	0.02	0.00	28.95	0.00	0.00	30.36
Month 13	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 13	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.55
Month 13	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 13	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	13	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	5.94	0.00	0.00	6.23
				Month Total:					**0.00**	**0.03**	**0.06**	**0.01**	**0.10**	**0.00**	**62.82**	**0.00**	**0.01**	**64.73**
Month 14	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	199	24	20	480	0.00	0.00	0.03	0.00	0.06	0.00	24.33	0.00	0.00	24.46
Month 14	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	199	24	20	480	0.00	0.00	0.03	0.00	0.01	0.00	26.43	0.00	0.00	27.72
Month 14	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 14	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 14	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 14	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	12	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	5.42	0.00	0.00	5.68
				Month Total:					**0.00**	**0.02**	**0.05**	**0.01**	**0.09**	**0.00**	**56.40**	**0.00**	**0.01**	**58.09**

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Table E.1-5. On-Road Construction Equipment - Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Month)						GHG Emissions (MT/Month)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
Month 15	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	167	24	20	480	0.00	0.00	0.02	0.00	0.05	0.00	20.42	0.00	0.00	20.53
Month 15	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	167	24	20	480	0.00	0.00	0.02	0.00	0.01	0.00	22.18	0.00	0.00	23.26
Month 15	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 15	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 15	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 15	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	10	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	4.54	0.00	0.00	4.77
				Month Total:					**0.00**	**0.02**	**0.04**	**0.01**	**0.07**	**0.00**	**47.36**	**0.00**	**0.00**	**48.79**
Month 16	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	280	24	20	480	0.00	0.01	0.04	0.01	0.09	0.00	34.24	0.00	0.00	34.42
Month 16	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	280	24	20	480	0.00	0.01	0.04	0.01	0.02	0.00	37.19	0.00	0.01	39.00
Month 16	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 16	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 16	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 16	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	17	24	9	216	0.00	0.02	0.00	0.00	0.02	0.00	7.62	0.00	0.00	7.99
				Month Total:					**0.00**	**0.03**	**0.08**	**0.01**	**0.12**	**0.00**	**79.26**	**0.00**	**0.01**	**81.64**
Month 17	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	273	24	20	480	0.00	0.01	0.03	0.01	0.08	0.00	33.38	0.00	0.00	33.56
Month 17	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	273	24	20	480	0.00	0.01	0.04	0.01	0.02	0.00	36.26	0.00	0.01	38.03
Month 17	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 17	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 17	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 17	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	7.44	0.00	0.00	7.81
				Month Total:					**0.00**	**0.03**	**0.07**	**0.01**	**0.12**	**0.00**	**77.30**	**0.00**	**0.01**	**79.62**
Month 18	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	304	24	20	480	0.00	0.01	0.04	0.01	0.09	0.00	37.17	0.00	0.00	37.37
Month 18	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	304	24	20	480	0.00	0.01	0.04	0.01	0.02	0.00	40.37	0.00	0.01	42.34
Month 18	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 18	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 18	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	18	24	9	216	0.00	0.02	0.00	0.00	0.02	0.00	8.28	0.00	0.00	8.69
				Month Total:					**0.00**	**0.04**	**0.08**	**0.01**	**0.13**	**0.00**	**86.05**	**0.00**	**0.01**	**88.63**
Month 19	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	271	24	20	480	0.00	0.01	0.03	0.01	0.08	0.00	33.14	0.00	0.00	33.31
Month 19	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	271	24	20	480	0.00	0.01	0.03	0.01	0.02	0.00	35.99	0.00	0.01	37.75
Month 19	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 19	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 19	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	7.37	0.00	0.00	7.73
				Month Total:					**0.00**	**0.03**	**0.07**	**0.01**	**0.12**	**0.00**	**76.72**	**0.00**	**0.01**	**79.02**
Month 20	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	332	24	20	480	0.00	0.01	0.04	0.01	0.10	0.00	40.59	0.00	0.00	40.81
Month 20	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	332	24	20	480	0.00	0.01	0.04	0.01	0.02	0.00	44.09	0.00	0.01	46.24
Month 20	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 20	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 20	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	20	24	9	216	0.00	0.03	0.00	0.00	0.02	0.00	9.05	0.00	0.00	9.49
				Month Total:					**0.01**	**0.04**	**0.09**	**0.01**	**0.15**	**0.00**	**93.96**	**0.00**	**0.01**	**96.78**
Month 21	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	262	24	20	480	0.00	0.00	0.03	0.01	0.08	0.00	32.04	0.00	0.00	32.21
Month 21	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	262	24	20	480	0.00	0.01	0.03	0.01	0.02	0.00	34.80	0.00	0.01	36.49
Month 21	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 21	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 21	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 21	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	16	24	9	216	0.00	0.02	0.00	0.00	0.01	0.00	7.13	0.00	0.00	7.48
				Month Total:					**0.00**	**0.03**	**0.07**	**0.01**	**0.11**	**0.00**	**74.18**	**0.00**	**0.01**	**76.41**

Table E.1-5. On-Road Construction Equipment - Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Month)						GHG Emissions (MT/Month)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
Month 22	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	98	24	20	480	0.00	0.00	0.01	0.00	0.03	0.00	11.98	0.00	0.00	12.05
Month 22	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	98	24	20	480	0.00	0.00	0.01	0.00	0.01	0.00	13.02	0.00	0.00	13.65
Month 22	Cement Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 22	Dump Truck	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	24	11	264	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Month 22	Water Truck	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.23
Month 22	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	6	24	9	216	0.00	0.01	0.00	0.00	0.01	0.00	2.66	0.00	0.00	2.79
				Month Total:					**0.00**	**0.01**	**0.03**	**0.00**	**0.04**	**0.00**	**27.88**	**0.00**	**0.00**	**28.71**
				Total On-Road Emissions:					**0.11**	**0.96**	**1.77**	**0.29**	**2.95**	**0.02**	**1,899.42**	**0.01**	**0.19**	**1,957.67**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton
   - 88 week construction period
   - 6 construction work days/week

Table E.1-6 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors		Activity Indicator		Emissions (Tons)	
	PM_{10}	$PM_{2.5}$			PM_{10}	$PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	1.7 miles	2.40 acres	0.00	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	2,160 hours	Excavators	0.81	0.45
Material Handling	8.93E-05 lb/ton	1.35E-05 lb/ton	1,405 tons		0.00	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	4,173 tons		0.00	0.00
Total Emissions (Tons)					0.82	0.45
Average Daily Emissions (Pounds/Day)					3.09	1.69

Notes:

1. Average daily emissions are calculated by assuming:
   88 week construction period
   6 construction work days/week

2. Miles traveled for site grading is based on the analytical approach suggested in *California Emissions Estimator Model User's* Guide (Version 2011.1) (CalEEMod User's Guide), ENVIRON International Corporation (for South Coast Air Quality Management District), February 2011, Appendix A (Calculation Details for CalEEMod), Section 4.3 (Dust from Material Movement).

   Grading miles are calculated as As/Wb × 43,560 square feet/acre ÷ 5,280 ft/mile,
   where As = acres to be graded and Wb =blade width (feet),
   assumed in the CalEEMod Version 2011.1.1 program to be 12 feet (based on a Caterpillar 140 motor grader).

3. Bulldozer hours estimate assumes the use of three excavators over a 90-day period.

4. Construction material handling as estimated by the facility.

5. Conversion factors:
   43,560 square feet/acre
   5,280 feet/mile
   12 feet grader blade width
   0.046 ton of construction debris per square foot (CalEEMod User's Guide, Appendix A)
   2,000 pounds/ton

Table E.1-6 Material Movement Emissions

Grading Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.6	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.031	--
Mean vehicle speed	EPA AP-42 Table 11.9-1	S	7.1	miles/hour
Grading		PM_{10}:	1.543	lb/mile
		$PM_{2.5}$:	0.167	lb/mile

$$Ef_{PM_{10}} = k \times 0.051 \times (S)^{2.0}$$

$$Ef_{PM_{2.5}} = k \times 0.040 \times (S)^{2.5}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.

Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and S.

Bulldozing Emission Factors

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.75	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.105	--
Silt content (overburden)	EPA AP-42 Table 11.9-1	s	6.9	%
Moisture content (overburden)	EPA AP-42 Table 11.9-1	M	7.9	%
Bulldozing		PM_{10}:	0.753	lb/hour
		$PM_{2.5}$:	0.414	lb/hour

$$Ef_{PM_{10}} = k \times \frac{1.0 \times (s)^{1.5}}{(M)^{1.4}}$$

$$Ef_{PM_{2.5}} = k \times \frac{5.7 \times (s)^{1.2}}{(M)^{1.3}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.

Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and the AP-42 default values for overburden are used for s and M.

Table E.1-6 Material Movement Emissions

Material Handling (Truck Loading/Unloading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	4.92	miles/hour
Moisture content (cover)	EPA AP-42 Table 13.2.4-1	M	12	%
Material Handling		PM_{10}:	8.93E-05	lb/ton
		$PM_{2.5}$:	1.35E-05	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 values are used for k and the AP-42 default value for municipal solid waste landfill cover is used for M.
Per CalEEMod User's Guide, Appendix D (Default Data Tables), Table 1.1 (Weather Data), a mean wind speed of 2.2 meters/second (m/s) is used for Contra Costa County.
Conversion factors to convert m/s to miles/hour: 2.2 m/s
1,609.3 meters/mile
60 seconds/minute
60 minutes/hour

Demolition Debris Handling (Mechanical Dismemberment/Truck Loading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	5.00	miles/hour
Moisture content	EPA AP-42 Table 13.2.4-1	M	2	%
Demolition Debris Handling		PM_{10}:	1.12E-03	lb/ton
		$PM_{2.5}$:	1.70E-04	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
The CalEEMod User's Guide, Appendix A, Section 4.4 recommends the AP-42 equation be used for mechanical dismemberment, using the default wind speed of 5 miles/hour and a moisture content of 2 percent.
AP-42 Section 13.2.3 (Heavy Construction Operations) Table 13.2.3-1 (Recommended Emission Factors for Construction Operations) also recommends the emission equation from AP-42 Section 13.2.4 be used for loading of construction debris into trucks.

Table E.1-7 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Access Road			
Total Emissions (Tons)	1.80 acres	2.62 lb/acre	0.002
Average Daily Emissions (Pounds/Day)			0.009

Notes:
1. Source for the ROG emission factor: CalEEMod User's Guide, Appendix A, Section 4.8 (Asphalt Paving Off-Gassing Emissions).
2. Average daily emissions are calculated by assuming:
   88 week construction period
   6 construction work days/week

3. Conversion factors:
   2,000 pounds/ton
   43,560 square feet/acre
   5,280 feet/mile

Table E.1-8 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Primer	4952	200 grams/liter	1668.91 lb/gallon	4.13
Final Coat	3798	250 grams/liter	2086.14 lb/gallon	3.96
Total Emissions (Tons)	**8,750 gallons**			**8.09**
Average Daily Emissions (Pounds/Day)				**30.66**

Notes:
1. Source for VOC coating limits: BAAQMD Rule 8-3, Table 1.

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. Average daily emissions are calculated by assuming:
88 week construction period
6 construction work days/week

4. Conversion factors:
2,000 pounds/ton

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Table E.1-9 Off-Road Engine Emissions Factors for BAAQMD

			Emission Factors													
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Aerial Lifts	63	Diesel	0.000061	0.000074	0.000088	0.002152	0.001130	0.358670	0.000024	0.000022	0.000024	0.000003	0.000003	0.000035	0.000072	lb/hp-hr
Air Compressors	78	Diesel	0.002246	0.002066	0.002472	0.172463	0.002988	0.967385	0.000067	0.000050	0.000074	0.000012	0.000017	0.000035	0.000072	lb/hp-hr
Concrete/Industrial Saws	81	Diesel	0.001571	0.001445	0.001729	0.118193	0.002499	1.347028	0.000093	0.000070	0.000103	0.000016	0.000020	0.000035	0.000072	lb/hp-hr
Cranes	231	Diesel	0.000164	0.000198	0.000236	0.001120	0.002191	0.335003	0.000091	0.000084	0.000091	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Excavators	158	Diesel	0.000126	0.000153	0.000182	0.002593	0.001264	0.444577	0.000062	0.000057	0.000062	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Forklifts	89	Diesel	0.000117	0.000142	0.000169	0.001611	0.001332	0.233562	0.000082	0.000076	0.000082	0.000002	0.000002	0.000035	0.000072	lb/hp-hr
Generator Sets	84	Diesel	0.000086	0.000104	0.000123	0.002505	0.001056	0.352083	0.000082	0.000075	0.000082	0.000003	0.000003	0.000035	0.000072	lb/hp-hr
Off-Highway Tractors	124	Diesel	0.000162	0.000196	0.000234	0.003020	0.001759	0.506598	0.000084	0.000078	0.000084	0.000005	0.000004	0.000033	0.000070	lb/hp-hr
Other General Industrial Equipment	88	Diesel	0.000364	0.000440	0.000524	0.002978	0.003582	0.399162	0.000280	0.000258	0.000280	0.000004	0.000003	0.000035	0.000072	lb/hp-hr
Rough Terrain Forklifts	100	Diesel	0.000093	0.000112	0.000134	0.002852	0.001642	0.468280	0.000041	0.000038	0.000041	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Skid Steer Loaders	65	Diesel	0.000103	0.000124	0.000148	0.002648	0.001658	0.428923	0.000056	0.000052	0.000056	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Welders	46	Diesel	0.001470	0.001352	0.001618	0.098755	0.002295	0.880660	0.000061	0.000046	0.000067	0.000011	0.000014	0.000038	0.000080	lb/hp-hr

Notes:

1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
   Region: Bay Area AQMD
   Calendar Year: 2022, 2023, and 2024
   Scenario: All Adopted Rules - Exhaust
   Vehicle Classification: OFFROAD2017 Equipment Types
   Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	**N2O (g/gallon)**	**CH4 (g/gallon)**
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Table E.1-10 On-Road Motor Vehicle Emissions Factors for BAAQMD

						Emission Factors									
Exhaust Source	**Vehicle Class**	**Fuel**	**EMFAC Category**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00005	0.00345	0.00188	0.00030	0.00029	0.00002	2.11322	0.00000	0.00033
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00682	0.00000	0.00000	0.00454	0.00001	1.33939	0.00001	0.00021
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00010	0.00553	0.00190	0.00032	0.00062	0.00003	3.26886	0.00000	0.00051
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00482	0.05958	0.00003	0.00002	0.06949	0.00012	12.37961	0.00022	0.00195
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00009	0.00054	0.00009	0.00030	0.00001	0.60998	0.00000	0.00010
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00130	0.00001	0.56160	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		

Paved Road Dust Entrainment

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Table E.2-1a. Average Daily Construction Emissions Summary.

Avon Marine Oil Terminal

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	0.31	0.00	3.39	0.07	0.01	0.01	NA			
On-road Motor Vehicles	0.10	0.00	0.16	0.01	0.08	0.01	NA			
Fugitive PM from Material Movement					0.00	0.00	NA			
Asphalt Paving Offgassing				0.00			NA			
Architectural Coating Offgassing				0.87			NA			
Average Daily Onsite Emissions (lb/day)	**0.41**	**0.00**	**3.55**	**0.94**	**0.09**	**0.02**	NA			
Significance Threshold:	54.00	NA	NA	54.00	82.00	54.00	NA			
Threshold Exceeded?	No	No	No	No	No	No				

Table E.2-1b. Total Construction Emissions Summary.

Avon Marine Oil Terminal

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	0.04	0.00	0.22	0.01	0.00	0.00	6.96	0.00	0.00	7.37
On-road Motor Vehicles	0.02	0.00	0.03	0.00	0.01	0.00	17.98	0.00	0.00	18.61
Fugitive PM from Material Movement					0.00	0.00				
Asphalt Paving Offgassing				0.00						
Architectural Coating Offgassing				0.01						
Total Construction Emissions	**0.06**	**0.00**	**0.25**	**0.02**	**0.02**	**0.00**	**24.94**	**0.00**	**0.00**	**25.97**
Significance Threshold:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1. Project construction at Avon may take ~ 12 months.
2. BAAQMD CEQA Guidelines define thresholds of significance for construction-related emissions on a daily average basis (See Table 2-4). No annual threshold exists.
3. BAAQMD CEQA Guidelines (Section 2.6.2) have not defined a GHG threshold of significance for construction related emissions.
4. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.2-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
							POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Task 1	Cranes	Cranes	231	0.29	1	8	0.11	1.17	0.05	0.05	0.60	0.00
Task 1	Welders	Welders	46	0.45	0	8	--	--	--	--	--	--
			Daily Average Total:				**0.11**	**1.17**	**0.05**	**0.05**	**0.60**	**0.00**
Task 2	Cranes	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 2	Welders	Welders	46	0.45	1	8	0.22	0.38	0.01	0.01	16.35	0.00
			Daily Average Total:				**0.22**	**0.38**	**0.01**	**0.01**	**16.35**	**0.00**
Task 3	Cranes	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 3	Welders	Welders	46	0.45	0	8	--	--	--	--	--	--
			Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
Task 4	Cranes	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 4	Welders	Welders	46	0.45	0	8	--	--	--	--	--	--
			Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
Task 5	Cranes	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 5	Welders	Welders	46	0.45	0	8	--	--	--	--	--	--
			Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
			Daily Average				**0.07**	**0.31**	**0.01**	**0.01**	**3.39**	**0.00**

Notes:
1. Average daily emissions are based on the estimated project schedule and associated equipment needs.
2. Source for equipment load factors and HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
3. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/
4. Project tasks have been identified as follows:

Task Code	Task Description
Task 1	Scaffolding
Task 2	Mechanical
Task 3	Coating
Task 4	Heat Tracing
Task 5	Insulation

Table E.2-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

								Criteria Pollutant Emissions (Ton/month)						GHG Emissions (MT/month)			
	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Task 1	Cranes	Cranes	231	0.29	1	66	8	0.00	0.04	0.00	0.00	0.02	0.00	5.37	0.00	0.00	5.73
Task 1	Welders	Welders	46	0.45	0	66	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Task Total:					**0.00**	**0.04**	**0.00**	**0.00**	**0.02**	**0.00**	**5.37**	**0.00**	**0.00**	**5.73**
Task 2	Cranes	Cranes	231	0.29	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 2	Welders	Welders	46	0.45	1	24	8	0.00	0.00	0.00	0.00	0.20	0.00	1.59	0.00	0.00	1.63
			Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.00**	**1.59**	**0.00**	**0.00**	**1.63**
Task 3	Cranes	Cranes	231	0.29	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 3	Welders	Welders	46	0.45	0	24	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Task 4	Cranes	Cranes	231	0.29	0	102	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 4	Welders	Welders	46	0.45	0	102	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Task 5	Cranes	Cranes	231	0.29	0	114	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 5	Welders	Welders	46	0.45	0	114	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
			Total Off-Road Emissions:					**0.01**	**0.04**	**0.0017**	**0.00**	**0.22**	**0.00**	**6.96**	**0.00**	**0.00**	**7.37**

Notes:

1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).

2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/

3. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton

Table E.2-4. On-Road Construction Equipment - Daily Average Emissions

									Emissions (lb/day)					
	Category	**Representative Equipment Model**	**Fuel**	**EMFAC Category**	**Number of Vehicles**	**Trips Per Day**	**Trip Length Two-Way**	**Round Trip Miles/Day**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**
Task 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	4	1	20	20	0.00	0.01	0.04	0.01	0.10	0.00
Task 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	4	1	20	20	0.00	0.01	0.04	0.01	0.02	0.00
Task 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.10**	**0.02**	**0.20**	**0.00**
Task 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
Task 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	2	1	20	20	0.00	0.00	0.02	0.00	0.05	0.00
Task 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	2	1	20	20	0.00	0.00	0.02	0.00	0.01	0.00
Task 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	-	-	-	-	-	-
				Daily Average Total:					**0.00**	**0.01**	**0.04**	**0.01**	**0.06**	**0.00**
Task 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
Task 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	4	1	20	20	0.00	0.01	0.04	0.01	0.10	0.00
Task 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	4	1	20	20	0.00	0.01	0.04	0.01	0.02	0.00
Task 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.10**	**0.02**	**0.20**	**0.00**
				Daily Average					**0.01**	**0.10**	**0.08**	**0.01**	**0.16**	**0.00**

Notes:

1. Average daily emissions are estimated vehicle needs based on available project information.

2. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

3. Project tasks have been identified as follows:

Task Code	**Task Description**
Task 1	Scaffolding
Task 2	Mechanical
Task 3	Coating
Task 4	Heat Tracing
Task 5	Insulation

Table E.2-5. On-Road Construction Equipment - Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Task)						GHG Emissions (MT/Task)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
Task 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	4	66	20	1,320	0.00	0.00	0.00	0.00	0.00	0.00	1.35	0.00	0.00	1.35
Task 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	4	66	20	1,320	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.00	0.00	1.53
Task 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	66	9	594	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	1.31
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.00**	**4.06**	**0.00**	**0.00**	**4.20**
Task 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	24	20	480	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.37
Task 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	24	20	480	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.42
Task 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	24	9	216	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.48
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.22**	**0.00**	**0.00**	**1.26**
Task 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	2	24	20	480	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.25
Task 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	2	24	20	480	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.28
Task 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.51**	**0.00**	**0.00**	**0.52**
Task 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	102	20	2,040	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	0.00	1.57
Task 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	102	20	2,040	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	1.78
Task 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	102	9	918	0.00	0.01	0.00	0.00	0.00	0.00	1.93	0.00	0.00	2.03
				Task Total:					**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.00**	**5.19**	**0.00**	**0.00**	**5.37**
Task 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	4	114	20	2,280	0.00	0.00	0.00	0.00	0.01	0.00	2.32	0.00	0.00	2.34
Task 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	4	114	20	2,280	0.00	0.00	0.00	0.00	0.00	0.00	2.52	0.00	0.00	2.65
Task 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	114	9	1,026	0.00	0.01	0.00	0.00	0.00	0.00	2.16	0.00	0.00	2.27
				Task Total:					**0.00**	**0.01**	**0.01**	**0.00**	**0.01**	**0.00**	**7.01**	**0.00**	**0.00**	**7.25**
				Total On-Road Emissions:					**0.00**	**0.02**	**0.01**	**0.00**	**0.03**	**0.00**	**17.98**	**0.00**	**0.00**	**18.61**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton
   - 220 week construction period
   - 6 construction work days/week

Table E.2-6 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors		Activity Indicator		Emissions (Tons)	
	PM_{10}	$PM_{2.5}$			PM_{10}	$PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	0.0 miles	2.40 acres	0.00	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	0 hours	Excavators	0.00	0.00
Material Handling	8.93E-05 lb/ton	1.35E-05 lb/ton	0 tons		0.00	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	0 tons		0.00	0.00
Total Emissions (Tons)					0.00	0.00
Average Daily Emissions (Pounds/Day)					0.00	0.00

Notes:

1. No material movement activities are anticipated for this project.

Table E.2-7 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Access Road Total Emissions (Tons)	0.00 acres	2.62 lb/acre	0.000
Average Daily Emissions (Pounds/Day)			0.000

Notes:

1. No Asphalt Paving activities are anticipated for this project.

Table E.2-8 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Final Coat	10 gallons	250 grams/liter	2.09 lb/gallon	0.01
Total Emissions (Tons)	**10 gallons**			**0.01**
Average Daily Emissions (Pounds/Day)				**0.87**

Notes:

1. Source for VOC coating limits: BAAQMD Rule 8-3, Table 1.

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

   E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
   E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. It is assumed that approximately 10 gallons of paint will be required to coat various surfaces at the terminal.

3. Average daily emissions are calculated by assuming:
   Task 3 - Coating duration (days): 24
   6 construction work days/week

4. Conversion factors:
   2,000 pounds/ton

Table E.2-9 Off-Road Engine Emissions Factors for BAAQMD

			Emission Factors													
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Cranes	231	Diesel	0.000164	0.000198	0.000236	0.001120	0.002191	0.335003	0.000091	0.000084	0.000091	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Welders	46	Diesel	0.001470	0.001352	0.001618	0.098755	0.002295	0.880660	0.000061	0.000046	0.000067	0.000011	0.000014	0.000038	0.000080	lb/hp-hr

Notes:
1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
Region: Bay Area AQMD
Calendar Year: 2022, 2023, and 2024
Scenario: All Adopted Rules - Exhaust
Vehicle Classification: OFFROAD2017 Equipment Types
Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	**N2O (g/gallon)**	**CH4 (g/gallon)**
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Table E.2-10 On-Road Motor Vehicle Emissions Factors for BAAQMD

						Emission Factors								
Exhaust Source	**Vehicle Class**	**Fuel**	**EMFAC Category**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00005	0.00345	0.00188	0.00030	0.00029	0.00002	2.11322	0.00000	0.00033
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00682	0.00000	0.00000	0.00454	0.00001	1.33939	0.00001	0.00021
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00010	0.00553	0.00190	0.00032	0.00062	0.00003	3.26886	0.00000	0.00051
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00482	0.05958	0.00003	0.00002	0.06949	0.00012	12.37961	0.00022	0.00195
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00009	0.00054	0.00009	0.00030	0.00001	0.60998	0.00000	0.00010
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00130	0.00001	0.56160	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		
Paved Road Dust Entrainment								

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Table E.3-1a. Average Daily Construction Emissions Summary.

Amorco Marine Oil Terminal

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Off-road Diesel Construction Equipment	0.65	0.00	3.03	0.09	0.03	0.02	NA			
On-road Motor Vehicles	0.08	0.00	0.15	0.01	0.08	0.01	NA			
Fugitive PM from Material Movement							NA			
Asphalt Paving Offgassing							NA			
Architectural Coating Offgassing				3.48			NA			
Average Daily Onsite Emissions (lb/day)	**0.73**	**0.00**	**3.17**	**3.57**	**0.10**	**0.04**	NA			
Significance Threshold:	54.00	NA	NA	54.00	82.00	54.00	NA			
Threshold Exceeded?	No	No	No	No	No	No				

Table E.3-1b. Total Construction Emissions Summary.

Amorco Marine Oil Terminal

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Off-road Diesel Construction Equipment	0.01	0.00	0.05	0.00	0.00	0.00	1.86	0.00	0.00	1.97
On-road Motor Vehicles	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	1.66
Fugitive PM from Material Movement										
Asphalt Paving Offgassing										
Architectural Coating Offgassing				0.01						
Total Construction Emissions	**0.01**	**0.00**	**0.06**	**0.01**	**0.00**	**0.00**	**3.47**	**0.00**	**0.00**	**3.63**
Significance Threshold:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1. Project construction at Amorco make take ~ 6 weeks.
2. BAAQMD CEQA Guidelines define thresholds of significance for construction-related emissions on a daily average basis (See Table 2-4). No annual threshold exists.
3. BAAQMD CEQA Guidelines (Section 2.6.2) have not defined a GHG threshold of significance for construction related emissions.
4. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.3-2. Off-Road Diesel Construction Equipment - Daily Average Emissions

	Category	Avg HP	Load Factor	Number of Units	Hours/Day	Emissions (lb/day)					
						POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Task 1	Cranes	231	0.29	1	8	0.11	1.17	0.05	0.05	0.60	0.00
Task 1	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**0.11**	**1.17**	**0.05**	**0.05**	**0.60**	**0.00**
Task 2	Cranes	231	0.29	1	8	0.11	1.17	0.05	0.05	0.60	0.00
Task 2	Welders	46	0.45	1	8	0.22	0.38	0.01	0.01	16.35	0.00
		Daily Average Total:				**0.33**	**1.55**	**0.06**	**0.05**	**16.95**	**0.00**
Task 3	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 3	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
Task 4	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 4	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
Task 5	Cranes	231	0.29	1	8	0.11	1.17	0.05	0.05	0.60	0.00
Task 5	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**0.11**	**1.17**	**0.05**	**0.05**	**0.60**	**0.00**
Task 6	Cranes	231	0.29	0	8	--	--	--	--	--	--
Task 6	Welders	46	0.45	0	8	--	--	--	--	--	--
		Daily Average Total:				**--**	**--**	**--**	**--**	**--**	**--**
		Daily Average				**0.09**	**0.65**	**0.03**	**0.02**	**3.03**	**0.00**

Notes:
1. Average daily emissions are based on the project schedule provided by the facility.
2. Source for equipment load factors and HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
3. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/
4. Project schedule has been summarized by the facility as follows:

Task	Task Description
Task 1	Scaffolding
Task 2	Steel Framing
Task 3	Coating
Task 4	Concrete Anchoring
Task 5	Fender Insulation
Task 6	Dolphin and Piling Repairs

Table E.3-3. Off-Road Diesel Construction Equipment - Total Construction Emissions

	Category	Avg HP	Load Factor	Number of Units	Number of Days	Hours/Day	Criteria Pollutant Emissions (Ton/Task)						GHG Emissions (MT/Task)			
							POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
Task 1	Cranes	231	0.29	1	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.52
Task 1	Welders	46	0.45	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.49**	**0.00**	**0.00**	**0.52**
Task 2	Cranes	231	0.29	1	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.52
Task 2	Welders	46	0.45	1	6	8	0.00	0.00	0.00	0.00	0.05	0.00	0.40	0.00	0.00	0.41
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.00**	**0.89**	**0.00**	**0.00**	**0.93**
Task 3	Cranes	231	0.29	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 3	Welders	46	0.45	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Task 4	Cranes	231	0.29	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 4	Welders	46	0.45	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Task 5	Cranes	231	0.29	1	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.52
Task 5	Welders	46	0.45	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.49**	**0.00**	**0.00**	**0.52**
Task 6	Cranes	231	0.29	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Task 6	Welders	46	0.45	0	6	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
		Total Off-Road Emissions:					**0.00**	**0.01**	**0.00**	**0.00**	**0.05**	**0.00**	**1.86**	**0.00**	**0.00**	**1.97**

Notes:

1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower

2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/

3. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton

Table E.3-4. On-Road Construction Equipment - Daily Average Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Trips Per Day	Trip Length Two-Way	Round Trip Miles/Day	Emissions (lb/day) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2
Task 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
Task 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
Task 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	-	-	-	-	-	-
				Daily Average Total:					**0.00**	**0.01**	**0.06**	**0.01**	**0.10**	**0.00**
Task 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
Task 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	-	-	-	-	-	-
				Daily Average Total:					**0.00**	**0.01**	**0.06**	**0.01**	**0.10**	**0.00**
Task 6	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	1	20	20	0.00	0.00	0.03	0.00	0.08	0.00
Task 6	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	1	20	20	0.00	0.01	0.03	0.01	0.02	0.00
Task 6	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	1	9	9	0.01	0.11	0.02	0.00	0.08	0.00
				Daily Average Total:					**0.01**	**0.12**	**0.08**	**0.01**	**0.17**	**0.00**
				Daily Average					**0.01**	**0.08**	**0.08**	**0.01**	**0.15**	**0.00**

Notes:
1. Average daily emissions are based on the equipment list and estimated trip distances provided by the facility.

2. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

Table E.3-5. On-Road Construction Equipment - Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Task)						GHG Emissions (MT/Task)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
Task 1	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 1	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 1	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	6	9	54	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.12
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.00**	**0.00**	**0.32**
Task 2	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 2	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 2	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	6	9	54	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.12
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.00**	**0.00**	**0.32**
Task 3	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 3	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 3	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.19**	**0.00**	**0.00**	**0.20**
Task 4	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 4	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 4	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	6	9	54	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.12
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.00**	**0.00**	**0.32**
Task 5	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 5	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 5	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	--	0	9	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.19**	**0.00**	**0.00**	**0.20**
Task 6	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.09
Task 6	Pickup Truck	Class 1 Light Duty Trucks (< 6,000 lbs GVWR)	Diesel	LDT2	3	6	20	120	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.10
Task 6	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	1	6	9	54	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.12
				Task Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.00**	**0.00**	**0.32**
				Total On-Road Emissions:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.60**	**0.00**	**0.00**	**1.66**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020 and January 26, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310
   2,000 pounds/ton
   0.45359 kilograms/pound)
   1,000 kilograms/metric ton
   #REF!
   #NAME?

Table E.3-6 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors		Activity Indicator		Emissions (Tons)	
	PM_{10}	$PM_{2.5}$			PM_{10}	$PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	0.0 miles	2.40 acres	0.00	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	0 hours	Excavators	0.00	0.00
Material Handling	8.93E-05 lb/ton	1.35E-05 lb/ton	0 tons		0.00	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	0 tons		0.00	0.00
Total Emissions (Tons)					0.00	0.00
Average Daily Emissions (Pounds/Day)					0.00	0.00

Notes:
1. No material movement activities are anticipated.

Table E.3-7 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Access Road			
Total Emissions (Tons)	0.00 acres	2.62 lb/acre	0.000
Average Daily Emissions (Pounds/Day)			0.000

Notes:
1. No asphalt paving activities are anticipated for this project.

Table E.3-8 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Final Coat	10 gallons	250 grams/liter	2.09 lb/gallon	0.01
Total Emissions (Tons)				**0.01**
Average Daily Emissions (Pounds/Day)				**3.48**

Notes:

1. Source for VOC coating limits: BAAQMD Rule 8-3, Table 1.

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

   E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
   E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. It is assumed that approximately 10 gallons of paint will be required to coat various piping surfaces.

4. Average daily emissions are calculated by assuming:
   Task 3 - Coating duration (days): 6
   6 construction work days/week

4. Conversion factors:
   2,000 pounds/ton

Table E.3-9 Off-Road Engine Emissions Factors for BAAQMD

			Emission Factors													
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Cranes	231	Diesel	0.000164	0.000198	0.000236	0.001120	0.002191	0.335003	0.000091	0.000084	0.000091	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Welders	46	Diesel	0.001470	0.001352	0.001618	0.098755	0.002295	0.880660	0.000061	0.000046	0.000067	0.000011	0.000014	0.000038	0.000080	lb/hp-hr

Notes:
1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
   Region: Bay Area AQMD
   Calendar Year: 2022, 2023, and 2024
   Scenario: All Adopted Rules - Exhaust
   Vehicle Classification: OFFROAD2017 Equipment Types
   Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	N2O (g/gallon)	CH4 (g/gallon)
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Table E.3-10 On-Road Motor Vehicle Emissions Factors for BAAQMD

						Emission Factors								
Exhaust Source	**Vehicle Class**	**Fuel**	**EMFAC Category**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00005	0.00345	0.00188	0.00030	0.00029	0.00002	2.11322	0.00000	0.00033
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00682	0.00000	0.00000	0.00454	0.00001	1.33939	0.00001	0.00021
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00010	0.00553	0.00190	0.00032	0.00062	0.00003	3.26886	0.00000	0.00051
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00482	0.05958	0.00003	0.00002	0.06949	0.00012	12.37961	0.00022	0.00195
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00009	0.00054	0.00009	0.00030	0.00001	0.60998	0.00000	0.00010
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00130	0.00001	0.56160	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		

Paved Road Dust Entrainment

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Table E.4-1a. Average Daily Construction Emissions Summary.

Avon Terminal (Rail Extension and Unload/Load Rack)

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	0.40	0.00	1.17	0.05	0.02	0.01	NA			
On-road Motor Vehicles	0.28	0.00	0.26	0.02	0.07	0.01	NA			
Fugitive PM from Material Movement					0.16	0.08	NA			
Asphalt Paving Offgassing				0.00			NA			
Architectural Coating Offgassing				0.08			NA			
Average Daily Onsite Emissions (lb/day)	**0.68**	**0.00**	**1.43**	**0.14**	**0.25**	**0.11**	NA			
Significance Threshold:	54.00	NA	NA	54.00	82.00	54.00	NA			
Threshold Exceeded?	No	No	No	No	No	No				

Table E.4-1b. Total Construction Emissions Summary.

Avon Terminal (Rail Extension and Unload/Load Rack)

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	0.05	0.00	0.16	0.01	0.00	0.00	10.13	0.00	0.00	10.60
On-road Motor Vehicles	0.04	0.00	0.04	0.00	0.01	0.00	16.82	0.00	0.00	17.47
Fugitive PM from Material Movement					0.02	0.01				
Asphalt Paving Offgassing				0.00						
Architectural Coating Offgassing				0.01						
Total Construction Emissions	**0.09**	**0.00**	**0.19**	**0.02**	**0.03**	**0.01**	**26.95**	**0.00**	**0.00**	**28.07**
Significance Threshold:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1. Project construction for the Avon Rail Section extension make take: 269 days
2. BAAQMD CEQA Guidelines define thresholds of significance for construction-related emissions on a daily average basis (See Table 2-4). No annual threshold exists.
3. BAAQMD CEQA Guidelines (Section 2.6.2) have not defined a GHG threshold of significance for construction related emissions.
4. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.4-2a. Off-Road Diesel Construction Equipment - Rail Spur Construction Emissions

								Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units per Week	Number of Days	Hours per Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
	Air Compressors	Air Compressors	78	0.48	1	9	4	0.00	0.00	0.00	0.00	0.12	0.00	0.59	0.00	0.00	0.61
	Cranes	Cranes	231	0.29	1	9	2	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.20
	Graders	Graders	187	0.41	3	6	6	0.00	0.01	0.00	0.00	0.00	0.00	1.79	0.00	0.00	1.87
	Off-Highway Trucks	Off-road Trucks (Haul)	402	0.38	4	7	3	0.00	0.01	0.00	0.00	0.01	0.00	2.50	0.00	0.00	2.60
	Off-Highway Trucks	Off-road Trucks (Water)	402	0.38	0	0	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Rollers	Rollers	80	0.38	3	8	2	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.00	0.29
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4	2	6	4	0.00	0.01	0.00	0.00	0.01	0.00	0.93	0.00	0.00	0.97
	Rubber Tired Loaders	Rubber Tired Loaders	203	0.36	3	8	4	0.00	0.01	0.00	0.00	0.00	0.00	1.25	0.00	0.00	1.32
	Other Construction Equipment	Other - Ballast Tamper	340	0.42	1	2	8	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.59
	Other Construction Equipment	Other - Ballast Regulator	326	0.42	1	2	8	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.00	0.56
			Project Total:					**0.01**	**0.05**	**0.00**	**0.00**	**0.15**	**0.00**	**8.61**	**0.00**	**0.00**	**9.01**

Table E.4-2b. Off-Road Diesel Construction Equipment - Unload/Load Rack Construction

								Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Number of Days per Unit	Hours per Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
	Excavators	Excavators	158	0.38	1	7	8	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.71
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4	1	1	8	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.17
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	97	0.37	3	4	8	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.71
			Project Total:					**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.00**	**1.52**	**0.00**	**0.00**	**1.59**

Total Off-Road Emissions:	**0.01**	**0.05**	**0.00**	**0.00**	**0.16**	**0.00**	**10.13**	**0.00**	**0.00**	**10.60**

Notes:

1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/
3. Rail construction duration, resources, and hours are based on the Derivation of Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule table, documented separately.
4. Source for Unload/Load Rack Construction: Piperack construction project in Santa Barbara County APCD.

5. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310
   2,000 pounds/ton
   0.45359 kilograms/pound)
   1,000 kilograms/metric ton

Marathon - Martinez
Renewable Fuels Project
Air Quality and GHG Technical Analysis

Table E.4-3a. On-Road Construction Equipment - Rail Spur Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	17	36	20	720	0.00	0.00	0.00	0.00	0.01	0.00	3.12	0.00	0.00	3.13
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	17	36	9	324	0.00	0.03	0.01	0.00	0.02	0.00	11.60	0.00	0.00	12.17
				Project Total:					**0.00**	**0.03**	**0.01**	**0.00**	**0.03**	**0.00**	**14.72**	**0.00**	**0.00**	**15.30**

Table E.4-3b. On-Road Construction Equipment - Unload/Load Rack Construction

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	4	36	20	720	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.74
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	2	36	9	324	0.00	0.00	0.00	0.00	0.00	0.00	1.37	0.00	0.00	1.43
				Month Total:					**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.10**	**0.00**	**0.00**	**2.17**
				Total On-Road Emissions:					**0.00**	**0.04**	**0.01**	**0.00**	**0.04**	**0.00**	**16.82**	**0.00**	**0.00**	**17.47**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2. Number of vehicles for Unload/Load Rack Construction estimated. Assume primary facility construction activities incorporate personnel and trucks already onsite.

3. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton
   - 5 construction work days/week

Table E.4-4 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors		Activity Indicator	Emissions (Tons)	
	PM_{10}	$PM_{2.5}$		PM_{10}	$PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	1.2 miles	0.00	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	53 hours	0.02	0.01
Material Handling	8.93E-05 lb/ton	1.35E-05 lb/ton	16,542 tons	0.00	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	0 tons	0.00	0.00
Total Emissions (Tons)				0.02	0.01
Average Daily Emissions (Pounds/Day)				0.16	0.08

Activity Grading	Phase Description	Activity Indicator Initial	Target	Notes
Rail Construction - Phase 2	Clear Land - Install Drainage	.6 acres	.40 miles	
Rail Construction - Phase 3	Prepare Sub-grade	.6 acres	.40 miles	
Rail Construction - Phase 4	Lay Sub-ballast	.6 acres	.40 miles	
Non-Rail Construction - Ph. 4	Grading	.02 acres	.00 miles	
	Total		**1.20 miles**	

Activity Bulldozing	Phase Description	Activity Indicator Initial	Target	Notes
Rail Construction - Phase 2	Install Erosion Controls/Clear & Grub		18 hours	From rail constr. schedule
Rail Construction - Phase 3	Prepare Sub Grade		27 hours	From rail constr. schedule
Non-Rail Construction - Ph. 4	Grading		8 hours	From estimated bulldozer activity
	Total		**53 hours**	

Activity Material Handling	Phase Description	Activity Indicator Initial	Target	Notes
Rail Construction - Phase 3	Prepare Sub-grade	3,640 tons earth	14,560 tons	4 movements required
Rail Construction - Phase 4	Lay Sub-ballast	402 tons ballast	804 tons	2 movements required
Rail Construction - Phase 5	Place Bottom Ballast	341 tons ballast	683 tons	2 movements required
Rail Construction - Phase 6	Lay/Install Track Work and Top Ballast	225 tons ballast	450 tons	2 movements required
Non-Rail Construction - Ph. 5	Construction (Footings)	46 tons earth	46 tons	
	Total	**21,196 tons**	**16,542 tons**	

Activity Demolition Debris Handling	Phase Description	Activity Indicator Initial	Target	Notes
Non-Rail Construction - Ph. 2	Mechanical Dismemberment	0 sq ft	0 tons	No demolition activities
Non-Rail Construction - Ph. 2	Demolition Debris Loading	0 sq ft	0 tons	No demolition activities
	Max	**0**	**0 tons**	

Table E.4-4 Material Movement Emissions

Notes:
1. Average daily emissions are calculated by assuming:
   54 week construction period
   5 construction work days/week

1. Grading for the entire length of the rail corridor is anticipated during three phases as indicated above. Acres to be graded assumes the rail construction corridor is 24 feet wide. Acres to be graded for the non-rail portion of the project is documented in the Non-Rail Construction Schedule, presented separately.

2. Miles traveled for site grading is based on the analytical approach suggested in *California Emissions Estimator Model User's* Guide (Version 2011.1) (CalEEMod User's Guide), ENVIRON International Corporation (for South Coast Air Quality Management District), February 2011, Appendix A (Calculation Details for CalEEMod), Section 4.3 (Dust from Material Movement).

   Grading miles are calculated as As/Wb × 43,560 square feet/acre ÷ 5,280 ft/mile,
   where As = acres to be graded and Wb =blade width (feet),
   assumed in the CalEEMod Version 2011.1.1 program to be 12 feet (based on a Caterpillar 140 motor grader).

3. Bulldozer hours are based on information presented in the Rail Terminal Construction Schedule and the Non-Rail Construction Schedule tables, documented separately.

4. Rail Construction material handling tons are based on information presented in the Rail Terminal Construction Materials table, presented separately. Under Prepare Sub-grade, it is expected that earth along the length of the rail corridor will be excavated for recompaction, resulting in four movements for each ton of earth excavated. For the other phases, it is expected that ballast will be loaded into trucks for offloading within the rail corridor, resulting in two movements for each ton of ballast.

5. Non-Rail (unload/load rack) material handling based on similar construction project in Santa Barbara County APCD.

6. Conversion factors:
   43,560 square feet/acre
   5,280 feet/mile
   1,000 linear feet of rail line to be constructed
   24 feet wide construction area
   12 feet grader blade width
   0.046 ton of construction debris per square foot (CalEEMod User's Guide, Appendix A)
   2,000 pounds/ton

Grading Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.6	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.031	--
Mean vehicle speed	EPA AP-42 Table 11.9-1	S	7.1	miles/hour
Grading		PM_{10}:	1.543	lb/mile
		$PM_{2.5}$:	0.167	lb/mile

$$Ef_{PM_{10}} = k \times 0.051 \times (S)^{2.0}$$

$$Ef_{PM_{2.5}} = k \times 0.040 \times (S)^{2.5}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and S.

Table E.4-4 Material Movement Emissions

Bulldozing Emission Factors

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.75	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.105	--
Silt content (overburden)	EPA AP-42 Table 11.9-1	s	6.9	%
Moisture content (overburden)	EPA AP-42 Table 11.9-1	M	7.9	%
Bulldozing		PM_{10}:	0.753	lb/hour
		$PM_{2.5}$:	0.414	lb/hour

$$Ef_{PM_{10}} = k \times \frac{1.0 \times (s)^{1.5}}{(M)^{1.4}}$$

$$Ef_{PM_{2.5}} = k \times \frac{5.7 \times (s)^{1.2}}{(M)^{1.3}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and the AP-42 default values for overburden are used for s and M.

Material Handling (Truck Loading/Unloading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	4.92	miles/hour
Moisture content (cover)	EPA AP-42 Table 13.2.4-1	M	12	%
Material Handling		PM_{10}:	8.93E-05	lb/ton
		$PM_{2.5}$:	1.35E-05	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 values are used for k and the AP-42 default value for municipal solid waste landfill cover is used for M.
Per CalEEMod User's Guide, Appendix D (Default Data Tables), Table 1.1 (Weather Data), a mean wind speed of 2.2 meters/second (m/s) is used for Contra Costa County.
Conversion factors to convert m/s to miles/hour: 2.2 m/s
1,609.3 meters/mile
60 seconds/minute
60 minutes/hour

Demolition Debris Handling (Mechanical Dismemberment/Truck Loading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	5.00	miles/hour
Moisture content	EPA AP-42 Table 13.2.4-1	M	2	%
Demolition Debris Handling		PM_{10}:	1.12E-03	lb/ton
		$PM_{2.5}$:	1.70E-04	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
The CalEEMod User's Guide, Appendix A, Section 4.4 recommends the AP-42 equation be used for mechanical dismemberment, using the default wind speed of 5 miles/hour and a moisture content of 2 percent.
AP-42 Section 13.2.3 (Heavy Construction Operations) Table 13.2.3-1 (Recommended Emission Factors for Construction Operations) also recommends the emission equation from AP-42 Section 13.2.4 be used for loading of construction debris into trucks.

Table E.4-5 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Total Emissions (Tons)	0.00 acres	2.62 lb/acre	0.000
Average Daily Emissions (Pounds/Day)			0.000

Notes:

1. Source for the ROG emission factor: CalEEMod User's Guide, Appendix A, Section 4.8 (Asphalt Paving Off-Gassing Emissions).

2. Average daily emissions are calculated by assuming:
   54 week construction period
   5 construction work days/week

3. No additional paving anticipated for the rail extension or unloading rack.

4. Conversion factors:
   2,000 pounds/ton
   43,560 square feet/acre
   5,280 feet/mile
   24 feet wide roadway

Table E.4-6 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Final Coat	10 gallons	250 grams/liter	2.09 lb/gallon	0.01
Total Emissions (Tons)				**0.01**
Average Daily Emissions (Pounds/Day)				**0.08**

Notes:

1. Source for VOC coating limits: BAAQMD Rule 8-3, Table 1.

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

   E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
   E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. It is assumed that approximately 10 gallons of paint will be required to coat various surfaces on the unload/load rack.

4. Average daily emissions are calculated by assuming:
   54 week construction period
   5 construction work days/week

5. Conversion factors:
   2,000 pounds/ton

Table E.4-7. Derivation of Rail Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule.

Port of Everett Rail Spur Project Construction Schedule (2,200 linear feet of rail track).

Construction Phase	Category	Air Compressors	Cranes	Graders	Off-Highway Trucks	Off-Highway Trucks	Rollers	Rubber Tired Dozers	Rubber Tired Loaders	Other Construction Equipment	Other Construction Equipment
1 Stage Equipment/Supplies											
2 Install Erosion Controls/Clear & Grub	2 weeks			1	1			1	1		
3 Prepare Sub Grade	3 weeks			1	1		1	1			
4 Lay Sub Ballast	3 weeks			1	1		1				
5 Place Bottom Ballast	4 weeks				1		1		1		
6 Lay Track Work and Top Ballast	4 weeks	1	1						1	1	
Operating Hours/Day per Item		4	2	6	3		2	4	4	8	
Operating Days per Item		20	20	40	60		50	25	50	20	
Total Operating Hours per Item		80	40	240	180		100	100	200	160	

Notes:

1. Source for schedule: *Technical Memorandum: An Assessment of the Air Quality and Noise Impacts from the Port of Everett Rail Spur Project* , Weston Solutions, Inc. (for Port of Everett), May 15, 2009, pages 5-6, available at www.portofeverett.com/docs/docs-_129570-v1-air___noise_technical_memo.pdf (accessed July 13, 2012).
2. According to the report, the above construction schedule assumes construction over a 16-week (80-day) period.
3. The Port of Everett Rail Spur Project construction schedule does not include phases for staging/demobilizing equipment and supplies, nor does it include a water truck or ballast regulator.

Avon Rail Terminal Project Construction Schedule (1,000 linear feet of rail spur).

Construction Phase	Category	Air Compressors	Cranes	Graders	Off-Highway Trucks	Off-Highway Trucks	Rollers	Rubber Tired Dozers	Rubber Tired Loaders	Other Construction Equipment	Other Construction Equipment
1 Stage Equipment/Supplies											
2 Install Erosion Controls/Clear & Grub	1 weeks			1	1			1	1		
3 Prepare Sub Grade	1 weeks			1	1		1	1			
4 Lay Sub Ballast	1 weeks			1	1		1				
5 Place Bottom Ballast	2 weeks				1		1		1		
6 Lay Track Work and Top Ballast	2 weeks	1	1						1		
7 Tamp/Finish Top Ballast and Inspect	0 weeks									1	1
Hours per Day Per Unit:		4	2	6	3		2	4	4	8	8
Operating Days per Item		9	9	18	27	0	22.5	11.25	22.5	2.25	2.25
Total Operating Hours per Item		36	18	108	81		45	45	90	18	18

Notes:

1. Task duration determined based on the schedule necessary to accomplish contruction of the rail spurs at the terminal within 4 months (16 weeks).
2. Equipment/supplies staging anticipated to take one week in advance of land clearing activities.
3. It is anticipated that construction of the rail spurs needed at the Avon termianl to complete transfer of the animal fats and vegetable oils will comprise 1,000 linear feet of additional rail track (all assumed to be new track).
4. Given the assumed use of automated ballast tamping and finishing equipment, tamping and finishing is listed separately from track laying, and assumes use of the following equipment:
   - Plasser American 09-16 C.A.T. (continuous action tamper) speed of 24 ties/minute, horsepower rating of 340 HP.
   - Plasser American SSP-203 Ballast Regulator, horsepower rating of 326 HP (assumed operating speed twice as fast as the 09-16 C.A.T.)

Table E.4-7. Derivation of Rail Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule.

5. Required tamping time calculated as follows:

- Feet of rail	1,000
- Tie spacing (inches, BNSF industrial manual)	21.5
- Tie spacing (feet)	1.79
- Total ties needed	559
- Ties/minute (Plasser American 09-16 C.A.T.)	24
- Tamping time (minutes, calculated)	23
- Tamping time (hours, calculated - rounded up)	1.00

6. In addition to the equipment listed in the Port Everett schedule, it is assumed a water truck (shared with the non-rail construction) will be used for dust suppression.
7. Operating hours per day and the quantity of each item used per day was adjusted as necessary such that total operating hours per item equaled the scaled total operating hours per item.

Port of Everett:	2,200	linear feet
Martinez - Avon	1,000	linear feet
Ratio:	0.45	

Table E.4-8. Rail Construction Materials.

Rail Ballast.

Category	Cross-Sectional Area		Rail Track	Ballast Required		
	Inches	Feet	Construction	Cubic Feet	Cubic Yards	Tons
Top Ballast						
Top Ballast (Gross)	924 square inches	6.42 square feet	1,000 feet	6,417 cubic feet	238 cubic yards	
Less Rail Ties	6,426 cubic inches	3.72 cubic feet	559 ties	2,079 cubic feet	77 cubic yards	
Net Top Ballast					161 cubic yards	225 tons
Bottom Ballast	948 square inches	6.58 square feet	1,000 feet	6,583 cubic feet	244 cubic yards	341 tons
Sub-ballast	1,116 square inches	7.75 square feet	1,000 feet	7,750 cubic feet	287 cubic yards	402 tons
Totals:						
Tons						968 tons
20-ton Truck Loads						49 loads

Notes:

1. Source for cross-sectional area for top ballast (gross), bottom ballast, and sub ballast and rail tie volume data: *Design Guidelines for Industrial Track Projects, BNSF Railway Company, Revised December 2011, page A-10.*
2. Source for linear feet of rail track construction and required rail ties: Derivation of Avon Terminal Rail Spur Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
3. Conversion factor: 1.4 tons/cubic yard of railroad ballast. Source: Concrete Materials Company, www.concretematerialscompany.com/aggregate/, 2 1/2" x 3/4" Railroad Ballast (accessed September 21, 2012).
4. Truck loads assume standard average on-road 20-ton loads.
5. Assume that off-highway haul trucks used during Rail Construction Phases 4 and 5 account for hauling ballast to the site.

Excavation of Earth.

Category	Cross-Sectional Area		Rail Track	Excavated Earth		
	Inches	Feet	Construction	Cubic Feet	Cubic Yards	Tons
Packed Earth	10,368 square inches	72.00 square feet	1,000 feet	72,000 cubic feet	2,667 cubic yards	3,640 tons

Notes:

1. Source for cross-sectional area for earth excavation: *Design Guidelines for Industrial Track Projects, BNSF Railway Company, Revised December 2011.*
2. Source for linear feet of rail track construction: Derivation of Avon Terminal Rail Spur Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
3. Conversion factor: 2,730 pounds (1.365 tons)/cubic yard of packed earth. Source: Department of Resources Recycling and Recovery, Construction/Demolition and Inert Debris (CDI) Tools and Resources: Calculations, available at www.calrecycle.ca.gov/SWFacilities/CDI/Tools/Calculations.htm. Loose/dry earth is estimated to have a density of 2,100 pounds per cubic yard, plus an additional 30% when compacted (or 2,730 pounds/cubic yard).

Rail.

Track Linear Feet	Rail Linear Feet	39-Ft. Sections	Weight/Yard	Weight/Rail Section	Sections/Truck Load	Truck Loads
1,000 feet	2,000 feet	52 sections	112 pounds	0.73 tons/section	27 sections/load	2

Notes:

1. Source for linear feet of track construction: Derivation of Avon Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
2. Per *Design Guidelines for Industrial Track Projects* , BNSF Railway Company, Revised August 2018, minimum rail length is specified as 39 feet and minimum acceptable track weight is specified as 112 pounds/yard of track.
3. Sections per truck load assume standard average on-road 20-ton flat bed truck loads.

Ties.

Ties Required	Cubic Feet/Tie	Density	Weight/Tie	Ties/Truck Load	Truck Loads
559 ties	3.72 cubic feet	30 lbs/cubic foot	111.56 lbs/tie	358 ties/load	2

Notes:

1. Source for required rail ties: Derivation of Avon Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
2. Source for rail tie volume data: Proposed Avon Rail Terminal Assumed Rail Cross-Section (For Calculation of Air Emissions from Rail Construction Activities), documented separately.
3. Ties assumed to be douglas fir, average weight of 30 pounds/cubic foot. Source: Public Domain Databases in the Sciences, "Physical Properties of Common Woods," Oliver Seely, Ph.D., Professor of Chemistry Emeritus, California State University Dominguez Hills, available at www.csudh.edu/oliver/chemdata/woods.htm, accessed September 24, 2012, average of coastal (32 pounds/cubic foot) and mountain varieties of douglas fir (28 pounds/cubic foot).
4. Ties per truck load assume standard average on-road 20-ton flat bed truck loads.

Spikes, Fasteners, and Other Supplies.

Assumed to comprise 20 percent of the weight of the rail sections:	1 truck loads

Table E.4-9 Off-Road Engine Emissions Factors for BAAQMD

			Emission Factors												
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Air Compressors	78	Diesel	0.002246	0.002066	0.002472	0.172463	0.002988	0.967385	0.000067	0.000050	0.000074	0.000012	0.000017	0.000035	0.000072	lb/hp-hr
Cranes	231	Diesel	0.000164	0.000198	0.000236	0.001120	0.002191	0.335003	0.000091	0.000084	0.000091	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Excavators	158	Diesel	0.000126	0.000153	0.000182	0.002593	0.001264	0.444577	0.000062	0.000057	0.000062	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Graders	187	Diesel	0.000213	0.000257	0.000306	0.001157	0.002926	0.475813	0.000097	0.000090	0.000097	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Off-Highway Trucks	402	Diesel	0.000131	0.000158	0.000189	0.001021	0.001137	0.444622	0.000041	0.000038	0.000041	0.000004	0.000004	0.000029	0.000061	lb/hp-hr
Other Construction Equipment	172	Diesel	0.000211	0.000255	0.000304	0.002890	0.002524	0.481549	0.000132	0.000121	0.000132	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Rollers	80	Diesel	0.000190	0.000230	0.000273	0.002834	0.002422	0.436737	0.000133	0.000122	0.000133	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Rubber Tired Dozers	247	Diesel	0.000363	0.000439	0.000523	0.002741	0.004824	0.461076	0.000217	0.000200	0.000217	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Rubber Tired Loaders	203	Diesel	0.000138	0.000166	0.000198	0.000957	0.001629	0.419957	0.000055	0.000050	0.000055	0.000004	0.000003	0.000033	0.000070	lb/hp-hr
Tractors/Loaders/Backhoes	97	Diesel	0.000154	0.000186	0.000221	0.002839	0.001910	0.430420	0.000092	0.000085	0.000092	0.000004	0.000004	0.000035	0.000072	lb/hp-hr

Notes:

1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
   Region: Bay Area AQMD
   Calendar Year: 2022, 2023, and 2024
   Scenario: All Adopted Rules - Exhaust
   Vehicle Classification: OFFROAD2017 Equipment Types
   Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	**N2O (g/gallon)**	**CH4 (g/gallon)**
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Original factors converted to g/gallon fuel using fuel density defaults from US Inventory of Greenhouse Gas Emissions and Sinks 1990-2017 (April 2019) Annex 6.5

Distillate:	1 metric ton	7.46	barrels
	1 metric ton	1.1023	short ton
	1 short ton	2000	pounds
	1 barrel	42	gallons
		7.04	**lb/gal**

Table E.4-10 On-Road Motor Vehicle Emissions Factors for BAAQMD

						Emission Factors								
Exhaust Source	**Vehicle Class**	**Fuel**	**EMFAC Category**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00005	0.00345	0.00188	0.00030	0.00029	0.00002	2.11322	0.00000	0.00033
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00682	0.00000	0.00000	0.00454	0.00001	1.33939	0.00001	0.00021
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00010	0.00553	0.00190	0.00032	0.00062	0.00003	3.26886	0.00000	0.00051
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00482	0.05958	0.00003	0.00002	0.06949	0.00012	12.37961	0.00022	0.00195
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00009	0.00054	0.00009	0.00030	0.00001	0.60998	0.00000	0.00010
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00130	0.00001	0.56160	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed January 18, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		

Paved Road Dust Entrainment

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Table E.5-1a. Average Daily Construction Emissions Summary.

Martinez Renewable Fuels Project - BAAQMD Off-Site Terminal

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	1.96	0.00	9.13	0.26	0.09	0.08	NA			
On-road Motor Vehicles	5.39	0.03	2.77	0.18	1.84	0.30	NA			
Fugitive PM from Material Movement					0.08	0.04	NA			
Asphalt Paving Offgassing				0.02			NA			
Architectural Coating Offgassing				0.24			NA			
Average Daily Onsite Emissions (lb/day)	**7.35**	**0.03**	**11.91**	**0.70**	**2.02**	**0.43**	NA			
Significance Threshold:	54.00	NA	NA	54.00	82.00	54.00	NA			
Threshold Exceeded?	No	No	No	No	No	No				

Table E.5-1b. Total Construction Emissions Summary.

Martinez Renewable Fuels Project - BAAQMD Off-Site Terminal

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	0.24	0.00	1.12	0.03	0.01	0.01	47.56	0.00	0.01	50.14
On-road Motor Vehicles	0.66	0.00	0.34	0.02	0.23	0.04	351.08	0.00	0.05	366.14
Fugitive PM from Material Movement					0.01	0.01				
Asphalt Paving Offgassing				0.00						
Architectural Coating Offgassing				0.03						
Total Construction Emissions	**0.90**	**0.00**	**1.46**	**0.09**	**0.25**	**0.05**	**398.64**	**0.01**	**0.06**	**416.28**
Significance Threshold:	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1. Project construction for the BAAQMD off-Site terminal make take: 246 days
2. BAAQMD CEQA Guidelines define thresholds of significance for construction-related emissions on a daily average basis (See Table 2-4). No annual threshold exists.
3. BAAQMD CEQA Guidelines (Section 2.6.2) have not defined a GHG threshold of significance for construction related emissions.
4. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.5-2. Off-Road Diesel Construction Equipment - Daily Averge Construction Emissions

								Criteria Pollutant Emissions (lb/day)						GHG Emissions (MT/Day)			
	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Number of Days per Unit	Hours per Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
	Air Compressors	Air Compressors	78	0.48				0.02	0.03	0.00	0.00	1.57	0.00				
	Concrete/Industrial Saws	Concrete/Industrial Saws	81	0.73				0.07	0.12	0.00	0.00	5.45	0.00				
	Cranes	Cranes	231	0.29				0.04	0.48	0.02	0.02	0.24	0.00				
	Forklifts	Forklifts	89	0.2				0.02	0.23	0.01	0.01	0.28	0.00				
	Graders	Graders	187	0.41				0.00	0.01	0.00	0.00	0.01	0.00				
	Rollers	Rollers	80	0.38				0.00	0.02	0.00	0.00	0.02	0.00				
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4				0.00	0.05	0.00	0.00	0.03	0.00				
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	97	0.37				0.10	1.03	0.05	0.05	1.52	0.00				
			Daily Average:					**0.26**	**1.96**	**0.09**	**0.08**	**9.13**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Table E.5-3. Off-Road Diesel Construction Equipment - Project Total Construction Emissions

								Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Number of Days per Unit	Hours per Day	POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	CO_2	CH_4	N_2O	CO_2e
	Air Compressors	Air Compressors	78	0.48	1	10	6	0.00	0.00	0.00	0.00	0.19	0.00	0.99	0.00	0.00	1.01
	Concrete/Industrial Saws	Concrete/Industrial Saws	81	0.73	2	12	8	0.01	0.01	0.00	0.00	0.67	0.00	6.94	0.00	0.00	7.06
	Cranes	Cranes	231	0.29	1	200	4	0.01	0.06	0.00	0.00	0.03	0.00	8.14	0.00	0.00	8.68
	Forklifts	Forklifts	89	0.2	2	200	6	0.00	0.03	0.00	0.00	0.03	0.00	4.53	0.00	0.00	4.98
	Graders	Graders	187	0.41	1	2	8	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.28
	Rollers	Rollers	80	0.38	1	10	7	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.44
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4	2	12	1	0.00	0.01	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.52
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	97	0.37	8	58	8	0.01	0.13	0.01	0.01	0.19	0.00	25.79	0.00	0.00	27.18
			Project Total:					**0.03**	**0.24**	**0.01**	**0.01**	**1.12**	**0.00**	**47.56**	**0.00**	**0.01**	**50.14**

Notes:
1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/
3. Daily average emissions estimated based on total project emissions divided by total project days.
4. Conversion factors:
    Global warming potential for methane: 21
    Global warming potential for nitrous oxide: 310
    2,000 pounds/ton
    0.45359 kilograms/pound)
    1,000 kilograms/metric ton

Table E.5-4. On-Road Diesel Construction Equipment - Daily Average Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (lb/day)						GHG Emissions (MT/Day)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA					0.01	0.06	0.40	0.06	0.99	0.00				
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single					0.17	5.33	1.44	0.24	1.79	0.03				
				Daily Average:					**0.18**	**5.39**	**1.84**	**0.30**	**2.77**	**0.03**				

Table E.5-5. On-Road Diesel Construction Equipment - Project Total Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	38	246	20	4,920	0.00	0.01	0.05	0.01	0.12	0.00	47.63	0.00	0.00	47.88
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	19	246	40	9,840	0.02	0.66	0.18	0.03	0.22	0.00	303.46	0.00	0.05	318.26
				Project Total:					**0.02**	**0.66**	**0.23**	**0.04**	**0.34**	**0.00**	**351.08**	**0.00**	**0.05**	**366.14**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed November 3, 2020). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)
2. Daily average emissions estimated based on total project emissions divided by total project days.

3. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton
   - 49 week construction period
   - 5 construction work days/week

Table E.5-6 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors		Activity Indicator	Emissions (Tons)	
	PM_{10}	$PM_{2.5}$		PM_{10}	$PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	0.7 miles	0.00	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	24 hours	0.01	0.00
Material Handling	8.93E-05 lb/ton	1.35E-05 lb/ton	956 tons	0.00	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	0 tons	0.00	0.00
Total Emissions (Tons)				0.01	0.01
Average Daily Emissions (Pounds/Day)				0.08	0.04

Notes:

1. Average daily emissions are calculated by assuming:
   49 week construction period
   5 construction work days/week

2. Grading, bulldozing, and material handling estimates based on Cal EEMod User's Guide equipment estimates for projects encompassing 1 acre.

3. Miles traveled for site grading is based on the analytical approach suggested in *California Emissions Estimator Model User's* Guide (Version 2011.1) (CalEEMod User's Guide), ENVIRON International Corporation (for South Coast Air Quality Management District), February 2011, Appendix A (Calculation Details for CalEEMod), Section 4.3 (Dust from Material Movement).

   Grading miles are calculated as As/Wb × 43,560 square feet/acre ÷ 5,280 ft/mile,
   where As = acres to be graded and Wb =blade width (feet),
   assumed in the CalEEMod Version 2011.1.1 program to be 12 feet (based on a Caterpillar 140 motor grader).

4. Material handling based on similar construction project in San Joaquin Valley APCD.
   It is assumed that packed earth has a density of 2,730 pounds/cubic yard. Source: Department of Resources Recycling and Recovery, Construction/Demolition and Inert Debris (CDI) Tools and Resources: Calculations, available at www.calrecycle.ca.gov/SWFacilities/CDI/Tools/Calculations.htm. Loose/dry earth is reported to have a density of 2,100 pounds per cubic yard, and an additional 30% when compacted (or 2,730 pounds/cubic yard).

Table E.5-6 Material Movement Emissions

5. Conversion factors:
   43,560 square feet/acre
   5,280 feet/mile

   24 feet wide construction area
   12 feet grader blade width
   0.046 ton of construction debris per square foot (CalEEMod User's Guide, Appendix A)
   2,000 pounds/ton

Grading Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.6	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.031	--
Mean vehicle speed	EPA AP-42 Table 11.9-1	S	7.1	miles/hour
Grading		PM_{10}:	1.543	lb/mile
		$PM_{2.5}$:	0.167	lb/mile

$$Ef_{PM_{10}} = k \times 0.051 \times (S)^{2.0}$$

$$Ef_{PM_{2.5}} = k \times 0.040 \times (S)^{2.5}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and S.

Bulldozing Emission Factors

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.75	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.105	--
Silt content (overburden)	EPA AP-42 Table 11.9-1	s	6.9	%
Moisture content (overburden)	EPA AP-42 Table 11.9-1	M	7.9	%
Bulldozing		PM_{10}:	0.753	lb/hour
		$PM_{2.5}$:	0.414	lb/hour

$$Ef_{PM_{10}} = k \times \frac{1.0 \times (s)^{1.5}}{(M)^{1.4}}$$

$$Ef_{PM_{2.5}} = k \times \frac{5.7 \times (s)^{1.2}}{(M)^{1.3}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and the AP-42 default values for overburden are used for s and M.

Table E.5-6 Material Movement Emissions

Material Handling (Truck Loading/Unloading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	4.92	miles/hour
Moisture content (cover)	EPA AP-42 Table 13.2.4-1	M	12	%
Material Handling		PM_{10}:	8.93E-05	lb/ton
		$PM_{2.5}$:	1.35E-05	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.

Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 values are used for k and the AP-42 default value for municipal solid waste landfill cover is used for M.

Per CalEEMod User's Guide, Appendix D (Default Data Tables), Table 1.1 (Weather Data), a mean wind speed of 2.2 meters/second (m/s) is used for Contra Costa County.

Conversion factors to convert 2.2 m/s to miles/hour:

1,609.3 meters/mile
60 seconds/minute
60 minutes/hour

Demolition Debris Handling (Mechanical Dismemberment/Truck Loading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	5.00	miles/hour
Moisture content	EPA AP-42 Table 13.2.4-1	M	2	%
Demolition Debris Handling		PM_{10}:	1.12E-03	lb/ton
		$PM_{2.5}$:	1.70E-04	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.

The CalEEMod User's Guide, Appendix A, Section 4.4 recommends the AP-42 equation be used for mechanical dismemberment, using the default wind speed of 5 miles/hour and a moisture content of 2 percent.

AP-42 Section 13.2.3 (Heavy Construction Operations) Table 13.2.3-1 (Recommended Emission Factors for Construction Operations) also recommends the emission equation from AP-42 Section 13.2.4 be used for loading of construction debris into trucks.

Table E.5-7 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Access Road			
Total Emissions (Tons)	2.18 acres	2.62 lb/acre	0.003
Average Daily Emissions (Pounds/Day)			0.023

Notes:
1. Source for the ROG emission factor: CalEEMod User's Guide, Appendix A, Section 4.8 (Asphalt Paving Off-Gassing Emissions).
2. Average daily emissions are calculated by assuming:
   49 week construction period
   5 construction work days/week

3. Conversion factors:
   2,000 pounds/ton
   43,560 square feet/acre
   5,280 feet/mile
   24 feet wide roadway

Table E.5-8 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Final Coat	5,000 sq ft	250 grams/liter	2.09 lb/gallon	0.03
Total Emissions (Tons)				**0.03**
Average Daily Emissions (Pounds/Day)				**0.24**

Notes:

1. Source for VOC coating limits: BAAQMD Rule 8-3, Table 1.

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

   E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
   E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. It is assumed that 5,000 square feet of industrial surfaces will be coated during construction of the non-rail portions of the project.

4. Average daily emissions are calculated by assuming:
   49 week construction period
   5 construction work days/week

5. Conversion factors:
   2,000 pounds/ton

Table E.5-9 Off-Road Engine Emissions Factors for BAAQMD

			Emission Factors													
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Air Compressors	78	Diesel	0.002246	0.002066	0.002472	0.172463	0.002988	0.967385	0.000067	0.000050	0.000074	0.000012	0.000017	0.000035	0.000072	lb/hp-hr
Concrete/Industrial Saws	81	Diesel	0.001571	0.001445	0.001729	0.118193	0.002499	1.347028	0.000093	0.000070	0.000103	0.000016	0.000020	0.000035	0.000072	lb/hp-hr
Cranes	231	Diesel	0.000164	0.000198	0.000236	0.001120	0.002191	0.335003	0.000091	0.000084	0.000091	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Excavators	158	Diesel	0.000126	0.000153	0.000182	0.002593	0.001264	0.444577	0.000062	0.000057	0.000062	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Forklifts	89	Diesel	0.000117	0.000142	0.000169	0.001611	0.001332	0.233562	0.000082	0.000076	0.000082	0.000002	0.000002	0.000035	0.000072	lb/hp-hr
Generator Sets	84	Diesel	0.000086	0.000104	0.000123	0.002505	0.001056	0.352083	0.000082	0.000075	0.000082	0.000003	0.000003	0.000035	0.000072	lb/hp-hr
Graders	187	Diesel	0.000213	0.000257	0.000306	0.001157	0.002926	0.475813	0.000097	0.000090	0.000097	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Off-Highway Trucks	402	Diesel	0.000131	0.000158	0.000189	0.001021	0.001137	0.444622	0.000041	0.000038	0.000041	0.000004	0.000004	0.000029	0.000061	lb/hp-hr
Other Construction Equipment	172	Diesel	0.000211	0.000255	0.000304	0.002890	0.002524	0.481549	0.000132	0.000121	0.000132	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Pavers	130	Diesel	0.000156	0.000189	0.000225	0.002753	0.001847	0.484353	0.000088	0.000081	0.000088	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Paving Equipment	132	Diesel	0.000150	0.000181	0.000216	0.002433	0.001671	0.412464	0.000088	0.000081	0.000088	0.000004	0.000003	0.000033	0.000070	lb/hp-hr
Rollers	80	Diesel	0.000190	0.000230	0.000273	0.002834	0.002422	0.436737	0.000133	0.000122	0.000133	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Rubber Tired Dozers	247	Diesel	0.000363	0.000439	0.000523	0.002741	0.004824	0.461076	0.000217	0.000200	0.000217	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Rubber Tired Loaders	203	Diesel	0.000138	0.000166	0.000198	0.000957	0.001629	0.419957	0.000055	0.000050	0.000055	0.000004	0.000003	0.000033	0.000070	lb/hp-hr
Tractors/Loaders/Backhoes	97	Diesel	0.000154	0.000186	0.000221	0.002839	0.001910	0.430420	0.000092	0.000085	0.000092	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Welders	46	Diesel	0.001470	0.001352	0.001618	0.098755	0.002295	0.880660	0.000061	0.000046	0.000067	0.000011	0.000014	0.000038	0.000080	lb/hp-hr

Notes:

1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
   Region: Bay Area AQMD
   Calendar Year: 2022, 2023, and 2024
   Scenario: All Adopted Rules - Exhaust
   Vehicle Classification: OFFROAD2017 Equipment Types
   Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	**N2O (g/gallon)**	**CH4 (g/gallon)**
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Original factors converted to g/gallon fuel using fuel density defaults from US Inventory of Greenhouse Gas Emissions and Sinks 1990-2017 (April 2019) Annex 6.5

Distillate:	1 metric ton	7.46	barrels
	1 metric ton	1.1023	short ton
	1 short ton	2000	pounds
	1 barrel	42	gallons
		7.04	**lb/gal**

Table E.5-10 On-Road Motor Vehicle Emissions Factors for BAAQMD

Exhaust Source	Vehicle Class	Fuel	EMFAC Category		Units	Emission Factors POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00005	0.00345	0.00188	0.00030	0.00029	0.00002	2.11322	0.00000	0.00033
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00682	0.00000	0.00000	0.00454	0.00001	1.33939	0.00001	0.00021
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00010	0.00553	0.00190	0.00032	0.00062	0.00003	3.26886	0.00000	0.00051
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00482	0.05958	0.00003	0.00002	0.06949	0.00012	12.37961	0.00022	0.00195
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00009	0.00054	0.00009	0.00030	0.00001	0.60998	0.00000	0.00010
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00130	0.00001	0.56160	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for BAAQMD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed January 18, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):

Variable	Road Type	ADT	Reference	Symbol	Value	Unit	PM_{10}	$PM_{2.5}$
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		
Paved Road Dust Entrainment								

$$Ef = k(sL)^{0.91} \times W^{1.02}$$

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Table E.6-1a. Average Daily Construction Emissions Summary.

SJVAPCD Terminal Construction

	Criteria Pollutant Emissions (lb/day)						GHG Emissions (Metric Tons/day)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	6.99	0.01	6.90	0.73	0.35	0.32	NA			
On-road Motor Vehicles	15.37	0.07	6.61	0.64	4.23	0.77	NA			
Fugitive PM from Material Movement					1.92	1.01	NA			
Asphalt Paving Offgassing				0.01			NA			
Architectural Coating Offgassing				1.22			NA			
Average Daily Onsite Emissions (lb/day)	**22.36**	**0.08**	**13.51**	**2.60**	**6.50**	**2.10**	NA			
SJVAPCD Significance Threshold:	NA	NA	NA	NA	NA	NA	NA			

Table E.6-1b. Total Construction Emissions Summary.

SJVAPCD Terminal Construction

	Criteria Pollutant Emissions (Tons)						GHG Emissions (Metric Tons/Year)			
Construction Component	**NOx**	**SO2**	**CO**	**POC**	**PM10**	**PM2.5**	**CO2**	**CH4**	**N2O**	**CO2e**
Off-road Diesel Construction Equipment	1.66	0.00	1.64	0.17	0.08	0.08	260.50	0.02	0.05	275.15
On-road Motor Vehicles	3.65	0.02	1.57	0.15	1.00	0.18	1574.76	0.01	0.22	1643.06
Fugitive PM from Material Movement					0.46	0.24				
Asphalt Paving Offgassing				0.00						
Architectural Coating Offgassing				0.29						
Total Construction Emissions	**5.31**	**0.02**	**3.21**	**0.62**	**1.54**	**0.50**	**1835.27**	**0.03**	**0.27**	**1918.21**
SJVAPCD Significance Threshold:	10	27	100	10	15	15	NA	NA	NA	NA
Threshold Exceeded?	No	No	No	No	No	No				

Notes:

1. Project duration estimate for the SJVAPCD Terminal Construction: 475 days
2. Source for criteria pollutant significance thresholds: Air Quality Thresholds of Significance - Criteria Pollutants, San Joaquin Valley Air Pollution Control District, March 2015.
3. Conversion factors:
   Global warming potential for methane: 21
   Global warming potential for nitrous oxide: 310

Table E.6-2a. Off-Road Diesel Construction Equipment - Rail Spur Construction Emissions

	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units per Week	Number of Days	Hours per Day	Criteria Pollutant Emissions (Ton/Project) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	GHG Emissions (MT/Project) CO_2	CH_4	N_2O	CO_2e
	Air Compressors	Air Compressors	78	0.48	1	60	4	0.00	0.02	0.00	0.00	0.02	0.00	2.45	0.00	0.00	2.55
	Cranes	Cranes	231	0.29	1	60	2	0.00	0.01	0.00	0.00	0.00	0.00	1.22	0.00	0.00	1.30
	Graders	Graders	187	0.41	3	40	6	0.01	0.09	0.00	0.00	0.03	0.00	11.91	0.00	0.00	12.47
	Off-Highway Trucks	Off-road Trucks (Haul)	402	0.38	4	45	3	0.01	0.06	0.00	0.00	0.04	0.00	16.64	0.00	0.00	17.36
	Rollers	Rollers	80	0.38	3	50	2	0.00	0.01	0.00	0.00	0.01	0.00	1.81	0.00	0.00	1.90
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4	2	38	4	0.01	0.08	0.00	0.00	0.04	0.00	6.20	0.00	0.00	6.50
	Rubber Tired Loaders	Rubber Tired Loaders	203	0.36	3	50	4	0.00	0.04	0.00	0.00	0.02	0.00	8.35	0.00	0.00	8.79
	Other Construction Equipment	Other - Ballast Tamper	340	0.42	1	15	8	0.00	0.02	0.00	0.00	0.02	0.00	3.74	0.00	0.00	3.92
	Other Construction Equipment	Other - Ballast Regulator	326	0.42	1	15	8	0.00	0.02	0.00	0.00	0.02	0.00	3.59	0.00	0.00	3.75
			Project Total:					**0.04**	**0.35**	**0.01**	**0.01**	**0.23**	**0.00**	**55.91**	**0.00**	**0.01**	**58.54**

Table E.6-2b. Off-Road Diesel Construction Equipment - Non-Rail Spur Construction Emissions

	Category	Representative Equipment Model	Avg HP	Load Factor	Number of Units	Number of Days per Unit	Hours per Day	Criteria Pollutant Emissions (Ton/Project) POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO2	GHG Emissions (MT/Project) CO_2	CH_4	N_2O	CO_2e
	Air Compressors	Air Compressors	78	0.48	1	20	6	0.00	0.01	0.00	0.00	0.01	0.00	1.23	0.00	0.00	1.27
	Concrete/Industrial Saws	Concrete/Industrial Saws	81	0.73	1	20	8	0.00	0.03	0.00	0.00	0.03	0.00	3.97	0.00	0.00	4.07
	Cranes	Cranes	231	0.29	1	370	7	0.02	0.21	0.01	0.01	0.10	0.00	26.36	0.00	0.01	28.12
	Excavators	Excavators	158	0.38	5	26	8	0.01	0.05	0.00	0.00	0.08	0.00	12.59	0.00	0.00	13.22
	Forklifts	Forklifts	89	0.2	3	370	8	0.01	0.12	0.01	0.01	0.13	0.00	16.75	0.00	0.01	18.41
	Generator Sets	Generator Sets	84	0.74	1	370	8	0.01	0.11	0.01	0.01	0.24	0.00	29.07	0.00	0.01	31.00
	Graders	Graders	187	0.41	1	35	8	0.00	0.04	0.00	0.00	0.01	0.00	4.63	0.00	0.00	4.85
	Pavers	Pavers	130	0.42	2	20	8	0.00	0.02	0.00	0.00	0.02	0.00	3.84	0.00	0.00	4.01
	Paving Equipment	Paving Equipment	132	0.36	2	20	8	0.00	0.01	0.00	0.00	0.02	0.00	2.84	0.00	0.00	3.00
	Rollers	Rollers	80	0.38	2	20	8	0.00	0.01	0.00	0.00	0.01	0.00	1.93	0.00	0.00	2.03
	Rubber Tired Dozers	Rubber Tired Dozers	247	0.4	6	18	8	0.02	0.22	0.01	0.01	0.11	0.00	17.35	0.00	0.00	18.19
	Tractors/Loaders/Backhoes	Tractors/Loaders/Backhoes	97	0.37	9	136	8	0.04	0.37	0.02	0.02	0.50	0.00	68.36	0.01	0.01	72.05
	Welders	Welders	46	0.45	1	370	8	0.02	0.12	0.01	0.01	0.14	0.00	15.67	0.00	0.00	16.38
			Project Total:					**0.14**	**1.31**	**0.07**	**0.06**	**1.41**	**0.00**	**204.60**	**0.02**	**0.04**	**216.61**
			Total Off-Road Emissions:					**0.17**	**1.66**	**0.08**	**0.08**	**1.64**	**0.00**	**260.50**	**0.02**	**0.05**	**275.15**

Notes:
1. Source for Equipment Load Factors and Average HP: Load factors and HP are based on *California Emissions Estimator Model (CalEEMod) User's Guide,* Appendix D, October 2017, Table 3.3 (OFFROAD Default Horsepower and Load Factors).
2. Source for emission factors: CARB OFFROAD 2017 - Orion Database. https://www.arb.ca.gov/orion/
3. Rail construction duration, resources, and hours are based on the Derivation of Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule table, documented separately.
4. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton

Table E.6-3a. On-Road Construction Equipment - Rail Spur Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	17	240	20	4,800	0.00	0.00	0.02	0.00	0.05	0.00	21.50	0.00	0.00	21.61
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	17	240	40	9,600	0.03	0.71	0.16	0.03	0.21	0.00	271.55	0.00	0.04	284.81
				Project Total:					**0.03**	**0.72**	**0.18**	**0.03**	**0.27**	**0.00**	**293.05**	**0.00**	**0.04**	**306.42**

Table E.6-3b. On-Road Construction Equipment - Non-Rail Spur Construction Emissions

	Category	Representative Equipment Model	Fuel	EMFAC Category	Number of Vehicles	Total Project Trips	Trip Length Two-Way	Round Trip Miles/Project	Criteria Pollutant Emissions (Ton/Project)						GHG Emissions (MT/Project)			
									POC	NOx	PM_{10}	$PM_{2.5}$	CO	SO_2	CO_2	CH_4	N_2O	CO_2e
	Passenger Car	Class 1 Light Duty Vehicle (< 8,500 lbs GVWR)	Gasoline	LDA	70	475	20	9,500	0.01	0.03	0.18	0.03	0.44	0.00	175.19	0.00	0.00	176.10
	Other Construction Trucks	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	35	475	40	19,000	0.12	2.91	0.65	0.12	0.87	0.01	1,106.52	0.00	0.17	1,160.54
				Month Total:					**0.12**	**2.93**	**0.82**	**0.15**	**1.30**	**0.01**	**1,281.71**	**0.01**	**0.18**	**1,336.64**
				Total On-Road Emissions:					**0.15**	**3.65**	**1.00**	**0.18**	**1.57**	**0.02**	**1,574.76**	**0.01**	**0.22**	**1,643.06**

Notes:

1. EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2021-2023 emission estimates for SJVAPCD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed January 20, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)
2. Rail construction duration, resources, and hours are based on the Derivation of Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule table, documented separately.

3. Conversion factors:
   - Global warming potential for methane: 21
   - Global warming potential for nitrous oxide: 310
   - 2,000 pounds/ton
   - 0.45359 kilograms/pound)
   - 1,000 kilograms/metric ton
   - 88 week construction period
   - 5 construction work days/week

Table E.6-4 Material Movement Emissions

Fugitive Particulate Matter Emissions from Material Movement.

Material Movement Component	Emission Factors PM_{10}	Emission Factors $PM_{2.5}$	Activity Indicator	Emissions (Tons) PM_{10}	Emissions (Tons) $PM_{2.5}$
Grading	1.543 lb/mile	0.167 lb/mile	21.6 miles	0.02	0.00
Bulldozing	0.753 lb/hour	0.414 lb/hour	1,140 hours	0.43	0.24
Material Handling	1.17E-04 lb/ton	1.76E-05 lb/ton	129,114 tons	0.01	0.00
Demolition Debris Handling	1.12E-03 lb/ton	1.70E-04 lb/ton	4,600 tons	0.00	0.00
Total Emissions (Tons)				0.46	0.24
Average Daily Emissions (Pounds/Day)				1.92	1.01

Activity Grading	Phase Description	Activity Indicator Initial	Activity Indicator Target	Notes
Rail Construction - Phase 2	Clear Land - Install Drainage	3.8 acres	2.60 miles	
Rail Construction - Phase 3	Prepare Sub-grade	3.8 acres	2.60 miles	
Rail Construction - Phase 4	Lay Sub-ballast	3.8 acres	2.60 miles	
Non-Rail Construction - Ph. 4	Grading	20. acres	13.80 miles	
	Total		**21.60 miles**	

Activity Bulldozing	Phase Description	Activity Indicator Initial	Activity Indicator Target	Notes
Rail Construction - Phase 2	Install Erosion Controls/Clear & Grub		120 hours	From rail constr. schedule
Rail Construction - Phase 3	Prepare Sub Grade		180 hours	From rail constr. schedule
Non-Rail Construction - Ph. 2	Demolition		320 hours	From non-rail constr. schedule
Non-Rail Construction - Ph. 3	Site Preparation		240 hours	From non-rail constr. schedule
Non-Rail Construction - Ph. 4	Grading		280 hours	From non-rail constr. schedule
	Total		**1,140 hours**	

Activity Material Handling	Phase Description	Activity Indicator Initial	Activity Indicator Target	Notes
Rail Construction - Phase 3	Prepare Sub-grade	25,116 tons earth	100,464 tons	4 movements required
Rail Construction - Phase 4	Lay Sub-ballast	2,773 tons ballast	5,546 tons	2 movements required
Rail Construction - Phase 5	Place Bottom Ballast	2,355 tons ballast	4,711 tons	2 movements required
Rail Construction - Phase 6	Lay/Install Track Work and Top Ballast	1,553 tons ballast	3,106 tons	2 movements required
Non-Rail Construction - Ph. 4	Grading (Sub-grade)	1,911 tons earth	7,644 tons	4 movements required
Non-Rail Construction - Ph. 5	Construction (Footings)	3,822 tons earth	7,644 tons	2 movements required
	Total	**166,644 tons**	**129,114 tons**	

Table E.6-4 Material Movement Emissions

Activity		Activity Indicator		Notes
Demolition Debris Handling	**Phase Description**	**Initial**	**Target**	
Non-Rail Construction - Ph. 2	Mechanical Dismemberment	100,000 sq ft	4,600 tons	Demolition debris
Non-Rail Construction - Ph. 2	Demolition Debris Loading	100,000 sq ft	4,600 tons	Demolition debris
	Max	**100,000**	**4,600 tons**	

Notes:
1. Average daily emissions are calculated by assuming:
   95 week construction period
   5 construction work days/week

1. Grading for the entire length of the rail corridor is anticipated during three phases as indicated above. Acres to be graded assumes the rail construction corridor is 24 feet wide. Acres to be graded for the non-rail portion of the project is documented in the Non-Rail Construction Schedule, presented separately.

2. Miles traveled for site grading is based on the analytical approach suggested in *California Emissions Estimator Model User's* Guide (Version 2011.1) (CalEEMod User's Guide), ENVIRON International Corporation (for South Coast Air Quality Management District), February 2011, Appendix A (Calculation Details for CalEEMod), Section 4.3 (Dust from Material Movement).

   Grading miles are calculated as As/Wb × 43,560 square feet/acre ÷ 5,280 ft/mile,
   where As = acres to be graded and Wb =blade width (feet),
   assumed in the CalEEMod Version 2011.1.1 program to be 12 feet (based on a Caterpillar 140 motor grader).

3. Bulldozer hours are based on information presented in the Rail Terminal Construction Schedule and the Non-Rail Construction Schedule tables, documented separately.

4. Rail Construction material handling tons are based on information presented in the Rail Terminal Construction Materials table, presented separately. Under Prepare Sub-grade, it is expected that earth along the length of the rail corridor will be excavated for recompaction, resulting in four movements for each ton of earth excavated. For the other phases, it is expected that ballast will be loaded into trucks for offloading within the rail corridor, resulting in two movements for each ton of ballast.

5. Non-Rail Material handling based on similar construction project in San Joaquin Valley APCD.
   It is assumed that packed earth has a density of 2,730 pounds/cubic yard. Source: Department of Resources Recycling and Recovery, Construction/Demolition and Inert Debris (CDI) Tools and Resources: Calculations, available at www.calrecycle.ca.gov/SWFacilities/CDI/Tools/Calculations.htm. Loose/dry earth is reported to have a density of 2,100 pounds per cubic yard, and an additional 30% when compacted (or 2,730 pounds/cubic yard).

6. Demolition debris handling assumes that 100,000 square feet of structures will be mechanically dismembered, and the resulting debris will be loaded onto haul trucks for disposal.

7. Conversion factors:
   43,560 square feet/acre
   5,280 feet/mile
   6,900 linear feet of rail line to be constructed
   24 feet wide construction area
   12 feet grader blade width
   0.046 ton of construction debris per square foot (CalEEMod User's Guide, Appendix A)
   2,000 pounds/ton

Grading Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.6	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.031	--
Mean vehicle speed	EPA AP-42 Table 11.9-1	S	7.1	miles/hour
Grading		PM_{10}:	1.543	lb/mile
		$PM_{2.5}$:	0.167	lb/mile

$$Ef_{PM_{10}} = k \times 0.051 \times (S)^{2.0}$$

$$Ef_{PM_{2.5}} = k \times 0.040 \times (S)^{2.5}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and S.

Bulldozing Emission Factors

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 11.9-1	k	0.75	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 11.9-1	k	0.105	--
Silt content (overburden)	EPA AP-42 Table 11.9-1	s	6.9	%
Moisture content (overburden)	EPA AP-42 Table 11.9-1	M	7.9	%
Bulldozing		PM_{10}:	0.753	lb/hour
		$PM_{2.5}$:	0.414	lb/hour

$$Ef_{PM_{10}} = k \times \frac{1.0 \times (s)^{1.5}}{(M)^{1.4}}$$

$$Ef_{PM_{2.5}} = k \times \frac{5.7 \times (s)^{1.2}}{(M)^{1.3}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 11.9 Western Surface Coal Mining, Table 11.9-1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 default values are used for k and the AP-42 default values for overburden are used for s and M.

Table E.6-4 Material Movement Emissions

Material Handling (Truck Loading/Unloading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	6.04	miles/hour
Moisture content (cover)	EPA AP-42 Table 13.2.4-1	M	12	%
Material Handling		PM_{10}:	1.17E-04	lb/ton
		$PM_{2.5}$:	1.76E-05	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
Per the CalEEMod User's Guide, Appendix A, Section 4.3, AP-42 values are used for k and the AP-42 default value for municipal solid waste landfill cover is used for M.
Per CalEEMod User's Guide, Appendix D (Default Data Tables), Table 1.1 (Weather Data), a mean wind speed of 2.7 meters/second (m/s) is used for San Joaquin Valley.
Conversion factors to convert 2.7 m/s to miles/hour:
1,609.3 meters/mile
60 seconds/minute
60 minutes/hour

Demolition Debris Handling (Mechanical Dismemberment/Truck Loading) Emission Factors.

Variable	Reference	Symbol	Value	Unit
PM_{10} particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.35	--
$PM_{2.5}$ particle size multiplier	EPA AP-42 Table 13.2.4-1	k	0.053	--
Mean wind speed	CalEEMod 2011.1.1 default	U	5.00	miles/hour
Moisture content	EPA AP-42 Table 13.2.4-1	M	2	%
Demolition Debris Handling		PM_{10}:	1.12E-03	lb/ton
		$PM_{2.5}$:	1.70E-04	lb/ton

$$Ef = k \times 0.0032 \times \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Source: U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors* (AP-42), Section 13.2.4 Aggregate Handling And Storage Piles, Equation 1.
The CalEEMod User's Guide, Appendix A, Section 4.4 recommends the AP-42 equation be used for mechanical dismemberment, using the default wind speed of 5 miles/hour and a moisture content of 2 percent.
AP-42 Section 13.2.3 (Heavy Construction Operations) Table 13.2.3-1 (Recommended Emission Factors for Construction Operations) also recommends the emission equation from AP-42 Section 13.2.4 be used for loading of construction debris into trucks.

Table E.6-5 Asphalt Paving Offgassing Emissions

Component	Paved Acres	POC Emission Factor	POC Emissions (Tons)
Access Road to rail spur Total Emissions (Tons)	2.18 acres	2.62 lb/acre	0.003
Average Daily Emissions (Pounds/Day)			0.012

Notes:
1. Source for the ROG emission factor: CalEEMod User's Guide, Appendix A, Section 4.8 (Asphalt Paving Off-Gassing Emissions).
2. Average daily emissions are calculated by assuming:
   95 week construction period
   5 construction work days/week

3. Conversion factors:
   2,000 pounds/ton
   43,560 square feet/acre
   5,280 feet/mile
   24 feet wide roadway

Table E.6-6 Architectural Coating Offgassing Emissions

Component	Volume Coating Applied	POC Coating Limit	POC Emission Factor	POC Emissions (Tons)
Industrial Surfaces				
Final Coat	50,000 sq ft	250 grams/liter	2.09 lb/gallon	0.29
Total Emissions (Tons)				**0.29**
Average Daily Emissions (Pounds/Day)				**1.22**

Notes:

1. Source for VOC coating limit: San Joaquin Valley Air Pollution Control District Rule 4601 (Architectural Coatings), Table 1 VOC Content Limits for Coatings, for Industrial Maintenance Coatings (Amended 4/16/20).

2. ROG emission factor calculated per CalEEMod User's Guide, Appendix A, Section 4.7 (Architectural Coatings):

E_{FAC} = Coating VOC Limit (grams/liter) × 1/453.59 grams/pound × 3.785 liters/gallon × 1 gallon/180 sq. ft.
E_{FAC} is multiplied by 1,000 to produce an emission factor in pounds per 1,000 square feet.

3. It is assumed that 50,000 square feet of industrial surfaces will be coated during construction of the rail and non-rail portions of the project.

4. Average daily emissions are calculated by assuming:
95 week construction period
5 construction work days/week

5. Conversion factors:
2,000 pounds/ton

Table E.6-7. Derivation of Rail Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule.

Port of Everett Rail Spur Project Construction Schedule (2,200 linear feet of rail track).

struction Phase	Category	Air Compressors	Cranes	Graders	Off-Highway Trucks	Off-Highway Trucks	Rollers	Rubber Tired Dozers	Rubber Tired Loaders	Other Construction Equipment	Other Construction Equipment
1 Stage Equipment/Supplies											
2 Install Erosion Controls/Clear & Grub	2 weeks			1	1			1	1		
3 Prepare Sub Grade	3 weeks			1	1		1	1			
4 Lay Sub Ballast	3 weeks			1	1		1				
5 Place Bottom Ballast	4 weeks				1		1		1		
6 Lay Track Work and Top Ballast	4 weeks	1	1						1	1	
Operating Hours/Day per Item		4	2	6	3		2	4	4	8	
Operating Days per Item		20	20	40	60		50	25	50	20	
Total Operating Hours per Item		80	40	240	180		100	100	200	160	

Notes:

1. Source for schedule: *Technical Memorandum: An Assessment of the Air Quality and Noise Impacts from the Port of Everett Rail Spur Project* , Weston Solutions, Inc. (for Port of Everett), May 15, 2009, pages 5-6, available at www.portofeverett.com/docs/docs-_129570-v1-air___noise_technical_memo.pdf (accessed July 13, 2012).
2. According to the report, the above construction schedule assumes construction over a 16-week (80-day) period.
3. The Port of Everett Rail Spur Project construction schedule does not include phases for staging/demobilizing equipment and supplies, nor does it include a water truck or ballast regulator.

Off-Site SJVAPCD Terminal Project Construction Schedule (6,900 linear feet of rail).

Construction Phase	Category	Air Compressors	Cranes	Graders	Off-Highway Trucks	Off-Highway Trucks	Rollers	Rubber Tired Dozers	Rubber Tired Loaders	Other Construction Equipment	Other Construction Equipment
1 Stage Equipment/Supplies											
2 Install Erosion Controls/Clear & Grub	6 weeks			1	1			1	1		
3 Prepare Sub Grade	9 weeks			1	1		1	1			
4 Lay Sub Ballast	9 weeks			1	1		1				
5 Place Bottom Ballast	12 weeks				1		1		1		
6 Lay Track Work and Top Ballast	12 weeks	1	1						1		
7 Tamp/Finish Top Ballast and Inspect	3 weeks									1	1
Hours per Day Per Unit:		4	2	6	3		2	4	4	8	8
Operating Days per Item		60	60	120	180	0	150	75	150	15	15
Total Operating Hours per Item		240	120	720	540	0	300	300	600	120	120

Notes:

1. Task duration determined based on the schedule necessary to accomplish contruction of the rail spurs at the terminal within 4 months (16 weeks).
2. Equipment/supplies staging anticipated to take one week in advance of land clearing activities.
3. It is anticipated that construction of the rail spurs needed at the Off-Site termianl to complete transfer of the animal fats and vegetable oils will comprise 6,900 linear feet of rail track (all assumed to be new track).
4. Given the assumed use of automated ballast tamping and finishing equipment, tamping and finishing is listed separately from track laying, and assumes use of the following equipment:
   - Plasser American 09-16 C.A.T. (continuous action tamper) speed of 24 ties/minute, horsepower rating of 340 HP.
   - Plasser American SSP-203 Ballast Regulator, horsepower rating of 326 HP (assumed operating speed twice as fast as the 09-16 C.A.T.)
5. Required tamping time calculated as follows:

- Feet of rail	6,900
- Tie spacing (inches, BNSF industrial manual)	21.5
- Tie spacing (feet)	1.79
- Total ties needed	3,852
- Ties/minute (Plasser American 09-16 C.A.T.)	24
- Tamping time (minutes, calculated)	161
- Tamping time (hours, calculated - rounded up)	3.00

6. In addition to the equipment listed in the Port Everett schedule, it is assumed a water truck (shared with the non-rail construction) will be used for dust suppression.
7. Operating hours per day and the quantity of each item used per day was adjusted as necessary such that total operating hours per item equaled the scaled total operating hours per item.

Port of Everett:	2,200	linear feet
Off-Site Terminal (SJVAPCD)	6,900	linear feet
Ratio:	3	

Table E.6-8. Rail Construction Materials.

Rail Ballast.

Category	Cross-Sectional Area		Rail Track	Ballast Required		
	Inches	Feet	Construction	Cubic Feet	Cubic Yards	Tons
Top Ballast						
Top Ballast (Gross)	924 square inches	6.42 square feet	6,900 feet	44,275 cubic feet	1,640 cubic yards	
Less Rail Ties	6,426 cubic inches	3.72 cubic feet	3,852 ties	14,325 cubic feet	531 cubic yards	
Net Top Ballast					1,109 cubic yards	1,553 tons
Bottom Ballast	948 square inches	6.58 square feet	6,900 feet	45,425 cubic feet	1,682 cubic yards	2,355 tons
Sub-ballast	1,116 square inches	7.75 square feet	6,900 feet	53,475 cubic feet	1,981 cubic yards	2,773 tons
Totals:						
Tons						6,681 tons
20-ton Truck Loads						335 loads

Notes:

1. Source for cross-sectional area for top ballast (gross), bottom ballast, and sub ballast and rail tie volume data: *Design Guidelines for Industrial Track Projects, BNSF Railway Company, Revised December 2011, page A-10.*
2. Source for linear feet of rail track construction and required rail ties: Derivation of Off-Site Terminal Rail Spur Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
3. Conversion factor: 1.4 tons/cubic yard of railroad ballast. Source: Concrete Materials Company, www.concretematerialscompany.com/aggregate/, 2 1/2" x 3/4" Railroad Ballast (accessed September 21, 2012).
4. Truck loads assume standard average on-road 20-ton loads.
5. Assume that off-highway haul trucks used during Rail Construction Phases 4 and 5 account for hauling ballast to the site.

Excavation of Earth.

Category	Cross-Sectional Area		Rail Track	Excavated Earth		
	Inches	Feet	Construction	Cubic Feet	Cubic Yards	Tons
Packed Earth	10,368 square inches	72.00 square feet	6,900 feet	496,800 cubic feet	18,400 cubic yards	25,116 tons

Notes:

1. Source for cross-sectional area for earth excavation: *Design Guidelines for Industrial Track Projects, BNSF Railway Company, Revised December 2011.*
2. Source for linear feet of rail track construction: Derivation of BWC Terminal Rail Spur Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
3. Conversion factor: 2,730 pounds (1.365 tons)/cubic yard of packed earth. Source: Department of Resources Recycling and Recovery, Construction/Demolition and Inert Debris (CDI) Tools and Resources: Calculations, available at www.calrecycle.ca.gov/SWFacilities/CDI/Tools/Calculations.htm. Loose/dry earth is estimated to have a density of 2,100 pounds per cubic yard, plus an additional 30% when compacted (or 2,730 pounds/cubic yard).

Rail.

Track Linear Feet	Rail Linear Feet	39-Ft. Sections	Weight/Yard	Weight/Rail Section	Sections/Truck Load	Truck Loads
6,900 feet	13,800 feet	354 sections	112 pounds	0.73 tons/section	27 sections/load	14

Notes:

1. Source for linear feet of track construction: Derivation of Off-Site Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
2. Per *Design Guidelines for Industrial Track Projects* , BNSF Railway Company, Revised August 2018, minimum rail length is specified as 39 feet and minimum acceptable track weight is specified as 112 pounds/yard of track.
3. Sections per truck load assume standard average on-road 20-ton flat bed truck loads.

Ties.

Ties Required	Cubic Feet/Tie	Density	Weight/Tie	Ties/Truck Load	Truck Loads
3,852 ties	3.72 cubic feet	30 lbs/cubic foot	111.56 lbs/tie	358 ties/load	11

Notes:

1. Source for required rail ties: Derivation of Off-Site Rail Terminal Construction Schedule Based on Port of Everett (Washington) Rail Spur Project Construction Schedule, documented separately.
2. Source for rail tie volume data: Proposed Off-Site Rail Terminal Assumed Rail Cross-Section (For Calculation of Air Emissions from Rail Construction Activities), documented separately.
3. Ties assumed to be douglas fir, average weight of 30 pounds/cubic foot. Source: Public Domain Databases in the Sciences, "Physical Properties of Common Woods," Oliver Seely, Ph.D., Professor of Chemistry Emeritus, California State University Dominguez Hills, available at www.csudh.edu/oliver/chemdata/woods.htm, accessed September 24, 2012, average of coastal (32 pounds/cubic foot) and mountain varieties of douglas fir (28 pounds/cubic foot).
4. Ties per truck load assume standard average on-road 20-ton flat bed truck loads.

Spikes, Fasteners, and Other Supplies.

Assumed to comprise 20 percent of the weight of the rail sections:	3 truck loads

Table E.6-9 Off-Road Engine Emissions Factors for SJVAPCD

			Emission Factors													
Equipment Category	**CalEEMod Avg HP**	**Fuel**	**HC**	**POC**	**TOG**	**CO**	**NOX**	**CO2**	**PM10**	**PM2.5**	**PM**	**SO2**	**NH3**	**CH4**	**N2O**	**Units**
Aerial Lifts	63	Diesel	0.000060	0.000073	0.000087	0.002152	0.001128	0.358680	0.000024	0.000022	0.000024	0.000003	0.000003	0.000035	0.000072	lb/hp-hr
Air Compressors	78	Diesel	0.000626	0.000745	0.000902	0.005304	0.004370	0.601360	0.000204	0.000187	0.000204	0.000008	0.000005	0.000035	0.000072	lb/hp-hr
Concrete/Industrial Saws	81	Diesel	0.000749	0.000892	0.001079	0.007209	0.006417	0.925813	0.000259	0.000239	0.000259	0.000012	0.000008	0.000035	0.000072	lb/hp-hr
Cranes	231	Diesel	0.000175	0.000212	0.000252	0.001139	0.002418	0.335002	0.000100	0.000092	0.000100	0.000003	0.000003	0.000033	0.000070	lb/hp-hr
Excavators	158	Diesel	0.000137	0.000166	0.000197	0.002595	0.001463	0.444620	0.000071	0.000066	0.000071	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Forklifts	89	Diesel	0.000131	0.000158	0.000188	0.001624	0.001470	0.233571	0.000097	0.000090	0.000097	0.000002	0.000002	0.000035	0.000072	lb/hp-hr
Generator Sets	84	Diesel	0.000103	0.000125	0.000148	0.002563	0.001184	0.348286	0.000099	0.000091	0.000099	0.000003	0.000003	0.000035	0.000072	lb/hp-hr
Graders	187	Diesel	0.000229	0.000277	0.000329	0.001182	0.003267	0.475839	0.000108	0.000100	0.000108	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Off-Highway Tractors	124	Diesel	0.000184	0.000223	0.000265	0.003053	0.002150	0.506752	0.000104	0.000095	0.000104	0.000005	0.000004	0.000033	0.000070	lb/hp-hr
Off-Highway Trucks	402	Diesel	0.000141	0.000170	0.000203	0.001064	0.001343	0.444590	0.000049	0.000045	0.000049	0.000004	0.000004	0.000029	0.000061	lb/hp-hr
Other Construction Equipment	172	Diesel	0.000228	0.000276	0.000328	0.002900	0.002802	0.481580	0.000147	0.000135	0.000147	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Other General Industrial Equipment	88	Diesel	0.000454	0.000549	0.000653	0.003104	0.004302	0.399111	0.000366	0.000336	0.000366	0.000004	0.000003	0.000035	0.000072	lb/hp-hr
Pavers	130	Diesel	0.000172	0.000209	0.000248	0.002756	0.002116	0.484271	0.000102	0.000094	0.000102	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Paving Equipment	132	Diesel	0.000153	0.000186	0.000221	0.002420	0.001781	0.412406	0.000092	0.000085	0.000092	0.000004	0.000003	0.000033	0.000070	lb/hp-hr
Rollers	80	Diesel	0.000209	0.000253	0.000301	0.002851	0.002633	0.436752	0.000152	0.000140	0.000152	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Rough Terrain Forklifts	100	Diesel	0.000097	0.000117	0.000139	0.002851	0.001729	0.468219	0.000047	0.000044	0.000047	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Rubber Tired Dozers	247	Diesel	0.000395	0.000478	0.000569	0.002660	0.005181	0.460937	0.000241	0.000222	0.000241	0.000004	0.000004	0.000033	0.000070	lb/hp-hr
Rubber Tired Loaders	203	Diesel	0.000155	0.000187	0.000223	0.000992	0.001961	0.419861	0.000066	0.000061	0.000066	0.000004	0.000003	0.000033	0.000070	lb/hp-hr
Scrapers	367	Diesel	0.000222	0.000269	0.000320	0.001975	0.002941	0.562345	0.000112	0.000103	0.000112	0.000005	0.000005	0.000029	0.000061	lb/hp-hr
Skid Steer Loaders	65	Diesel	0.000110	0.000134	0.000159	0.002653	0.001775	0.428842	0.000066	0.000060	0.000066	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Tractors/Loaders/Backhoes	97	Diesel	0.000169	0.000204	0.000243	0.002851	0.002100	0.430262	0.000112	0.000103	0.000112	0.000004	0.000004	0.000035	0.000072	lb/hp-hr
Welders	46	Diesel	0.000548	0.000652	0.000789	0.004663	0.004012	0.563795	0.000184	0.000169	0.000184	0.000007	0.000005	0.000038	0.000080	lb/hp-hr

Notes:

1. Data from the OFFROAD2017 (v1.01) Emission Inventory: https://www.arb.ca.gov/orion
2. Region Type: Air District
   Region: San Joaquin Valley APCD
   Calendar Year: 2021, 2022, and 2023
   Scenario: All Adopted Rules - Exhaust
   Vehicle Classification: OFFROAD2017 Equipment Types
   Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

3. Source for CH4 and N_2O emission factors:

The Climate Registry, The Climate Registry's 2020 Default Emission Factors, Table 2.7 (US Default Factors for Calculating CH4 and N20 Emissions from Non-Highway Vehicles) Factors (in kg/gallon or g/gallon are converted to g/bhp-hr by using the brake specific fuel consumption factors described in CARB's Large CI Engine Emission Inventory (https://www.arb.ca.gov/msei/onroad/downloads/pubs/mo9932.zip)

Construction/Mining Equipment:	**N2O (g/gallon)**	**CH4 (g/gallon)**
Diesel Equipment	0.472	0.227
Diesel - Off-Road Trucks	0.495	0.156

Original factors converted to g/gallon fuel using fuel density defaults from US Inventory of Greenhouse Gas Emissions and Sinks 1990-2017 (April 2019) Annex 6.5

Distillate:	1 metric ton	7.46	barrels
	1 metric ton	1.1023	short ton
	1 short ton	2000	pounds
	1 barrel	42	gallons
		7.04	**lb/gal**

Table E.6-10 On-Road Motor Vehicle Emissions Factors for SJVAPCD

						Emission Factors									
Exhaust Source	**Vehicle Class**	**Fuel**	**EMFAC Category**		**Units**	**POC**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
Running	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyRunning	lb/mile	0.00007	0.00393	0.00189	0.00031	0.00034	0.00002	2.19007	0.00000	0.00034
Idle	Class 7 Heavy-Duty Vehicles (26 - 33,000 lbs. GVWR)	Diesel	T6 Heavy	T6 HeavyIdle	lb/vehicle/day	0.00012	0.00703	0.00001	0.00001	0.00452	0.00001	1.36970	0.00001	0.00022
Running	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleRunning	lb/mile	0.00023	0.00719	0.00195	0.00037	0.00096	0.00003	3.36185	0.00001	0.00053
Idle	Class 8a and 8b Heavy-Duty Vehicles (>33,000 lbs. GVWR)	Diesel	T7 Single	T7 SingleIdle	lb/vehicle/day	0.00478	0.06229	0.00004	0.00004	0.06605	0.00012	12.26071	0.00022	0.00193
Running	Light Duty Trucks	Diesel	LDT2	LDT2Running	lb/mile	0.00003	0.00010	0.00054	0.00009	0.00029	0.00001	0.59106	0.00000	0.00009
Idle	Light Duty Trucks	Diesel	LDT2	LDT2Idle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Running	Light Duty Vehicles	Gasoline	LDA	LDARunning	lb/mile	0.00002	0.00008	0.00053	0.00008	0.00131	0.00001	0.58081	0.00000	0.00001
Idle	Light Duty Vehicles	Gasoline	LDA	LDAIdle	lb/vehicle/day	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Notes:

1 EMFAC2017 criteria pollutant and GHG emission factors are derived from the California Air Resources Board's EMFAC2017 2022-2024 emission estimates for SJVAPCD Region. Source: California Air Resources Board, EMFAC2017 Web Database (v1.0.3) (undated), emissions data option, available at www.arb.ca.gov/emfac/2017/ (accessed January 18, 2021). Data reflects the use of aggregated vehicle model years, vehicle speeds, grouped by Road Type)

2 Criteria pollutant emission factors include total emissions for each pollutant. In addition to exhaust emissions, ROG emission factors include emissions from diurnal, hot soak, running losses, and resting losses. PM10 and PM2.5 factors also include emissions from brake wear and tire wear.

3 Conversion factors:
2000 pounds/ton
453.59 grams/pound

4 Equation for calculating on-road vehicle paved road dust entrainment emissions: U.S. Environmental Protection Agency, Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads, Equation 1.
a. Silt loading factors are as defined by EPA, Table 13.2.1-2 of *Compilation of Air Pollutant Emission Factors (AP-42), Section 13.2.1 Paved Roads* . Project assumes vehicle traffic over freeway (LDA and LDT2) and Major Road (T7 Single).
b. Particle size multipliers and average vehicle weight as defined by CARB in Section 7.9 of the Emissions Inventory Guidance Document - Entrained Road Travel, Paved Road Dust (March 2018). https://www.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2018.pdf

On-road Vehicle Paved Road Dust Entrainment Emission Factors (pounds/mile):								
Variable	**Road Type**	ADT	**Reference**	**Symbol**	**Value**	**Unit**	**PM_{10}**	**$PM_{2.5}$**
PM_{10} particle size multiplier			CARB - 2018 EI	k	0.0022	lb/vmt		
$PM_{2.5}$ particle size multiplier			CARB - 2018 EI	k	0.00033	lb/vmt	lb/mile	lb/mile
Road silt loading - Freeway	Freeway	>10,000	EPA - AP42	sL	0.015	g/m^2	5.26E-04	7.88E-05
Road silt loading - Major	Major	5-10,000	EPA - AP42	sL	0.060	g/m^2	1.86E-03	2.78E-04
Road silt loading - Collector	Collector	500 - 5,000	EPA - AP42	sL	0.200	g/m^2	5.55E-03	8.33E-04
Road silt loading - Local	Local	< 500	EPA - AP42	sL	0.600	g/m^2	1.51E-02	2.26E-03
Average vehicle weight			CalTrans WIM	W	10.41	tons		
Paved Road Dust Entrainment							$Ef = k(sL)^{0.91} \times W^{1.02}$	

5 Average vehicle weight based on weight in motion (WIM) monitoring stations installed by CalTrans in regions surrounding the facility's major truck transport routes (Contra Costa, San Joaquin, Alamdea, and Fresno counties). Based on available data from 2019 to establish a reasonable average vehicle weight representative of major roadway sections.

Appendix F

Baseline for Avon and Amorco Terminals

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GROUP

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Martinez Renewable Fuels Project

Establishing the "Baseline" Existing Environmental conditions for the Assessment of Changes to Avon and Amorco Marine Terminal

Prepared for
Tesoro Refining & Marketing Company LLC, an indirect, wholly-owned subsidiary of Marathon Petroleum Corporation

July 2021

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Establishing the "Baseline" Existing Environmental Conditions

July 2021

Contents

1.0 Introduction and Summary

For projects undergoing environmental review pursuant to the California Environmental Quality Act ("CEQA"), agencies must establish an appropriate baseline of existing conditions against which to assess the significance of the project's potential environmental effects. Generally, this requires an identification of physical conditions at the time analysis is commenced.[1] Yet in many circumstances, a point-in-time snapshot can result in misleading or uninformative comparisons. This includes circumstances where environmental conditions change or fluctuate over time or where projected future conditions would yield the most informative analysis. In accord, the CEQA Guidelines afford a lead agency the discretion to identify the best measure of existing conditions in the first instance, provided the agency's choice is supported by substantial evidence.[2]

CEQA establishes similar, but distinct rules where changes are proposed to a project previously subject to environmental review.[3] In these circumstances, the lead agency may look to and rely upon the prior environmental analysis prepared for the project in assessing whether proposed changes involve any new, previously unconsidered significant effects, provided the prior analysis retains informational value.[4] Consistent with this principle, California courts have repeatedly upheld lead agencies' decisions to treat a project analyzed in a prior environmental impact report ("EIR") as part of the "baseline" existing conditions when conducting subsequent CEQA review. As repeated by courts on several occasions, most recently by the Supreme Court, "[t]he event of a change in a project is not an occasion to revisit environmental concerns laid to rest in the original analysis."[5]

The changes proposed by Marathon Petroleum Corporation ("Marathon") to its Amorco and Avon Marine Terminals as part of the Martinez Renewable Fuels Project fall squarely within this framework. Both terminals were recently subject to comprehensive CEQA review in 2014 and 2015 in association with renewal of their State Lands Commission leases for additional 30-year terms through 2044 and 2045. As detailed below, these EIRs remain informative, relevant, and are thus an appropriate starting point for considering any incremental impacts associated with proposed physical and operational changes to the terminals. It is therefore appropriate to rely upon these prior EIRs to establish the baseline for considering such impacts and of no consequence that the proposed changes are being considered within the scope of

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[1] CEQA Guidelines, 14 C.C.R. §15125(a)(1).
[2] *Id.* § 15125.
[3] *See* Pub. Res. Code § 21166. *Communities for a Better Environment v. South Coast Air Quality Management District*, 48 Cal. 4th 310 at 326 (2010) ("*CBE*").
[4] *See Friends of San Mateo Gardens v. San Mateo County Community College District*, 1 Cal. 5th 937 (2016) ("*San Mateo Gardens*").
[5] *Id.* at 949 (quoting *Save Our Neighborhood v. Lishman*, 140 Cal. App. 4th 1288, 1296 (2006)).

environmental review for the broader Martinez Renewable Fuels Project.[6] The basis for these conclusions is detailed below.

[6] *See Sierra Club v. City of Orange*, 163 Cal. App. 4th 523, 541-43 (2008) (traffic analysis from previously reviewed residential development was properly incorporated into environmental analysis of new, larger residential development).

2.0 An Existing EIR May Establish "Baseline" Conditions for Subsequent Review

CEQA provides lead agencies with broad flexibility to identify an accurate and informative baseline against which to measure the significance of a project's potential environmental effects. This is because the default point-in-time snapshot of environmental conditions at the time environmental review begins does not always provide the most accurate or informative baseline for decision makers or the public. Thus, agencies may establish a baseline by reference to historical conditions, those expected when a project becomes operational, or other reasonable formulations, to provide a more accurate picture of a project's impacts. These choices are committed to the discretion of the agency, provided they are supported by substantial evidence.[7]

Relatedly, agencies are accorded significant discretion when considering how to evaluate changes to projects that have already undergone review in an EIR, an issue that primarily arises in the context of CEQA's subsequent review provisions.[8] The lead agency's task in these circumstances is to evaluate whether the existing EIR retains informational value and, if so, whether the proposed changes to the project would result in any previously unconsidered environmental effects.[9] As stated by the Supreme Court in its 2016 *San Mateo Gardens* decision, the task for the agency is to review impacts "not considered in the original environmental document" and an agency's determination that an existing EIR remains relevant is "for the agency to answer in the first instance," subject to review for substantial evidence.[10] The overlap between CEQA's subsequent review provisions and the principles that govern an agency's baseline determination is considerable, such that numerous authorities have concluded that a project reviewed in a prior EIR should be treated as the "baseline" for purposes of reviewing subsequent project changes.[11]

Consistent with these principles, California courts routinely uphold agency decisions that treat projects previously reviewed as part of the baseline environmental setting for purposes of subsequent review. In *Fairview Neighbors*, for example, the agency prepared a new, standalone EIR in connection with a proposed conditional use permit ("CUP") for a mining operation.[12] The operation had previously been reviewed in an EIR approximately 20 years earlier, when a prior CUP was modified and renewed for the

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[7] CEQA Guidelines § 15125.

[8] *See* Pub. Res. Code § 21166; *San Mateo Gardens*, 1 Cal. 5th 937.

[9] *San Mateo Gardens*, 1 Cal. 5th at 952.

[10] *Id.* at 949 (quoting *Save Our Neighborhood*, 140 Cal. App. 4th at 1296), 953.

[11] *See* Kostka & Zischke, Practice Under the California Environmental Quality Act § 12.23.5 (2020) ("In effect, 'the baseline for purposes of CEQA is adjusted such that the originally approved project is assumed to exist.'" (quoting Remy, Thomas, Moose & Manley, Guide to CEQA)); A. Coon, Miller and Starr California Real Estate 4th § 26:20 (subsequent review is limited "to the incremental environmental impacts of project changes when compared to a 'baseline' assuming full build out of the originally approved project . . . .") (2020).

[12] *Fairview Neighbors v. County of Ventura*, 70 Cal. App. 4th 238 (1999) ("*Fairview Neighbors*").

operation.[13] In evaluating traffic impacts in the new EIR, the agency used the truck traffic limit authorized by its prior CUP and analyzed in the earlier EIR as the baseline for evaluating the effects of the reissued CUP.[14] In rejecting plaintiff claims that the EIR was comparing anticipated traffic figures "against a project that does not exist," the court reasoned that the prior project authorized by the CUP had "already undergone environmental review" and therefore the current EIR "appropriately assume[d] the existing traffic impact level to be the traffic generated when the mine operates at [the] full capacity" previously analyzed.[15] In effect, it was appropriate for the lead agency to use the anticipated truck traffic levels previously reviewed in the initial EIR as the baseline for the subsequent analysis.

This discretion also extends to circumstances where a prior EIR encompasses only one component of a broader project proposed for approval. In *City of Orange*, an EIR had previously been certified for a proposed residential development project.[16] Approximately five years later, the agency approved a larger development that encompassed the land area of the original proposal, but with substantial changes to the project proposed on that parcel, along with newly proposed development on neighboring parcels.[17] For the component that had already been subject to review in the prior EIR, the agency limited its analysis to changes from the previously reviewed project.[18] The plaintiff challenged the traffic aspects of this analysis, alleging that, by including the number of traffic trips analyzed by the prior EIR within the baseline, the agency had violated CEQA by using an inflated baseline. The court rejected these claims, reasoning that it was reasonable and appropriate for the agency to limit its review for that "portion" of the environmental analysis to previously unconsidered effects, and thus the agency "properly describe[d] and consider[ed] the baseline traffic conditions."[19]

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[13] *Id.* at 240-41.
[14] *Id.* at 241-43.
[15] *Id.* at 242-43.
[16] *City of Orange*, 163 Cal. App. 4th at 528.
[17] *Id.* at 528-29.
[18] *Id.* at 529.
[19] *Id.* at 542-43.

3.0 Substantial Evidence Supports Reliance on Amorco and Avon EIRs

While the Martinez Renewable Fuels Project primarily entails conversion of the existing Martinez Refinery from production of fossil fuels to production of renewable fuels, related changes are proposed at Marathon's nearby Amorco and Avon Marine Terminals to accommodate the receipt and distribution of renewable feedstocks and product. As proposed, the physical structure of both terminals would remain largely unchanged.[20] New manifold systems would be installed at each terminal while various pipes and hoses would be reconfigured in order to segregate renewable fuels and feedstocks from petroleum product. The pipeline to the Avon Marine Terminal would also be replaced to add heat tracing and insulation, but would not increase in size or capacity.[21] These proposed changes come several years after both terminals were subject to environmental review in EIRs prepared in connection with renewal of their State Lands Commission leases for new 30-year terms. As detailed below, substantial evidence supports treating the projects analyzed in these EIRs as the baseline conditions from which to evaluate whether the changes to the terminals proposed as part of the Martinez Renewable Fuels Project may result in any new, previously unconsidered environmental effects.

3.1 Background on Terminal Operations and Prior Environmental Review

Like the Martinez Refinery, the Amorco Marine Terminal ("Amorco") has been in operation for generations, first beginning nearly a century ago in 1923. Amorco is located on public land leased from the State of California through the State Lands Commission. A lease was executed with the Commission in 1961, which was followed by a number of amendments and assignments. A new lease commenced in 1984 for a 25-year term. Upon expiration in 2008, Amorco operated in "holdover" status pending execution of a new lease or termination by the Commission. The Avon Marine Terminal ("Avon") has likewise operated for nearly a century, since 1925, and is also located on public land. A lease was executed with the Commission in 1964 for a 15-year term, followed by three subsequent 10-year renewal terms. Upon expiration in 2009, Avon entered holdover status as well.

In considering applications for new leases for both terminals in 2014 and 2015, the State Lands Commission prepared EIRs to analyze the environmental impacts associated with their continued operation for an additional 30 years and, in the case of Avon, physical upgrades to comply with engineering and safety regulations.[22] The broad scope of the underlying projects required comprehensive

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[20] Environmental Audit, Inc., Initial Study for: Tesoro Refining & Marketing Company LLC – Marathon Martinez Refinery Renewable Fuels Project submitted to Contra Costa County (Oct. 2020) ("Initial Study").
[21] *Id.*
[22] The Marine Oil Terminal Engineering and Maintenance Standards ("MOTEMS"), codified at 24 C.C.R. §§ 3101F *et seq.*

evaluations in each EIR. Importantly, both EIRs analyzed potential air quality impacts of projected vessel traffic and throughput associated with continued use of the terminals over the 30-year lease term. The Amorco EIR evaluated emissions impacts associated with a projected 90 vessels per year,[23] which was in line with historical totals that had ranged between 53 to 85 vessels in recent years. In similar fashion, the Avon EIR evaluated emissions impacts associated with a projected 120 vessels per year,[24] which was in line with the historical average of 124 vessels per year in recent years. Following certification, the Commission approved new leases for Amorco (running to 2044)[25] and Avon (running to 2045).[26]

3.2 The Projects as Analyzed Establish Appropriate Baseline Conditions

These facts strongly support relying on the 2014 and 2015 EIRs to establish an appropriate baseline for considering changes to the terminals proposed as part of the Martinez Renewable Fuels Project. Consistent with *San Mateo Gardens* and as demonstrated above, both documents retain informational value and relevance, as they evaluated impacts associated with continued operation of the terminals over 30-year lease periods, which commenced only recently. Additionally, the overall operation and function of the marine terminals will remain largely the same as analyzed by the EIRs, with the exception that they will now be used for loading and unloading of renewable feedstocks and product, as opposed to petroleum-based feedstocks and product. The changes to the terminals will also be subject to review and approval by the State Lands Commission through minor lease amendments, with the States Lands Commission acting as a responsible agency and relying upon the lead agency's certified EIR to satisfy CEQA for such amendments. Thus, just like in an ordinary subsequent review context, the environmental impact of the proposed terminal changes may reasonably be evaluated by limiting consideration "to effects not considered in connection with the earlier project."[27]

These circumstances bear a close resemblance to the approach that was endorsed by the court in *Fairview Neighbors*. There, the agency prepared a standalone EIR for a new CUP for a mining operation. As an analytic baseline, the EIR relied upon the maximum authorized traffic levels as analyzed in a previous EIR that had been prepared for a prior version of the CUP issued 20 years earlier.[28] In rejecting claims that this baseline amounted to a comparison of traffic figures to "a project that does not exist," the court reasoned that reliance on previously-analyzed levels was reasonable and likened it to situations where supplemental and narrowed EIRs are prepared.[29] The court also explained that reliance on actual traffic counts may have

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[23] *See* Amorco Marine Oil Terminal Lease Consideration Project Final EIR, Ch. 4.4-12 to 13 (Feb. 2014) (link).
[24] *See* Tesoro Avon Marine Oil Terminal Lease Consideration Project Final EIR, Ch. 4.4-13 (Jan. 2015) (link).
[25] *See* CSLC, Calendar Item C41 (PRC 3453.1) (approved Feb. 21, 2014) (link).
[26] *See* CSLC, Calendar Item C02 (PRC 3454.1) (approved Mar. 20, 2015) (link).
[27] *Martis Camp Community Association v. County of Placer*, 53 Cal. App. 5th 569, 608 (2020) (citing *City of Orange*, 163 Cal. App. 4th at 543)).
[28] *Fairview Neighbors*, 70 Cal. App. 4th at 242-43.
[29] *Id.*

been "misleading and illusory" given that the flow of traffic for such operations "fluctuates considerably based on need, capacity and other factors."[30]

Likewise, in comprehensive analyses completed relatively recently, the Amorco and Avon EIRs evaluated impacts associated with continued operation of the marine terminals through 2044 and 2045, including from projected vessel traffic. By virtue of these prior EIRs, the environmental concerns associated with such operations and vessel traffic have been "laid to rest,"[31] and the prior analyses therefore constitute sound and reasonable starting points for evaluating the subsequent changes to the leased terminals proposed as part of the Martinez Renewable Fuels Project. Thus, the number of annual vessel trips that served as the basis for the prior EIRs' assessment of the 30-year lease terms represents an appropriate and realistic baseline for considering the impacts associated with the proposed terminal changes. Relying upon the prior EIRs' vessel traffic projections is particularly appropriate here, given the extent to which vessel traffic may "fluctuate[] considerably based on need, capacity and other factors."[32]

The conclusion that the prior EIRs may be relied upon to establish the baseline for consideration of the proposed terminal changes is in no way diminished by the fact that these changes are being proposed and considered as part of a broader project. As in *City of Orange*, projected traffic levels analyzed in a prior EIR may be relied upon to establish the baseline environmental conditions for one component of a larger proposed project, while the analysis for the remainder of the project may rely on a different measure to establish the baseline, provided both constitute realistic descriptions of existing conditions.[33]

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[30] *Id.* at 243.
[31] *San Mateo Gardens*, 1 Cal. 5th at 949.
[32] *Fairview Neighbors*, 70 Cal. App. 4th at 243
[33] *City of Orange*, 163 Cal. App. 4th at 542-43. This approach is also consistent with direction in the CEQA Guidelines, which authorizes use of multiple baselines in the same document. *See* 14 C.C.R. § 15125(a)(1).

4.0 Conclusions

For the reasons outlined above, substantial evidence supports reliance on the Amorco and Avon EIRs' assessment of impacts associated with terminal operations and vessel traffic over the 30-year lease terms as an appropriate baseline for analysis of the changes to the terminals proposed as part of the Martinez Renewable Fuels Project.

Appendix G

Summary of Federal, State, and Local Air Regulations

Martinez Renewable Fuels Project
Air Quality Regulatory Applicability Tables
Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	**--**	**Standards of Performance for New Stationary Sources. See subparts below.**			
40 CFR 60	A	General Provisions	Applicable to pre-project operations	See individual 40 CFR 60 subparts below	Applicable to a project that is subject to a specific standard of performance under 40 CFR part 60. Marathon is subject to specific standards of performance; therefore, it is also subject to the general provisions under Subpart A
40 CFR 60	B	Adoption and Submittal of State Plans for Designated Facilities			Administrative rule.
40 CFR 60	C	Emission Guidelines and Compliance Times			Applies to sources covered under subparts Cb - Ce. Subpart C does not have any applicable requirements.
40 CFR 60	Cb	Emission Guidelines and Compliance Times for Large Municipal Waste Combustors That Are Constructed on or Before September 20, 1994			Applies to municipal waste combustor units with a combustion capacity greater than 250 tons per day of municipal solid waste for which construction commenced on or before 09/20/94. Cement kilns are specifically exempted. Marathon is not a municipal waste combustor.
40 CFR 60	Cc	Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills			Applies to each existing MSW landfill for which construction, reconstruction or modification was commenced before 05/30/91. Marathon is not a MSW landfill.
40 CFR 60	Cd	Emissions Guidelines and Compliance Times for Sulfuric Acid Production Units			Applies to each existing sulfuric acid production plant. Marathon operates a sulfuric acid plant that is subject to Subpart H; therefore, it is not subject to this subpart.
40 CFR 60	Ce	Emission Guidelines and Compliance Times for Hospital/Medical/Infectious Waste Incinerators			Applies to each HMIWI for which construction was commenced on or before 06/20/96. Cement kilns are specifically exempted. Marathon is not a HMIWI.
40 CFR 60	Cf	Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills			Establishes emission guidelines and compliance times for the control of designated pollutants from certain designated municipal solid waste (MSW) landfills. Marathon is not a MSW landfill.

Martinez Renewable Fuels Project
Air Quality Regulatory Applicability Tables
Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	D	Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction is Commenced After August 17, 1971			Applies to each fossil-fuel-fired steam generating unit of more than 250 MMBtu/hr heat input and each fossil-fuel and wood-residue-fired steam generating unit (not subject to Da) capable of firing fossil fuel at a heat input of more than 250 MMBtu/hr that commenced construction or modification after 08/17/71 and each lignite-fired steam generating unit that commenced construction or modification after 12/22/76. Marathon does not include a boiler of this type.
40 CFR 60	Da	Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978			Applies to each electric utility steam generating unit that is capable of combusting more than 73 megawatts (250 million Btu/hour) heat input of fossil fuel (either alone or in combination with any other fuel) for which construction or modification is commenced after September 18, 1978. Marathon does not include a boiler of this type.
40 CFR 60	Db	Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units		Will become subject to this subpart	Applies to each steam generating unit that commences construction, modification, or reconstruction after June 19, 1984 and that has a heat input capacity from fuels combusted in the steam generating unit of greater than 29 MW (100 million Btu/hour). Marathon did not operate equipment regulated by Subpart Db prior to the project. F-78 (S1511) triggers applicability for Subpart Db via modification.
40 CFR 60	Dc	Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units	Applicable to pre-project operations	No change to subpart-level applicability	Applicable to each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 29 megawatts (MW) (100 MMBtu/hr) or less, but greater than or equal to 2.9 MW (10 MMBtu/hr). Marathon operates equipment subject to Subpart Dc. There are no changes to applicability as a result of the project.
40 CFR 60	E	Standards of Performance for Incinerators			Applies to each incinerator of more than 50 tons per day charging rate that commences construction or modification after 08/17/71. Marathon does not and will not operate an incinerator that meets these criteria.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	Ea	Standards of Performance for Municipal Waste Combustors for Which Construction is Commenced After December 20, 1989 and on or Before September 20, 1994			Applies to each municipal waste combustor unit with a capacity greater than 250 tons/day of municipal solid waste for which construction commenced after 12/20/89 but on or before 09/20/94 or modification or reconstruction commenced after 12/20/89 built on or before 06/19/96. Marathon does not and will not operate a MSW combustor.
40 CFR 60	Eb	Standards of Performance for Large Municipal Waste Combustors for Which Construction is Commenced After September 20, 1994 or for Which Modification of Reconstruction is Commenced After June 19, 1996			Applies to each municipal waste combustor unit with a combustion capacity greater than 250 tons/day of municipal solid waste for which construction commenced after 09/20/94 or for which modification or reconstruction commenced after 06/19/96. Marathon does not and will not operate a MSW combustor.
40 CFR 60	Ec	Standards of Performance for Hospital/Medical/Infectious Waste Incinerators for Which Construction is Commenced After June 20, 1996			Applies to each individual hospital/medical/infectious waste incinerator for which construction commenced after 06/20/96 or for which modification commenced after 03/16/98. Marathon does not and will not operate a hospital waste incinerator.
40 CFR 60	F	Standards of Performance for Portland Cement Plants			Applies to Portland cement plant units that commence construction or modification after 08/17/71. Marathon is not a cement plant.
40 CFR 60	G	Standards of Performance for Nitric Acid Plants			Applies to nitric acid production units that commence construction or modification after 08/17/71. Marathon is not a nitric acid plant.
40 CFR 60	Ga	Standards of Performance for Nitric Acid Plants for Which Construction, Reconstruction, or Modification Commenced After October 14, 2011			Applies to nitric acid production units that commence construction or modification after 10/14/11. Marathon is not a nitric acid plant.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	H	Standards of Performance for Sulfuric Acid Plants	Applicable to pre-project operations	No change to subpart-level applicability	Applies to sulfuric acid production units that commence construction or modification after 08/17/71. Per Paragraph 54 of the 2016 Marathon CD, the Martinez Sulfuric Acid Plant (SAP) is an affected facility under Subpart H and is subject to the requirements of the subpart.
40 CFR 60	I	Standards of Performance for Hot Mix Asphalt Facilities			Applies to hot mix asphalt facilities that commence construction or modification after 06/11/73. Marathon is not a hot mix asphalt facility.
40 CFR 60	J	Standards of Performance for Petroleum Refineries	Applicable to pre-project operations	Will not be subject to subpart	Applies to fluid catalytic cracking unit catalyst regenerators, fuel gas combustion devices, and all Claus sulfur recovery plants great than 20 long tons per day. Marathon is no longer considered a petroleum refinery.
40 CFR 60	Ja	Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007	Applicable to pre-project operations	Will not be subject to subpart	Applies to certain equipment located within petroleum refineries. Marathon is no longer considered a petroleum refinery.
40 CFR 60	K	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After June 11, 1973, and Prior to May 19, 1978			Applies to storage vessels for petroleum liquids which have a storage capacity greater than 40,000 gallons that commence construction or modification after 03/08/74 but prior to 05/19/78 if the vessel is equal to or less than 65,000 gallons and after 06/11/73 but prior to 05/19/78 if greater than 65,000 gallons. Marathon does not have storage vessels meeting this criteria.
40 CFR 60	Ka	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984	Applicable to pre-project operations	No change to subpart-level applicability	Applies to storage vessels for petroleum liquids which have storage capacities greater than 40,000 gallons and for which construction commences after 05/18/78 but before 07/23/84. Marathon operates storage vessels that will remain subject to NSPS Ka, though they will not store petroleum liquids following completion of the project.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	Kb	Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction or Modification Commenced After July 23, 1984	Applicable to pre-project operations	No change to subpart-level applicability	Applies to each storage vessel with a capacity equal to or greater than 40 cubic meters that is used to store volatile organic liquids and meet maximum true vapor pressure criteria and for which construction, reconstruction or modification commenced after 07/23/84. Marathon operates storage vessels that meet these criteria. The project triggers NSPS Kb applicabiltiy via modification of Tank 621 (S621).
40 CFR 60	L	Standards of Performance for Secondary Lead Smelters			Applies to affected sources at secondary lead smelters that commence construction or modification after 06/11/73. Marathon does not and will not operate a lead smelter.
40 CFR 60	M	Standards of Performance for Secondary Brass and Bronze Production Plants			Applies to affected sources at secondary brass or bronze production plants that commence construction or modification after 06/11/73. Marathon does not and will not operate a brass or bronze production plant.
40 CFR 60	N	Standards of Performance for Primary Emissions from Basic Oxygen Process Furnaces for Which Construction is Commenced After June 11, 1973			Applies to each basic oxygen process furnace that commences construction or modification after 06/11/73. Marathon does not and will not operate a steelmaking furnace.
40 CFR 60	Na	Standards of Performance for Secondary Emissions from Basic Oxygen Process Steelmaking Facilities for Which Construction is Commenced After January 20, 1983			Applies to affected sources at each iron and steel plant that commences construction or modification after 01/20/83. Marathon does not and will not operate a steelmaking furnace.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	O	Standards of Performance for Sewage Treatment Plants			Applies to each incinerator that combusts wastes containing more than 10% sewage sludge (dry basis) produced by municipal sewage treatment plants or each incinerator that charges more than 2205 lb/day municipal sewage sludge (dry basis) that commences construction or modification after 06/11/73. Marathon does not and will not operate an incinerator that meets this criteria.
40 CFR 60	P	Standards of Performance for Primary Copper Smelters			Applies to affected sources at primary copper smelters that commence construction or modification after 10/16/74. Marathon does not and will not operate a copper smelter.
40 CFR 60	Q	Standards of Performance for Primary Zinc Smelters			Applies to affected sources at primary zinc smelters that commence construction or modification after 10/16/74. Marathon does not and will not operate a zinc smelter.
40 CFR 60	R	Standards of Performance for Primary Lead Smelters			Applies to affected sources at primary lead smelters that commence construction or modification after 10/16/74. Marathon does not and will not operate a lead smelter.
40 CFR 60	S	Standards of Performance for Primary Aluminum Reduction Plants			Applies to potroom groups and anode bake plants at primary aluminum reduction plants that commence construction or modification after 10/23/74. Marathon does not and will not operate an aluminum production facility.
40 CFR 60	T	Standards of Performance for the Phosphate Fertilizer Industry: Wet-Process Phosphoric Acid Plants			Applies to affected sources at each wet-process phosphoric acid plant having design capacity of more than 15 tons of equivalent P2O5 feed per calendar day that commenced construction or modification after 10/22/74. Marathon does not and will not operate a phosphoric acid plant.
40 CFR 60	U	Standards of Performance for the Phosphate Fertilizer Industry: Superphosphoric Acid Plants			Applies to affected sources at each superphosphoric acid plant having design capacity of more than 15 tons of equivalent P2O5 feed per calendar day that commenced construction or modification after 10/22/74. Marathon does not and will not operate a superphosphoric acid plant.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	V	Standards of Performance for the Phosphate Fertilizer Industry: Diammonium Phosphate Plants			Applies to affected sources at each granular diammonium phosphate plant having design capacity of more than 15 tons of equivalent P2O5 feed per calendar day that commenced construction or modification after 10/22/74. Marathon does not and will not operate a fertilizer production plant.
40 CFR 60	X	Standards of Performance for the Phosphate Fertilizer Industry: Granular Triple Superphosphate Storage Facilities			Applies to affected sources at each granular triple superphosphate storage facility that commences construction or modification after 10/22/74. Marathon does not and will not operate a fertilizer production plant.
40 CFR 60	Y	Standards of Performance for Coal Preparation Plants			Applies to thermal dryers, pneumatic coal-cleaning equipment (air tables), coal processing and conveying equipment (including breakers and crushers), coal storage systems and coal transfer and loading systems in coal preparation plants which process greater than 200 tons per day that commence construction or modification after 10/24/74. Marathon does not and will not operate a coal preparation plant.
40 CFR 60	Z	Standards of Performance for Ferroalloy Production Facilities			Applies to electric submerged arc furnaces which produce silicon metal, ferrosilicon, calcium silicon, silicomanganese zirconium, ferrochrome silicon, silvery iron, high-carbon ferrochrome, charge chrome, standard ferromanganese, silicomanganese, ferromanganese silicon or calcium carbide and dust handling equipment that commences construction or modification after 10/21/74. Marathon does not operate a ferroalloy production facility.
40 CFR 60	AA	Standards of Performance for Steel Plants: Electric Arc Furnaces Constructed After October 21, 1974, and On or Before August 17, 1983			Applies to electric arc furnaces and dust handling equipment in steel plants that produce carbon, alloy or specialty steels and which commence construction, modification or reconstruction after 10/21/74 but on or before 08/17/83. Marathon does not and will not operate an electric arc furnace.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	AAa	Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983			Applies to electric arc furnaces, argon-oxygen decarburization vessels and dust handling systems that commence construction, modification or reconstruction after 08/17/83. Marathon does not and will not operate an electric arc furnace.
40 CFR 60	BB	Standards of Performance for Kraft Pulp Mills			Applies to affected sources at kraft pulp mills that commence construction or modification after 09/24/76. Marathon does not and will not operate a Kraft pulp mill.
40 CFR 60	BBa	Standards of Performance for Kraft Pulp Mill Affected Sources for which Construction, Reconstruction, or Modification Commenced After May 23, 2013			Applies to affected sources at kraft pulp mills that commence construction or modification after 05/23/13. Marathon does not and will not operate a Kraft pulp mill.
40 CFR 60	CC	Standards of Performance for Glass Manufacturing Plants			Applies to each non-hand and non-electric glass melting furnace designed to produce greater than 4550 kg of glass/day that commences construction or modification after 06/15/79. Marathon does not and will not operate a glass manufacturing plant.
40 CFR 60	DD	Standards of Performance for Grain Elevators			Applies to affected sources at grain terminal or grain storage elevators that commence construction, modification or reconstruction after 08/03/78. Marathon does not and will not operate a grain elevator.
40 CFR 60	EE	Standards of Performance for Surface Coating of Metal Furniture			Applies to each metal furniture surface coating operation in which organic coatings are applied and that commence construction, modification or reconstruction after 11/28/80. Marathon does not and will not produce or coat metal furniture.
40 CFR 60	GG	Standards of Performance for Stationary Gas Turbines			Applicable to combustion turbines with a heat input capacity at peak load greater than 10.7 gigajoules (10.14 MMBtu) per hour constructed after 10/3/77. Marathon does not and will not operate a stationary gas turbine that meets these criteria.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	HH	Standards of Performance for Lime Manufacturing Plants			Applies to rotary lime kilns used in the manufacture of lime that commences construction or modification after 05/03/77. Marathon is not a lime manufacturing plant.
40 CFR 60	KK	Standards of Performance for Lead-Acid Battery Manufacturing Plants			Applies to affected sources at any lead-acid battery manufacturing plant that produces or has the design capacity to produce in one day (24 hours) batteries containing an amount of lead equal to or greater than 6.5 tons that commences construction or modification after 01/14/80. Marathon does not produce lead-acid batteries.
40 CFR 60	LL	Standards of Performance for Metallic Mineral Processing Plants			Applies to affected sources metallic mineral processing plants that commence construction or modification after 08/24/82. (Plants that produce concentrates containing any of aluminum, copper, gold, iron, lead, uranium, zinc or zirconium in concentrations that contribute to the concentrate's commercial value.) Marathon does not operate a metallic mineral processing plant.
40 CFR 60	MM	Standards of Performance for Automobile and Light Duty Truck Surface Coating Operations			Applies to affected sources automobile or light-duty truck assembly plants that begin construction, reconstruction or modification after 10/05/79. Marathon does not and will not operate a vehicle surface coating facility.
40 CFR 60	NN	Standards of Performance for Phosphate Rock Plants			Applies to affected sources at phosphate rock plants which have a maximum plant production capacity greater than 4 tons/hr that commences construction, modification or reconstruction after 09/21/79. Marathon is not a phosphate rock plant.
40 CFR 60	PP	Standards of Performance for Ammonium Sulfate Manufacture			Applies to each ammonium sulfate dryer within an ammonium sulfate manufacturing plant in the caprolactam by-product, synthetic and coke oven by-product sectors of the ammonium sulfate industry that commences construction or modification after 02/04/80. Marathon does not manufacture ammonium sulfate.
40 CFR 60	QQ	Standards of Performance for the Graphic Arts Industry: Publication Rotogravure Printing			Applies to each publication rotogravure printing press that commences construction, modification or reconstruction after 10/28/80. Marathon does not and will not operate any publication rotogravure printing presses.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	RR	Standards of Performance for Pressure Sensitive Tape and Label Surface Coating Operations			Applies to each coating line used in the manufacture of pressure sensitive tape and label materials that begins construction, modification or reconstruction after 12/30/80. Marathon does not produce pressure sensitive tape.
40 CFR 60	SS	Standards of Performance for Industrial Surface Coating: Large Appliances			Applies to each surface coating operation in a large appliance surface coating line that commences construction, modification or reconstruction after 12/24/80. Marathon does not manufacture or coat large appliances.
40 CFR 60	TT	Standards of Performance for Metal Coil Surface Coating			Applies to affected sources at metal coil surface coating operations that commence construction, modification or reconstruction after 01/05/81. Marathon does not and will not operate metal coil coating operations.
40 CFR 60	UU	Standards of Performance for Asphalt Processing and Asphalt Roofing Manufacture			Applies to affected sources at asphalt roofing plants and affected sources at asphalt processing plants, petroleum refineries and asphalt roofing plants that process and/or store only non-roofing asphalts which commence construction or modification after 11/18/80 and all other affected sources at asphalt processing plants, petroleum refineries and asphalt roofing plants which commence construction or modification after 05/26/81. Marathon does not and will not operate a asphalt or asphalt roofing facility.
40 CFR 60	VV	Standards of Performance for Equipment Leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI)			Applies to affected sources at synthetic organic chemical manufacturing industry facilities that commence construction or modification after 01/05/81. Marathon does not and will not operate a process unit producing listed chemicals.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	VVa	Standards of Performance for Equipment Leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemicals Manufacturing Industry (SOCMI) for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006			Applies to affected sources at synthetic organic chemical manufacturing industry facilities that commence construction or modification after 11/7/2006. Marathon does not and will not operate an affected facility producing a listed chemical for sale.
40 CFR 60	WW	Standards of Performance for the Beverage Can Surface Coating Industry			Applies to the following affected facilities in beverage can surface coating lines: each exterior base coat operation, each overvarnish coating operation, and each inside spray coating operation, which commences construction, modification, or reconstruction after 11/26/80. Marathon does not have beverage can surface coating lines.
40 CFR 60	XX	Standards of Performance for Bulk Gasoline Terminals			Applies to the total of all loading racks at bulk gasoline terminals which deliver liquid product into gasoline tank trucks that commence construction or modification after 12/17/80. Marathon operates a bulk gasoline terminal that is not subject to Subpart XX as an affected facility. Marathon will comply with certain provisions of Subpart XX as directed by 40 CFR 63 Subpart R.
40 CFR 60	AAA	Standards of Performance for New Residential Wood Heaters			Applies to wood heaters manufactured on or after 07/01/88 or sold at retail on or after 07/01/90. Marathon does not include residential wood heaters.
40 CFR 60	BBB	Standards of Performance for the Rubber Tire Manufacturing Industry			Applies to affected sources at rubber tire manufacturing plants that commence construction, modification or reconstruction after 01/20/83. Marathon does not manufacture rubber tires.
40 CFR 60	DDD	Standards of Performance for Volatile Organic Compound (VOC) Emissions from the Polymer Manufacturing Industry			Applies to affected sources at the manufacture of polypropylene, polyethylene, polystyrene or polyethylene terephthalate. Marathon does not manufacture any of the subject polymers.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	FFF	Standards of Performance for Flexible Vinyl and Urethane Coating and Printing			Applies to each rotogravure printing line used to print or coat flexible vinyl or urethane products which begins construction, modification or reconstruction after 01/18/83. Marathon does not coat or print flexible vinyl or urethane products.
40 CFR 60	GGG	Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries	Applicable to pre-project operations	Will not be subject to subpart	Applies to affected sources at petroleum refineries that commence construction or modification after 01/04/83. Following completion of the project, Marathon will operate as a chemical plant, not a refinery.
40 CFR 60	GGGa	Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006	Applicable to pre-project operations	Will not be subject to subpart	Applies to affected sources at petroleum refineries that commence construction or modification after 01/04/83. Marathon is not a petroleum refinery.
40 CFR 60	HHH	Standards of Performance for Synthetic Fiber Production Facilities			Applies to facilities with solvent-spun synthetic fiber processes that produce more than 500 Mg of fiber per year and commence construction or reconstruction after 11/23/82, other than facilities that use the reaction spinning process to produce spandex fiber or the viscose process to produce rayon fiber. Marathon does not and will not operate a synthetic fiber production facility.
40 CFR 60	III	Standards of Performance for Volatile Organic Compound (VOC) Emissions From the Synthetic Organic Chemical Manufacturing Industry (SOCMI) Air Oxidation Unit Processes			Applies to affected air oxidation reactors and associated recovery systems that produce any of the listed chemicals as a product, co-product, by-product or intermediate and that commences construction, modification or reconstruction after 10/21/83. Marathon does not and will not operate any air oxidation reactors.
40 CFR 60	JJJ	Standards of Performance for Petroleum Dry Cleaners			Applies to affected sources at petroleum dry cleaning plants with a total manufacturers' rated dryer capacity greater than or equal to 84 pounds that commences construction or modification after 12/14/82. Marathon does not and will not operate petroleum dry cleaners.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	KKK	Standards of Performance for Equipment Leaks of VOC From Onshore Natural Gas Processing Plants			Applies to affected sources at onshore natural gas processing plants that commence construction, reconstruction or modification after 01/20/84. Marathon does not and will not operate a natural gas processing plant.
40 CFR 60	LLL	Standards of Performance for Onshore Natural Gas Processing: SO_2 Emissions			Applies to each sweetening unit and each sweetening unit followed by a sulfur recovery unit that process natural gas that commence construction or modification after 01/20/84. Marathon does not and will not operate a natural gas processing plant.
40 CFR 60	NNN	Standards of Performance for Volatile Organic Compound (VOC) Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations		Will become subject to this subpart	Applies to affected distillation units and associated recovery systems that are a part of a process unit that produce a listed chemical as a product, co-product, by-product or intermediate that commences construction, modification or reconstruction after 12/30/83. Applies to 003-C-3 Depropanizer following completion of project. The facility will control vent streams from distillation units by either sending downstream vent streams into the fuel gas system for combustion in heaters and boilers or to a flare in accordance with the requirements of 40 CFR 63 Subpart FFFF. Per the overlap provisions of 40 CFR 63 Subpart FFFF at §63.2535(h), compliance with Subpart FFFF constitutes compliance with the requirements of 40 CFR
40 CFR 60	OOO	Standards of Performance for Nonmetallic Mineral Processing Plants			Applies to affected sources at nonmetallic mineral processing plants that commence construction, reconstruction or modification after 08/31/83. Marathon does not and will not operate a mineral processing plant.
40 CFR 60	PPP	Standard of Performance for Wool Fiberglass Insulation Manufacturing Plants			Applies to each rotary spin wool fiberglass insulation manufacturing line that commences construction, modification or reconstruction after 02/07/84. Marathon does not manufacture fiberglass.
40 CFR 60	QQQ	Standards of Performance for VOC Emissions From Petroleum Refinery Wastewater Systems	Applicable to pre-project operations	Will not be subject to subpart	Applies to individual drain systems, oil-water separators and aggregate facilities located in petroleum refineries for which construction, modification or reconstruction commenced after 05/04/87. Marathon no longer operates as a petroleum refinery and is no longer subject to requirements of this rule.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	RRR	Standards of Performance for Volatile Organic Compound Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes		Will not be subject to subpart	Applies to affected reactor process and associated recovery systems that are part of a process unit that produces a listed chemical as a product, co-product, by-product or intermediate and that commences construction, modification or reconstruction after 06/29/90. Marathon does not trigger Subpart RRR applicability due to the project. The facility will control vent streams from reactor processes by either sending downstream vent streams into the fuel gas system for combustion in heaters and boilers or to a flare, in accordance with the requirements of 40 CFR 63 Subpart FFFF. Per the overlap provisions of 40 CFR 63 Subpart FFFF at §63.2535(h), compliance with Subpart FFFF constitutes compliance with the requirements of 40 CFR 63 Subpart RRR.
40 CFR 60	SSS	Standards of Performance for Magnetic Tape Coating Facilities			Applies to each coating operation and each piece of coating mix preparation equipment for which construction, modification or reconstruction begins after 01/22/86. Marathon is not a magnetic tape coating facility.
40 CFR 60	TTT	Standards of Performance for Industrial Surface Coating: Surface Coating of Plastic Parts for Business Machines			Applies to each spray booth in which plastic parts for use in the manufacture of business machines receive prime coats, color coats, texture coats or touch-up coats for which construction, modification or reconstruction begins after 01/08/86. Marathon does not spray coat plastic parts for use in the manufacture of business machines.
40 CFR 60	UUU	Standards of Performance for Calciners and Dryers in Mineral Industries			Applies to each calciner and dryer (not subject to LL) at a mineral processing plant that commences construction, modification or reconstruction after 04/23/86. Marathon does not and will not operate a mineral processing plant.
40 CFR 60	VVV	Standards of Performance for Polymeric Coating of Supporting Substrates Facilities			Applies to each coating operation and any onsite coating mix preparation equipment used to prepare coatings for the polymeric coating of supporting substrates for which construction, modification or reconstruction begins after 04/30/87. Marathon does not and will not operate a substrate facility.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	WWW	Standards of Performance for Municipal Solid Waste Landfills			Applies to each municipal solid waste landfill that commenced construction, reconstruction or modification after 05/30/91. Marathon does not and will not operate a MSW landfill.
40 CFR 60	XXX	Standards of Performance for Municipal Solid Waste Landfills that Commenced Construction, Reconstruction, or Modification After July 17, 2014			Applies to each municipal solid waste landfill that commenced construction, reconstruction or modification after 07/17/14. Marathon does not and will not operate a MSW landfill.
40 CFR 60	AAAA	Standards of Performance for Small Municipal Waste Combustion Units			Applies to new municipal solid waste combustion units built after August 30, 1999 or modified after June 6, 2001; and have the capacity to combust at least 35 tons per day but no more than 250 tons per day of municipal solid waste or refuse-derived fuel. Marathon does not and will not operate a municipal solid waste combustor.
40 CFR 60	BBBB	Standards of Performance for Small Municipal Waste Combustion Units			Applies to state Administrators with one or more existing small municipal waste combustion units that commenced construction on or before August 30, 1999. Marathon does not fit this requirement.
40 CFR 60	CCCC	Standards of Performance for Commercial and Industrial Solid Waste Incineration Units			Applies to new incineration units built after May 20, 2011 or modified after September 21, 2011. Marathon does not and will not operate a solid waste incineration unit.
40 CFR 60	DDDD	Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units			Applies to state Administrators with one or more existing CISWI units as defined in the rule. Marathon does not and will not operate an existing CISWI unit.
40 CFR 60	EEEE	Standards of Performance for Other Solid Waste Incineration Units			Applies to new other solid waste incineration units built after December 9, 2004 or modified after June 16, 2006. Other solid waste incinerators are very small municipal waste combustion units and institutional waste incineration units. Marathon does not and will not operate an other solid waste incinerator.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	FFFF	Emission Guidelines and Compliance Times for Other Solid Waste Incineration Units			Applies to the Administrator of an air quality program in a State or United States protectorate with one or more existing OSWI units or air curtain incinerators that commenced construction on or before December 9, 2004. Marathon is not an other solid waste incinerator
40 CFR 60	IIII	Standards of Performance for Stationary Compression Ignition Internal Combustion Engines	Applicable to pre-project operations	No change to subpart-level applicability	Applies to stationary compression ignition (CI) internal combustion engines (ICE) that commence construction after July 11, 2005 where the stationary CI ICE is either manufactured after April 1, 2006 and are not fire pump engines, or are manufactured as certified NFPA fire pump engines after July 1, 2006. Marathon operates engines that are subject to Subpart IIII. No construction, reconstruction, or modification occurs to stationary CI ICE as part of the project. The applicable provisions of Subpart IIII will continue to apply following completion of the project
40 CFR 60	JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines			Applies to stationary spark ignition engines. Marathon does not have any stationary spark ignition ICE.
40 CFR 60	KKKK	Standards of Performance for Stationary Combustion Turbines			Applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 MMBtu) per hour, which commenced construction, modification, or reconstruction after February 18, 2005. Marathon does not and will not operate any combustion turbines that meet this criteria
40 CFR 60	LLLL	Standards of Performance for New Sludge Incineration Units			Applies to New Sludge Incineration Units. Marathon does not and will not operate a sludge incineration unit.
40 CFR 60	MMMM	Emission Guidelines and Compliance Times for Existing Sewage Sludge Incineration Units			Applies to Existing Sludge Incineration Units. Marathon does not and will not operate a sludge incineration unit.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after August 23, 2011, and On or Before September 18, 2015			Emission standards and compliance schedules for the control of VOC and SO2 emissions from onshore crude oil and natural gas production, transmission and distribution facilities that commence construction, modification or reconstruction after August 23, 2011, and on or before September 18, 2015. Marathon is not a crude oil and natural gas production, transmission and distribution facility.
40 CFR 60	OOOOa	Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after September 18, 2015			Emission standards and compliance schedules for the control of GHG in the crude oil and natural gas source category that commence construction, modification, or reconstruction after September 18, 2015. This subpart also establishes emission standards and compliance schedules for the control of VOC and SO2 emissions from affected facilities in the crude oil and natural gas source category that commence construction, modification or reconstruction after September 18, 2015. Marathon is not a crude oil and natural gas production, transmission and distribution facility.
40 CFR 60	QQQQ	Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces			Applicable to facilities which manufacture, sell, offer for sale, import for sale, distribute, offer to distribute, introduce or deliver for introduction into commerce in the United States, or install or operate a residential hydronic heater, forced-air furnace or other central heater manufactured on or after May 15, 2015. Marathon is not associated with residential hydronic heaters, forced-air furnaces, or other central heaters.
40 CFR 60	TTTT	Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units			Emission standards and compliance schedules for the control of GHG emissions from a steam generating unit, IGCC, or a stationary combustion turbine that commences construction after January 8, 2014 or commences modification or reconstruction after June 18, 2014 and has a base load rating >250 MMBtu/hr of fossil fuel and serves a generator or generators capable of selling greater than 25 MW of electricity to a utility power distribution system. Marathon does not have any electricity generating units that meet these criteria.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 60	UUUUa	Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units			This subpart establishes emission guidelines and approval criteria for State or multi-State plans that establish emission standards limiting GHG emissions from an affected steam generating unit, integrated gasification combined cycle (IGCC), or stationary combustion turbine. An affected steam generating unit, IGCC, or stationary combustion turbine shall, for the purposes of this subpart, be referred to as an affected EGU. Marathon does not have any electricity generating units that meet these criteria.
40 CFR 61	**--**	**National Emission Standards for Hazardous Air Pollutants. See subparts below**			
40 CFR 61	A	General Provisions	Applicable to pre-project operations	See individual 40 CFR 61 subparts below	Applicable to a project that is subject to a specific national emission standard under 40 CFR part 61. Marathon is subject to a various national emission standards; therefore it is subject to the general provisions under Subpart A
40 CFR 61	B	National Emission Standards for Radon Emissions From Underground Uranium Mines			Applies to active underground uranium mines which have mined, will mine or are designed to mine over 100,000 tons of ore during the life of the mine or has had or will have an annual ore production rate greater than 10,000 tons. Marathon does not perform uranium mining
40 CFR 61	C	National Emission Standard for Beryllium			Applies to extraction plants, ceramic plants, foundries, incinerators and propellant plants which process beryllium ore, beryllium, beryllium oxide, beryllium alloys or beryllium-containing wastes and machine shops which process beryllium, beryllium oxides or any alloy that contains more than 5% beryllium. Marathon facility does not process any material containing 5% beryllium
40 CFR 61	D	National Emission Standard for Beryllium Rocket Motor Firing			Applies to rocket motor test sites. Marathon is not a rocket motor test site.
40 CFR 61	E	National Emission Standard for Mercury			Applies to those stationary sources which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide and incinerate or dry wastewater treatment plant sludge. Marathon does not process mercury ore

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 61	F	National Emission Standard for Vinyl Chloride			Applies to plants which produce ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene, vinyl chloride by any process and/or one or more polymers containing any fraction of polymerized vinyl chloride. Marathon is not an ethylene dichloride production facility.
40 CFR 61	H	National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities			Applies to operations at any facility owned or operated by the Department of Energy that emits any radionuclides other than radon-222 and radon-220 into the air. Marathon is not a DOE facility.
40 CFR 61	I	National Emission Standards for Radionuclide Emissions From Federal Facilities Other Than Nuclear Regulatory Commission Licensees and Not Covered by Subpart H			Applies to facilities owned or operated by any federal agency other than the Department of Energy and not licensed by the Nuclear Regulatory Commission. Marathon is not a federal facility.
40 CFR 61	J	National Emission Standard for Equipment Leaks (Fugitive Emission Sources) of Benzene	Applicable to pre-project operations	Will not be subject to subpart	Applies to each pump, compressor, pressure relief device, sampling connection system, open-ended valve or line, valve, flange, connectors, surge control vessel, bottoms receiver, and control device or system required by this subpart that is intended to operate in benzene service. There will be no equipment in benzene service following the project.
40 CFR 61	K	National Emission Standards for Radionuclide Emissions From Elemental Phosphorous Plants			Applies to calciners and nodulizing kilns at elemental phosphorous plants. Marathon is not a phosphorus plant.
40 CFR 61	L	National Emission Standard for Benzene Emissions from Coke By-Product Recovery Plants			Applies to affected sources at furnace and foundry coke by-product recovery plants. Marathon is not a coke by-product recovery plant.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 61	M	National Emission Standard for Asbestos	Applicable to pre-project operations	No change to subpart-level applicability	Applies to asbestos mills, roadways using asbestos tailings or waste materials, manufacturing operations using commercial asbestos, demolition or renovation projects, operations in which asbestos-containing materials (ACM) are spray applied, fabricating operations using commercial asbestos, installation of insulating materials containing commercial asbestos, waste disposal of asbestos material activity, operations that convert asbestos-containing waste material into non-asbestos material. Marathon will continue to comply with the rule and must comply with applicable requirements if conducting any of the regulated activities that are identified
40 CFR 61	N	National Emission Standard for Inorganic Arsenic Emissions From Glass Manufacturing Plants			Applies to glass melting furnaces that use commercial arsenic as a raw material. Marathon is not a glass manufacturing plant.
40 CFR 61	O	National Emission Standard for Inorganic Arsenic Emissions From Primary Copper Smelters			Applies to each copper converter at any new or existing primary copper smelter. Marathon is not a copper smelting facility.
40 CFR 61	P	National Emission Standard for Inorganic Arsenic Emissions From Arsenic Trioxide and Metallic Arsenic Production Facilities			Applies to each metallic arsenic production plant and to each arsenic trioxide plant that processes low-grade arsenic-bearing materials by a roasting condensation process. Marathon is not an arsenic production facility.
40 CFR 61	Q	National Emission Standards for Radon Emissions From Department of Energy Facilities			Applies to the design and operation of all storage and disposal facilities for radium-containing material that are owned or operated by the Department of Energy that emit radon-222. Marathon is not a DOE facility.
40 CFR 61	R	National Emission Standards for Radon Emissions From Phosphogypsum Stacks			Applies to each phosphogypsum stack and to each person who owns, sells, distributes or otherwise uses any quantity of phosphogypsum which is produced as a result of wet acid phosphorus production or is removed from any existing phosphogypsum stack. Marathon is not a phosphgypsum processing plant.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 61	T	National Emission Standards for Radon Emissions From the Disposal of Uranium Mill Tailings			Applies to all sites that are used for the disposal of tailings and that managed residual radioactive material or uranium by-product materials during and following the processing of uranium ores that are regulated under the Uranium Tailings Radiation Control Act of 1978. Marathon does not use or produce uranium mill tailings.
40 CFR 61	V	National Emission Standard for Equipment Leaks (Fugitive Emission Sources)			Applies to each pump, compressor, pressure relief device, sampling connection system, open-ended valve or line, valve, flange and other connectors, product accumulator vessel and control device or system required by this subpart that are intended to convey volatile hazardous air pollutant (VHAP) containing materials in excess of 10% VHAP.
40 CFR 61	W	National Emission Standards for Radon Emissions From Operating Mill Tailings			Applies to facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores. Marathon does not generate mill tailings.
40 CFR 61	Y	National Emission Standard for Benzene Emissions From Benzene Storage Vessels			Applies to each storage vessel storing industrial or refined benzene that has a specific gravity within the range of the listed specific gravities. Marathon does not store products that meet these specifications for benzene.
40 CFR 61	BB	National Emission Standard for Benzene Emissions From Benzene Transfer Operations			Applies to the total of all loading racks at which benzene is loaded into tank trucks, railcars or marine vessels at each benzene production facility and each bulk terminal. Marathon does not include benzene loading operations.
40 CFR 61	FF	National Emissions Standard for Benzene Waste Operations	Applicable to pre-project operations	No change to subpart-level applicability	Applies to chemical manufacturing plants, coke by-product recovery plants,and petroleum refineries; the rule also applies to hazardous waste treatment, storage and disposal facilities that treat, store or dispose of hazardous waste generated by chemical manufacturing plants, coke by-product recovery plants or petroleum refineries. The facility meets the definition of chemical manufacturing plant following the project.
40 CFR 63	**--**	**National Emission Standards for Hazardous Air Pollutants for Source Categories. See subparts below**			
40 CFR 63	A	General Provisions	Applicable to pre-project operations	See individual 40 CFR 63 subparts below	Applies to owners or operators who are subject to subsequent subparts of this part. Marathon will be subject to a subpart, and these general provisions will also apply.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	B	Requirements for Control Technology Determinations for Major Sources in Accordance With Clean Air Act Sections, Sections 112(g) and 112(j)			After the effective date of a permit program under title V in any State, no person may construct or reconstruct any major source of hazardous air pollutants, unless the Administrator (or the State) determines that the maximum achievable control technology emission limitation under this section for new sources will be met. Marathon is a major source of HAP but the project does not trigger the requirements of this rule.
40 CFR 63	C	List of Hazardous Air Pollutants, Petition Process, Lesser Quantity Designations, Source Category List			Administrative rule. Subpart C does not include any direct requirements for Marathon.
40 CFR 63	D	Regulations Governing Compliance Extensions for Early Reductions of Hazardous Air Pollutants			Applies to an owner or operator of an existing source who wishes to obtain a compliance extension from a standard issued under section 112(d) of the Act. At present, Marathon is not affected by this subpart.
40 CFR 63	E	Approval of State Programs and Delegation of Federal Authorities			Administrative rule. Subpart E does not include any direct requirements for Marathon.
40 CFR 63	F	National Emission Standards for Organic Hazardous Air Pollutants From the Synthetic Organic Chemical Manufacturing Industry			Applies to chemical manufacturing process units that manufacture as a primary product a listed chemical, used as a reactant or manufacture as a product or co-product a listed chemical and are located at a plant site that is a major source of HAPs. Marathon is not and will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.
40 CFR 63	G	National Emission Standards for Organic Hazardous Air Pollutants From the Synthetic Organic Chemical Manufacturing Industry for Process Vents, Storage Vessels, Transfer Operations, and Wastewater			Applies to all process vents, storage vessels, transfer racks and wastewater streams within a source subject to 40 CFR 63 Subpart F. Marathon is not and will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	H	National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks			Applies to pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems and control devices or systems required by this subpart that are intended to operate in organic hazardous air pollutant service 300 hours or more during the calendar year within a source subject to the provisions of a specific subpart in 40 CFR Part 63 that references this subpart. Marathon is not and will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.
40 CFR 63	I	National Emission Standards for Organic Hazardous Air Pollutants for Certain Processes Subject to the Negotiated Regulation for Equipment Leaks			Applies to emissions of designated organic HAPs from listed processes located at major sources of HAPs. Marathon does not and will not operate listed processes within the rule.
40 CFR 63	J	National Emission Standards for Polyvinyl Chloride and Copolymers Production			This subpart establishes the NESHAP for facilities producing polyvinyl chloride and copolymers. Marathon will not produce polyvinyl chloride or copolymers.
40 CFR 63	L	National Emission Standards for Coke Oven Batteries			Applies to existing by-product coke oven batteries at a coke plant, existing nonrecovery coke oven batteries at a coke plant, greenfield coke oven batteries, new or reconstructed coke oven batteries at existing coke plants if the coke oven battery results in an increase in the design capacity of the coke plant as of 11/15/90, the capacity of any coke oven battery subject to a construction permit on 11/15/90 which commenced operation before 10/27/93, each brownfield coke oven battery, each rebuild pad, each cold-idle coke oven battery that is restarted and each foundry coke producer. Marathon does not and will not operate a coke oven battery.
40 CFR 63	M	National Perchloroethylene Air Emissions Standards for Dry Cleaning Facilities			Applies to any dry cleaning facility that uses perchloroethylene. Marathon does not and will not operate a dry cleaning operation.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	N	National Emission Standards for Chromium Emissions From Hard and Decorative Chromium Electroplating And Chromium Anodizing Tanks			Applies to each chromium electroplating or chromium anodizing tank at facilities performing hard chromium electroplating, decorative chromium electroplating or chromium anodizing. Marathon does not and will not operate a chromium plating operation.
40 CFR 63	O	Ethylene Oxide Emissions Standards for Sterilization Facilities			Applies to all sterilization sources in sterilization or fumigation operations. Marathon does not and will not operate a sterilization operation.
40 CFR 63	Q	National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers	Applicable to pre-project operations	No change to subpart-level applicability	Applies to all new and existing industrial process cooling towers that are operated with chromium-based water treatment chemicals on or after 09/08/94 and are either major sources or are integral parts of facilities that are major sources of HAPs. Marathon's cooling towers shall not be operated with chromium-based water treatment chemicals.
40 CFR 63	R	National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations)	Applicable to pre-project operations	No change to subpart-level applicability	Applies to affected bulk gasoline terminals and pipeline breakout stations. Marathon operates the Bulk Plant Truck Loading Rack, which meets these criteria and is subject to Subpart R.
40 CFR 63	S	National Emission Standards for Hazardous Air Pollutants from the Pulp and Paper Industry			Applies to affected processes that produce pulp, paper or paperboard that are located at plant sites that are major sources of HAPs and that use kraft, soda, sulfite or semi-chemical pulping processes using wood, mechanical pulping processes using wood or any process using secondary or non-wood fibers. Marathon is not a pulp and paper facility.
40 CFR 63	T	National Emission Standards for Halogenated Solvent Cleaning			Applies to each batch vapor, in-line vapor, in-line cold and batch cold solvent cleaning machine that uses methylene chloride, perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, chloroform or any combination of these halogenated HAP solvents in a total concentration greater than 5% by wt as a cleaning and/or drying agent. Marathon does not include halogenated solvent cleaning.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	U	National Emission Standards for Hazardous Air Pollutant Emissions: Group I Polymers and Resins			Applies to each group of one or more elastomer product process units that manufacture the same primary product and are located at a plant site that is a major source. Marathon is not a resin or polymer production facility.
40 CFR 63	W	National Emissions Standards for Hazardous Air Pollutants for Epoxy Resins Production and Non-Nylon Polyamides Production			Applies to all manufacturers of basic liquid epoxy resins and manufacturers of wet strength resins that are located at a plant site that is a major source of HAPs. Marathon is not a resin or polyamide production facility.
40 CFR 63	X	National Emission Standards for Hazardous Air Pollutants from Secondary Lead Smelting			Applies to blast, reverberatory, rotary and electric smelting furnaces, refining kettles, agglomerating furnaces, dryers, process fugitive sources and fugitive dust sources at all secondary lead smelters. Marathon is not a lead smelter.
40 CFR 63	Y	National Emission Standards for Marine Tank Vessel Loading Operations	Applicable to pre-project operations	No change to subpart-level applicability	Applies to any location where at least one dock or loading berth is bulk loading liquid such as gasoline or crude oil onto marine tank vessels. Marathon operates the Avon Wharf, which is subject to the requirements of this rule. The Amorco Wharf Terminal is normally used for unloading only, which is not a regulated activity covered by Subpart Y. The source is exempt from Subpart Y for unloading activities and loading activities for materials with vapor pressures of less than 1.5 psia.
40 CFR 63	AA	National Emission Standards for Hazardous Air Pollutants from Phosphoric Acid Manufacturing Plants			Applies to affected sources at phosphoric acid manufacturing plants that are major sources of HAPs. Marathon does not and will not operate a phosphoric acid manufacturing plant.
40 CFR 63	BB	National Emission Standards for Hazardous Air Pollutants from Phosphate Fertilizer Production Plants			Applies to affected sources at phosphate fertilizers production plants located at major sources of HAPs. Marathon idoes not operate a phosphate fertilizer plant.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	CC	National Emission Standards for Hazardous Air Pollutants From Petroleum Refineries	Applicable to pre-project operations	Will not be subject to subpart	Applies to petroleum refining process units and related emission points that are located at a plant site that is a major source of HAPs and emit or have equipment containing or contacting one or more of the listed HAPs. The facility is no longer considered a petroleum refinery and does not operate under Source Industrial Classification Code 2911. Marathon will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.
40 CFR 63	DD	National Emission Standards for Hazardous Air Pollutants from Off-Site Waste and Recovery Operations			Applies to affected sources at a plant site that is a major source of HAPs and has located at it one or more operations that receives off-site materials and the operations are specified waste management or recovery operations. Marathon does not and will not operate a waste management or recovery operation.
40 CFR 63	EE	National Emission Standards for Magnetic Tape Manufacturing Operations			Applies to magnetic tape manufacturing operations located at a major source of HAPs or one that chooses to obtain a federally enforceable limit on its potential to emit HAPs. Marathon is not a magnetic tape manufacturing facility.
40 CFR 63	GG	National Emission Standards for Aerospace Manufacturing and Rework Facilities			Applies to affected sources at facilities that are engaged, either in part or in whole, in the manufacture or rework of commercial, civil or military aerospace vehicles or components and that are major sources of HAPs. Marathon does not and will not operate an aerospace facility.
40 CFR 63	HH	National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities			Applies to affected sources at oil and natural gas production facilities that are major sources of HAPs and either process, upgrade or store hydrocarbon liquids prior to point of custody transfer or process, upgrade or store natural gas prior to the point at which natural gas enters the transmission and storage source category or is delivered to a final end user. Marathon does not and will not operate an oil or natural gas production facility.
40 CFR 63	II	National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)			Applies to shipbuilding and ship repair operations at any facility that is a major source of HAPs. Marathon does not and will not operate a shipbuilding facility.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	JJ	National Emission Standards for Wood Furniture Manufacturing Operations			Applies to each facility that is engaged, either in part or in whole, in the manufacture of wood furniture or wood furniture components and that is located at a plant site that is a major source of HAPs. Marathon does not and will not operate a wood furniture manufacturing facility.
40 CFR 63	KK	National Emission Standards for the Printing and Publishing Industry			Applies to each facility that is a major source of HAPS at which publication rotogravure, product and packaging rotogravure or wide-web flexographic printing presses are operated. Marathon does not and will not operate a printing or publishing operation.
40 CFR 63	LL	National Emission Standards for Hazardous Air Pollutants for Primary Aluminum Reduction Plants			Applies to each new pitch storage tank and each new or existing potline, paste production plant or anode bake furnace associated with primary aluminum production and located at a major source of HAPs. Marathon does not and will not operate an aluminum plant.
40 CFR 63	MM	National Emission Standards for Hazardous Air Pollutants for Combustion Sources at Kraft, Soda, and Sulfite Pulp and Paper Mills			Applies to pulp and paper mill operations. Marathon does not and will not operate a pulp and paper plant.
40 CFR 63	OO	National Emission Standards for Tanks - Level 1			Applies to the control of air emissions from tanks for which another subpart of 40 CFR parts 60, 61 or 63 references the use of this subpart for such air emission control. Unless referred to this subpart by another rule, OO is not directly applicable to Marathon.
40 CFR 63	PP	National Emission Standards for Containers			Applies to the control of air emissions from containers for which another subpart of 40 CFR parts 60, 61 or 63 references the use of this subpart for such air emission control. Unless referred to this subpart by another rule, PP is not directly applicable to Marathon.
40 CFR 63	QQ	National Emission Standards for Surface Impoundments			Applies to the control of air emissions from surface impoundments for which another subpart of 40 CFR parts 60, 61 or 63 references the use of this subpart for such air emission control. Marathon does not and will not operate a surface impoundment.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	RR	National Emission Standards for Individual Drain Systems			Applies to the control of air emissions from individual drain systems for which another subpart of 40 CFR parts 60, 61 or 63 references compliance with provisions within this subpart does not operate. Unless referred to this subpart by another rule, RR is not directly applicable to Marathon.
40 CFR 63	SS	National Emission Standards for Closed Vent Systems, Control Devices, Recovery Devices and Routing to a Fuel Gas System or a Process			Applies to closed vent systems, control devices and routing of air emissions to a fuel gas system or process when another subpart references this subpart. Marathon will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.
40 CFR 63	TT	National Emission Standards for Equipment Leaks - Control Level 1			Applies to equipment leaks for which another subpart references this subpart. Unless referred to this subpart by another rule, TT is not directly applicable to Marathon.
40 CFR 63	UU	National Emission Standards for Equipment Leaks - Control Level 2 Standards			Applies to equipment leaks for which another subpart references this subpart. Unless referred to this subpart by another rule, UU is not directly applicable to Marathon.
40 CFR 63	VV	National Emission Standards for Oil-Water Separators and Organic-Water Separators			Applies to the control of air emissions from oil-water separators and organic-water separators for which another subpart of 40 CFR parts 60, 61 or 63 references the use of this subpart for such air emission control. Unless referred to this subpart by another rule, VV is not directly applicable to Marathon.
40 CFR 63	WW	National Emission Standards for Storage Vessels (Tanks) - Control Level 2			Applies to storage vessels for which another subpart references this subpart. Marathon will not be subject to this subpart, though it is subject to other subparts in 40 CFR Part 63 that may refer to this subpart.
40 CFR 63	XX	National Emission Standards for Ethylene Manufacturing Process Units: Heat Exchange Systems and Waste Operations			Applies to a heat exchange system operated in conjunction with an ethylene production unit expressly referenced to this subpart from subpart YY of this part. Marathon does not and will not operate a heat exchanger in ethylene service.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	YY	National Emission Standards for Hazardous Air Pollutants for Source Categories: Generic Maximum Achievable Control Technology Standards			Applies to acetal resins production, acrylic and modacrylic fibers production, hydrogen fluoride production and polycarbonate production facilities. Marathon does not and will not operate any of these processes.
40 CFR 63	CCC	National Emission Standards for Hazardous Air Pollutants for Steel Pickling - HCl Process Facilities and Hydrochloric Acid Regeneration Plants			Applies to affected sources at steel pickling facilities that use hydrochloric acid solution that contains 6% or more HCl and is at a temperature of 100 F or greater and hydrochloric acid regeneration plants that are located at a plant site that is a major source of HAPs. Marathon does not and will not operate a steel pickling facility with 6% or more hydrochloric acid.
40 CFR 63	DDD	National Emission Standards for Hazardous Air Pollutants for Mineral Wool Production			Applies to mineral wool production facilities located at plant sites that major sources of HAPs. Marathon does not and will not operate a mineral wool production facility.
40 CFR 63	EEE	National Emission Standards for Hazardous Air Pollutants From Hazardous Waste Combustors			Applies to sources that combust hazardous waste. Marathon does not and will not operate hazardous waste combustion activities.
40 CFR 63	GGG	National Emission Standards for Pharmaceuticals Production			Applies to pharmaceutical manufacturing operations that manufacture a pharmaceutical product, are located at a major source of HAPs and process, use or produce a HAP. Marathon is not a pharmaceutical facility.
40 CFR 63	HHH	National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities			Applies to each glycol dehydration units at natural gas transmission and storage facilities that transport or store natural gas prior to entering the pipeline to a local distribution company or to a final end user and that are major sources of HAPs. Marathon is not a natural gas transmission and storage facility.
40 CFR 63	III	National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production			Applies to each flexible polyurethane foam or rebond foam process that produces flexible polyurethane or rebond foam, emits a HAP and is located at a major source. Marathon does not not produce polyurethane foam.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	JJJ	National Emission Standards for Hazardous Air Pollutant Emissions: Group IV Polymers and Resins			Applies to each group of one or more thermoplastic product process units that is manufacturing the same primary product and that is located at a plant site that is a major source of HAPs. Marathon will not produce polymers or resins.
40 CFR 63	LLL	National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry			Applies to affected sources at portland cement plants. Marathon does not and will not operate a portland cement plant.
40 CFR 63	MMM	National Emission Standards for Hazardous Air Pollutants for Pesticide Active Ingredient Production			Applies to the facility-wide collection of pesticide active ingredient manufacturing process units that process, use or produce HAPs and that are located at major sources of HAPs. Marathon does not produce pesticide active ingredients.
40 CFR 63	NNN	National Emission Standards for Hazardous Air Pollutants for Wool Fiberglass Manufacturing			Applies to affected sources at each wool fiberglass manufacturing facility that is a major source or is located at a major source. Marathon does not produce wool fiberglass.
40 CFR 63	OOO	National Emission Standards for Hazardous Air Pollutants for Polymers & Resins III, Amino Acids, Phenolic Resins			Applies to polymer, resin and amino acid manufacturing process units and associated equipment. Marathon does not produce polymers, resins or amino acids.
40 CFR 63	PPP	National Emission Standards for Hazardous Air Pollutants for Polyether Polyols Production			Applies to polyether polyol manufacturing process units and associated equipment. Marathon will not produce polyether polyols.
40 CFR 63	QQQ	National Emission Standards for Hazardous Air Pollutants for Primary Copper Production			Applies to primary copper production facilities. Marathon is not a primary copper production facility.
40 CFR 63	RRR	National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum			Applies to aluminum production facilities. Marathon does not produce aluminum.

Martinez Renewable Fuels Project
Air Quality Regulatory Applicability Tables
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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	TTT	National Emission Standards for Hazardous Air Pollutants for Primary Lead Smelting			Applies to sinter machines, blast furnaces, dross furnaces, process fugitive sources and fugitive dust sources located at primary lead smelters. Marathon is not a lead smelter.
40 CFR 63	UUU	National Emission Standards for Hazardous Air Pollutants for Petroleum Refineries	Applicable to pre-project operations	Will not be subject to subpart	Applies to certain petroleum refinery processes (catalytic cracking, catalytic reforming and sulfur recovery unit plant units. The facility is no longer considered a petroleum refinery as a result of the project. The offgas treating system is not a SRU plant because elemental sulfur isn't recovered.
40 CFR 63	VVV	National Emission Standards for Hazardous Air Pollutants for Publicly Owned Treatment Works (POTW)			Applies to publicly owned treatment works (POTWs). Marathon is not a POTW.
40 CFR 63	XXX	National Emission Standards for Hazardous Air Pollutants for Ferroalloys Production: Ferromanganese and Silicomanganese			Applies to affected sources at ferromanganese and silicomanganese production facilities that manufacture ferromanganese or silicomanganese and are major sources of HAPs or are co-located at major sources of HAPs. Marathon is not a ferroalloy production facility.
40 CFR 63	AAAA	National Emission Standards for Hazardous Air Pollutants for Municipal Solid Waste Landfills			Applies to municpal solid waste landfills that are major HAP sources. Marathon is not a municipal solid waste landfill.
40 CFR 63	CCCC	National Emission Standards for Hazardous Air Pollutants for Manufacturing Nutritional Yeast			Applies to facilites that manufacture nutritional yeast. Marathon does not manufacture nutritional yeast.
40 CFR 63	DDDD	National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products			Applies to plywood and composite wood products (PCWP) manufacturing facilities. Marathon does not and will not operate a PCWP manufacturing facility.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	EEEE	National Emission Standards for Hazardous Air Pollutants for Organic Liquids Distribution			Applies to organic liquid distribution (OLD) facilities. Marathon conducts activities that would be regulated by this rule, but complies with provisions of other subparts (e.g., R for truck loading rack, Y for Avon and Amorco Wharf) to satisfy the requirements of this subpart. Therefore, Subpart EEEE does not apply.
40 CFR 63	FFFF	National Emission Standards for Hazardous Air Pollutants for Miscellaneous Organic Chemical Manufacturing (23 subcategories)		Will become subject to this subpart	Applies to miscellaneous organic chemical manufacturing process units (MCPU) that are located at, or are part of, a major source of hazardous air pollutants (HAP) emissions. Marathon meets these criteria and will comply with the provisions for a existing source following the project.
40 CFR 63	GGGG	National Emission Standards for Hazardous Air Pollutants for Solvent Extraction for Vegetable Oil Production			Applies to solvent extraction process for vegetable oil production at major HAP sources. Marathon does not and will not operate a solvent extraction process for vegetable oil production.
40 CFR 63	HHHH	National Emission Standards for Hazardous Air Pollutants for Wet Formed Fiberglass Mat Production			Applies to fiberglass mat production processes. Marathon does not produce fiberglass materials.
40 CFR 63	IIII	National Emission Standards for Hazardous Air Pollutants: Surface Coating of Automobiles and Light-Duty Trucks			Applies to facilities which surface coat new automobile or new light-duty truck bodies or body parts for new automobiles or new light-duty trucks. Marathon does not and will not operate vehicle surface coating operations.
40 CFR 63	JJJJ	National Emission Standards for Hazardous Air Pollutants for Paper and Other Web Surface Coating			Applies to paper and web-coating operations. Marathon does not conduct paper and web-coating operations.
40 CFR 63	KKKK	National Emission Standards for Hazardous Air Pollutants for Metal Can Surface Coating			Applies to facilities engaged in surface coating of metal cans and ends (including decorative tins) and metal crowns and closures. Marathon will not conduct metal can coating operations.

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Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	MMMM	National Emission Standards for Hazardous Air Pollutants for Miscellaneous Metal Parts and Products (Surface Coating)			Miscellaneous metal parts and products include, but are not limited to, metal components of the following types of products as well as the products themselves: motor vehicle parts and accessories, bicycles and sporting goods, recreational vehicles, extruded aluminum structural components, railroad cars, heavy duty trucks, medical equipment, lawn and garden equipment, electronic equipment, magnet wire, steel drums, industrial machinery, metal pipes, and numerous other industrial, household, and consumer products. Marathon does not and will not operate [illegible]
40 CFR 63	NNNN	National Emission Standards for Hazardous Air Pollutants for Large Appliance Manufacturing			Applies to surface coating operations for large appliance manufacturing. Marathon is not an appliance manufacturing facility.
40 CFR 63	OOOO	National Emission Standards for Hazardous Air Pollutants for Fabric Printing, Coating & Dyeing			Applies to fabric and other textiles printing, coating and dyeing operations. Marathon does not conduct operations for fabric and other textiles printing, coating and dyeing.
40 CFR 63	PPPP	National Emission Standards for Hazardous Air Pollutants for Plastic Parts and Products Surface Coating			Applies to plastic product coating operations. Marathon does not conduct operations to coat plastic products.
40 CFR 63	QQQQ	National Emission Standards for Hazardous Air Pollutants for Wood Building Products			Applies to wood building product manufacture at major HAP sources. Marathon does not manufacture wood building products.
40 CFR 63	RRRR	National Emission Standards for Hazardous Air Pollutants for Surface Coating of Metal Furniture			Applies to any metal furniture coating pocess at a facility that is a major HAP source. Marathon does not include metal furniture coating.
40 CFR 63	SSSS	National Emission Standards for Hazardous Air Pollutants for Surface Coating of Metal Coil			Applies to any metal coil coating line at a facility that is a major HAP source. Marathon does not and will not operate a coil coating process as defined by Part 63.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	TTTT	National Emission Standards for Hazardous Air Pollutants for Leather Finishing Operations			Applies to leather finishing operations at a major HAP source. Marathon does not conduct leather finishing operations.
40 CFR 63	UUUU	National Emission Standards for Hazardous Air Pollutants for Cellulose Products Manufacturing			Applies to cellulose products manufacturing operations. Marathon does not conduct cellulose product manufacturing.
40 CFR 63	VVVV	National Emission Standards for Hazardous Air Pollutants for Boat Manufacturing			Applies to boat manufacturing facilities. Marathon is not a boat manufacturing facility.
41 CFR 63	WWWW	National Emission Standards for Hazardous Air Pollutants for Reinforced Plastic Composites Production			Applies to reinforced plastic composites production facilities located at a major source of HAP emissions. Marathon will not include reinforced plastic composites manufacturing.
40 CFR 63	XXXX	National Emission Standards for Hazardous Air Pollutants for Tire Manufacturing			Applies to tire manufacturing facilities. Marathon is not a tire manufacturing facility.
40 CFR 63	YYYY	National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines			Applies to stationary combustion turbines located at major sources of HAP emissions; however, the rule as it applies to several subcategories of turbines within this NESHAP category has been stayed. Marathon does not and will not operate combustion turbine units.
40 CFR 63	ZZZZ	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines	Applicable to pre-project operations	No change to subpart-level applicability	Applies to stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. Marathon operates multiple RICE subject to this subpart that will continue to operate or remain available for operations following completion of the project. Several RICE that are currently subject to Subpart ZZZZ will be shutdown and no longer subject to the requirements of this rule.
40 CFR 63	AAAAA	National Emission Standards for Hazardous Air Pollutants for Lime Manufacturing			Applies to lime manufacturing plants. Marathon does not and will not operate a lime manufacturing plant.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	BBBBB	National Emission Standards for Hazardous Air Pollutants for Semiconductor Manufacturing			Applies to semiconductor manufacturing processes. Marathon does not produce semiconductors.
40 CFR 63	CCCCC	National Emission Standards for Hazardous Air Pollutants for Coke Oven: Pushing, Quenching & Battery Stacks			Applies to coke oven operations. Marathon does not and will not operate coke ovens.
40 CFR 63	DDDDD	National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters	Applicable to pre-project operations	No change to subpart-level applicability	Applies to industrial, commercial, and institutional boilers and process heaters at major sources of HAPs. Marathon operates boilers and process heaters subject to this rule and will remain subject to the rule following completion of the project.
40 CFR 63	EEEEE	National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries			Applies to iron and steel foundries. Marathon is not a foundry and will not produce commercial castings.
40 CFR 63	FFFFF	National Emission Standards for Hazardous Air Pollutants for Integrated Iron & Steel			Applies to integrated iron and steel manufacturing facilities, which are defined as establishments engaged in the production of steel from iron ore. Marathon does not and will not operate any of the affected sources listed by the standard.
40 CFR 63	GGGGG	National Emission Standards for Hazardous Air Pollutants for Remediation Sites	Applicable to pre-project operations	No change to subpart-level applicability	Establishes emissions limitations and work practice standards for hazardous air pollutants (HAP) emitted from site remediation activities at major sources. Marathon is subject to this subpart and will continue to be so following the project.
40 CFR 63	HHHHH	National Emission Standards for Hazardous Air Pollutants: Miscellaneous Coating Manufacturing			Applies to miscellaneous coating manufacturing facilities. Coatings are defined as any materials such as paint, ink, or adhesive that are intended to be applied to a substrate. Marathon does not manufacture miscellaneous coatings.
40 CFR 63	IIIII	National Emission Standards for Hazardous Air Pollutants for Mercury-Cell Chlor-Alkalai Plants			Applies to affected sources of mercury emissions at mercury cell chlor-alkali plants. Marathon does not and will not operate not a chlor-alkali facility.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	JJJJJ	National Emission Standards for Hazardous Air Pollutants for Brick and Structural Clay Products Manufacturing			Applies to clay products manufacturing facilities. Marathon does not and will not manufacture clay products.
40 CFR 63	KKKKK	National Emission Standards for Hazardous Air Pollutants for Clay Ceramics Manufacturing			Applies to clay ceramics manufacturing. Marathon does not and will not operate a clay ceramics manufacturing facility.
40 CFR 63	LLLLL	National Emission Standards for Hazardous Air Pollutants for Asphalt Roofing & Processing			Applies to asphalt roofing manufacture and processing. Marathondoes not and will not produce asphalt roofing products.
40 CFR 63	MMMMM	National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production			Applies to a plant site that is a major HAP source where pieces of flexible polyurethane foam are bonded together or to other substrates using HAP-based adhesives or flame lamination. Marathon does not and will not process polyurethane foam.
40 CFR 63	NNNNN	National Emission Standards for Hazardous Air Pollutants for Hydrochloric Acid Production			Applies to hydrochloric acid production processes. Marathon does not and will not produce hydrochloric acid.
40 CFR 63	PPPPP	National Emission Standards for Hazardous Air Pollutants for Engine Test Cells/Stands			Applies to engine test cells and stands. Marathon does not and will not utilize engine test cells and stands.
40 CFR 63	QQQQQ	National Emission Standards for Hazardous Air Pollutants for Friction Products Manufacturing			Applies to any facility engaged in the manufacture of friction materials such as brake and clutch linings. Marathon does not and will not manufacture friction materials.
40 CFR 63	RRRRR	National Emission Standards for Hazardous Air Pollutants for Taconite Ore Processing			Applies to taconite iron ore processing plants. Marathon is not a taconite iron ore processing plant.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	SSSSS	National Emission Standards for Hazardous Air Pollutants for Refractory Products Manufacturing			Applies to facilities that manufacture refractory products. Marathon does not and will not manufacture refractory materials.
40 CFR 63	TTTTT	National Emission Standards for Hazardous Air Pollutants for Primary Magnesium Refining			Applies to facilities that engaged in primary magnesium production. Marathon does not and will not produce magnesium materials.
40 CFR 63	UUUUU	National Emission Standards for Hazardous Air Pollutants for Coal- and Oil-Fired Electric Utility Steam Generating Units			National emission limitations and work practice standards for hazardous air pollutants (HAP) emitted from coal- and oil-fired electric utility steam generating units (EGUs) as defined in §63.10042 of this subpart. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations. Marathon does not and will not use any coal- or oil-fired EGUs.
40 CFR 63	WWWWW	National Emission Standards for Hazardous Air Pollutants for Hospital Ethylene Oxide Sterilizers			Establishes best management practices for ethylene oxide sterilzation. Marathon does not and will not operate ethylene oxide sterilizers.
40 CFR 63	YYYYY	National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities			Applies if you own or operate an electric arc furnace (EAF) steelmaking facility that will be an area source of hazardous air pollutant (HAP) emissions. Marathon is not an area source of HAP.
40 CFR 63	ZZZZZ	National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries Area Sources			Applies if you own or operate an iron and steel foundry that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not and will not operate an iron and steel foundry and is not an area source of HAP.
40 CFR 63	BBBBBB	National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities			Establishes best management practices and control equipment requirements for area source gasoline distribution bulk terminals, bulk plants, and pipeline facilities. Marathon is not an area source of HAP.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	CCCCCC	National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities			Establishes best management practices and control equipment requirements for gasoline dispensing facilities at area sources. Marathon is not an area source of HAP.
40 CFR 63	DDDDDD	National Emission Standards For Hazardous Air Pollutants For Polyvinyl Chloride And Copolymers Production Area Sources			Applies if you own or operate a plant specified in 40 CFR 61.61(c) that produces polyvinyl chloride (PVC) or copolymers and will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not produce PVC or copolymers and is not an area source of HAP.
40 CFR 63	EEEEEE	National Emission Standards For Hazardous Air Pollutants For Primary Copper Smelting Area Sources			Applies if you own or operate a primary copper smelter that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not and will not operate a primary copper smelter and is not an area source of HAP.
40 CFR 63	FFFFFF	National Emission Standards For Hazardous Air Pollutants For Secondary Copper Smelting Area Sources			Applies if you own or operate a new secondary copper smelter that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not and will not operate a new secondary copper smelter and is not an area source of HAP.
40 CFR 63	GGGGGG	National Emission Standards For Hazardous Air Pollutants For Primary Nonferrous Metals Area Sources--Zinc, Cadmium, And Beryllium			Applies if you own or operate a primary zinc production facility or primary beryllium production facility that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not and will not operate a primary zinc or beryllium production facility and is not an area source of HAP.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	HHHHHH	National Emission Standards For Hazardous Air Pollutants: Paint Stripping And Miscellaneous Surface Coating Operations At Area Sources			Applies if you are an area source of hazardous air pollutant (HAP emissions) and if you operate (a) Paint stripping operations that involve the use of chemical strippers that contain methylene chloride (MeCl), Chemical Abstract Service number 75092, in paint removal processes; (b) Autobody refinishing operations that encompass motor vehicle and mobile equipment spray-applied surface coating operations; (c) Spray application of coatings containing compounds of chromium (Cr), lead (Pb), manganese (Mn), nickel (Ni), or cadmium (Cd), collectively referred to as the target HAP to any part or product made of metal or plastic, or combinations of metal and plastic that are not motor vehicles or mobile equipment. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	JJJJJJ	National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters at Area Sources			Applies to industrial, commercial, and institutional boilers and process heaters within a subcategory at area sources of HAPs. Marathon is not an area source of HAP.
40 CFR 63	LLLLLL	National Emission Standards For Hazardous Air Pollutants For Acrylic And Modacrylic Fibers Production Area Sources			Applies if you own or operate an acrylic or modacrylic fibers production plant that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engange in these operations and is not an area source of HAP.
40 CFR 63	MMMMMM	National Emission Standards For Hazardous Air Pollutants For Carbon Black Production Area Sources			Applies if you own or operate a carbon black production facility that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	NNNNNN	National Emission Standards For Hazardous Air Pollutants For Chemical Manufacturing Area Sources: Chromium Compounds			Applies if you own or operate a chromium compounds manufacturing facility that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	OOOOOO	National Emission Standards For Hazardous Air Pollutants For Flexible Polyurethane Foam Production And Fabrication Area Sources			Applies if you own or operate an area source of hazardous air pollutant (HAP) emissions that meets the criteria in paragraph (a)(1) or (2) of this section. (1) You own or operate a plant that produces flexible polyurethane foam or rebond foam as defined in §63.1292 of subpart III. (2) You own or operate a flexible polyurethane foam fabrication facility, as defined in §63.11419. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	PPPPPP	National Emission Standards For Hazardous Air Pollutants For Lead Acid Battery Manufacturing Area Sources			Applies if you own or operate a lead acid battery manufacturing plant that will be an area source of hazardous air pollutants (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	QQQQQQ	National Emission Standards For Hazardous Air Pollutants For Wood Preserving Area Sources			Applies if you own or operate a wood preserving operation that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	RRRRRR	National Emission Standards For Hazardous Air Pollutants For Clay Ceramics Manufacturing Area Sources			Applies if you own or operate a clay ceramics manufacturing facility (as defined in §63.11444), with an atomized glaze spray booth or kiln that fires glazed ceramic ware, that processes more than 45 megagrams per year (Mg/yr) (50 tons per year (tpy)) of wet clay and will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	SSSSSS	National Emission Standards For Hazardous Air Pollutants For Glass Manufacturing Area Sources			Applies if you own or operate a glass manufacturing facility that will be an area source of hazardous air pollutant (HAP) emissions and meets specific criteria. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	TTTTTT	National Emission Standards For Hazardous Air Pollutants For Secondary Nonferrous Metals Processing Area Sources			Applies if you own or operate a secondary nonferrous metals processing facility (as defined in §63.11472) that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	VVVVVV	National Emission Standards For Hazardous Air Pollutants For Chemical Manufacturing Area Sources			Applies if you own or operate a chemical manufacturing process unit (CMPU) at an area source of HAP in NAICS code 325 that uses certain listed HAP. Marathon is not an area source of HAP.
40 CFR 63	WWWWWW	National Emission Standards For Hazardous Air Pollutants: Area Source Standards For Plating And Polishing Operations			Applies if you own or operate a plating and polishing facility that will be an area source of hazardous air pollutant (HAP) emissions and meets specific criteria. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	XXXXXX	National Emission Standards For Hazardous Air Pollutants Area Source Standards For Nine Metal Fabrication And Finishing Source Categories			Applies if you own or operate an area source that is primarily engaged in the operations in one of the nine source categories of metal fabrication and finishing operations. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	YYYYYY	National Emission Standards For Hazardous Air Pollutants For Area Sources: Ferroalloys Production Facilities			Applies if you own or operate a ferroalloys production facility that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	ZZZZZZ	National Emission Standards For Hazardous Air Pollutants: Area Source Standards For Aluminum, Copper, And Other Nonferrous Foundries			Applies if you own or operate an aluminum foundry, copper foundry, or other nonferrous foundry that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	AAAAAAA	National Emission Standards For Hazardous Air Pollutants For Area Sources: Asphalt Processing And Asphalt Roofing Manufacturing			Applies if you own or operate an asphalt processing operation and/or asphalt roofing manufacturing operation that will be an area source of hazardous air pollutant (HAP) emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	BBBBBBB	National Emission Standards For Hazardous Air Pollutants For Area Sources: Chemical Preparations Industry			Applies if (1) You own or operate a chemical preparations facility that is a stationary area source of HAP and has at least one chemical preparations operation in target HAP service. Marathon is an area source of HAP.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 63	CCCCCCC	National Emission Standards For Hazardous Air Pollutants For Area Sources: Paints And Allied Products Manufacturing			Applies if you own or operate a facility that performs paints and allied products manufacturing that will be an area source of HAP emissions and processes, uses, or generates materials containing HAP, as defined in §63.11607. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	DDDDDDD	National Emission Standards For Hazardous Air Pollutants For Area Sources: Prepared Feeds Manufacturing			Applies to each new and existing prepared feeds manufacturing affected source located at area sources of HAP emissions. Marathon does not engage in these operations and is not an area source of HAP.
40 CFR 63	EEEEEEE	National Emission Standards for Hazardous Air Pollutants: Gold Mine Ore Processing and Production Area Source Category			Applies if you own or operate a gold mine ore processing and production facility as defined in §63.11651, that will be an area source. Marathon does not own or operate a gold mine ore processing and production facility and is not an area source of HAP.
40 CFR 63	HHHHHHH	National Emission Standards for Hazardous Air Pollutant Emissions for Polyvinyl Chloride and Copolymers Production			Applies to facilities with polyvinyl chloride and copolymers production process units (PVCPU) that are located at, or are part of, a major source of HAP. Marathon does not produce polyvinyl chloride and copolymers and is not an area source of HAP.
40 CFR 64	---	Compliance Assurance Monitoring for Major Stationary Sources	Applicable to pre-project operations	No change to subpart-level applicability	The requirements of this part apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if the unit satisfies several criteria. Following completion of the project, Marathon will operates the Sulfuric Acid Plant, which was subject to CAM prior to the project and are unchanged by the project or facility conversion from petroleum refinery to renewable chemical production facility.
40 CFR 65	---	Consolidated Federal Air Rule			This part allows an owner or operator to comply with this consolidated regulation as an alternative to individual referenced subparts in 40 CFR 60, 61, or 63. Marathon has not chosen this alternative, though it is subject to other subparts in 40 CFR Part 63 that may refer to this part.

Table G.1: Federal Regulations

Part	Subpart	Rule Name	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
40 CFR 68	---	Chemical Accident Prevention Provisions (RMP)	Applicable to pre-project operations	No change to subpart-level applicability	This Part sets forth the list of regulated substances and thresholds, the petition process for adding or deleting substances to the list of regulated substances, the requirements for owners or operators of stationary sources concerning the prevention of accidental releases, and the State accidental release prevention programs approved under section 112(r). Marathon stores and handles regulated substances above the respective threshold quantities and will continue to be subject to the rule following completion of the project.
40 CFR 70	---	State Operating Permit Programs	Applicable to pre-project operations	No change to subpart-level applicability	The regulations in this part provide for the establishment of comprehensive State air quality permitting systems consistent with the requirements of title V of the Clean Air Act (Act) (42 U.S.C. 7401, et seq.). Marathon operates under a Title V permit.
40 CFR 82	---	Protection of Stratospheric Ozone	Applicable to pre-project operations	No change to subpart-level applicability	The regulations in this subpart implement the Montreal Protocol and limits on the production, consumption, and utilization of certain ozone-depleting substances. Marathon shall continue to use regulated product and refrigerants in certain equipment at the site following the project.
40 CFR 98	---	Federal Greenhouse Gas Reporting Rule	Applicable to pre-project operations	Applicable to post-project operations	This part establishes a mandatory greenhouse gas emission reporting program. This program applies to Marathon because it is expected to emit greater than 25,000 tons per year of CO2e as a result of fossil fuel combustion following the project. Marathon will no longer report under Subpart Y, but will continue to report emissions associated with the source under Subparts C, P, and MM.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 1	General Provisions & Definitions	NA	Applicable to pre-project operations	No change in rule-level applicability	Applicable to all District Regulations and are in addition to the provisions and definitions in individual Rules and Regulations. Regulation 1 includes sections on exclusions, breakdown procedures, definition of terms, registration, right of access, sampling facilities, record maintenance, and many other provisions. Applicable to all
Regulation 2, Rule 1	General Requirements	NA	Applicable to pre-project operations	No change in rule-level applicability	Includes criteria for issuance or denial of permits, exemptions, appeals against decisions of the APCO and District actions on applications. This project triggers the BAAQMD permitting requirements.
Regulation 2, Rule 2	New Source Review	NA	Applicable to pre-project operations	See post-project statement	Applies to new or modified sources. Rule 2 contains requirements for Best Available Control Technology and emission offsets. Rule 2 implements federal New Source Review and Prevention of Significant Deterioration requirements.
Regulation 2, Rule 4	Emissions Banking	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule includes procedures for banking and offsets. Establishes a small facility bank for offsets for eligible facilities. The rule is applicable for the generation of any ERCs from the project.
Regulation 2, Rule 5	New Source Review of Toxic Air Contaminants	NA	Applicable to pre-project operations	See post-project statement	Applies preconstruction permit review to new and modified sources of toxic air contaminants; contains project health risk limits and requirements for Toxics Best Available Control Technology. Applicability will be determined via the Project emissions calculations.

Martinez Renewable Fuels Project
Table G.2: BAAQMD Regulations

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 2, Rule 6	Major Facility Review	NA	Applicable to pre-project operations	No change in rule-level applicability	Establishes procedures for large facilities to obtain Title V permits. The facility will remain subject to Title V.
Regulation 2, Rule 9	Interchangeable Emission Reduction Credits	NA	Applicable to pre-project operations	No change in rule-level applicability	Regulates use and trading of Interchangeable Emission Reduction Credits from stationary sources of nitrogen oxides (NOx). The rule is applicable for the generation of any IERCs from the project.
Regulation 3	Fees 2020 Amendment (Current)	NA	Applicable to pre-project operations	No change in rule-level applicability	This Regulation establishes fees to be charged for permits, equipment registration, emissions, Hearing Board filings, and other District services. Applicable to all sources.
Regulation 4	Air Pollution Episode Plan	NA	Applicable to pre-project operations	No change in rule-level applicability	A system designed to reduce levels of air contaminants that may be harmful to health and to protect that portion of the population at risk. Establishes control and advisory procedures when specified levels have been or are forecasted to be reached at each of four stages. Applicable to the facility.
Regulation 5	Open Burning 2019 Amendment (Current)	NA	Applicable to pre-project operations	No change in rule-level applicability	Generally prohibits open burning, but also allows for exemptions such as agricultural burning, disposal of hazardous materials, fire training, and range, forest, and wildlife management.
Regulation 6	Particulate Matter - Common Definitions and Test Methods	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of Regulation 6 is to reduce emissions of particulate matter from commercial and industrial sources.
Regulation 6, Rule 1	General Requirements 2018 Amendment (Current)	NA	Applicable to pre-project operations	No change in rule-level applicability	Limits the quantity of particulate matter in the atmosphere by controlling emission rates, concentration, visible emissions and opacity.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 6, Rule 5	Particulate Emissions from Refinery Fluidized Catalytic Cracking Units 2018 Amendment (Current)	Fluidized Catalytic Cracking Unit (FCCU): A fluidized catalytic cracking unit (FCCU) is a processing unit that converts heavy petroleum fractions, typically from crude oil distillation units, into lighter fuel intermediates by using a fine, powdered catalyst to promote a chemical reaction in which the heavy petroleum molecules are broken into smaller molecules. In addition to the cracking reactor, an FCCU includes a catalyst regeneration unit (CRU), ancillary equipment including blowers, and all equipment for controlling air pollutant emissions and recovering	Applicable to pre-project operations	Will not be subject to rule	This rule limits the emissions of condensable particulate matter emissions from petroleum refinery fluidized catalytic cracking units (FCCUs) as well as emissions of precursors of secondary particulate matter. Since the FCCU will be shutdown, this rule shall no longer apply.
Regulation 7	Odorous Substances	NA	Applicable to pre-project operations	No change in rule-level applicability	Establishes general limitations on odorous substances and specific emission limitations on certain odorous compounds. The facility is subject to the rule
Regulation 8, Rule 1	General Provisions	NA	Applicable to pre-project operations	See rule-level applicability below	The purpose of this Regulation is to limit the emission of organic compounds to the atmosphere. See individual rules below.
Regulation 8, Rule 3	Architectural Coatings	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit the quantity of VOC in architectural coatings used within the District. This rule will continue to apply.
Regulation 8, Rule 4	General Solvent and Surface Coating Operations	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit the emissions of VOC from the use of solvents and surface coatings. This rule will continue to apply.
Regulation 8, Rule 5	Storage of Organic Liquids	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds from storage tanks. This rule will continue to apply to facility tanks.

Martinez Renewable Fuels Project
Table G.2: BAAQMD Regulations

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 6	Terminals and Bulk Plants	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds from transfer operations at non-gasoline organic liquid bulk terminals and bulk plants.
Regulation 8, Rule 7	Gasoline Dispensing Facilities	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule limits organic compound emissions from gasoline dispensing facilities. Post-project, the facility will continue to operate is gasoline dispensing station. This rule will continue to apply.
Regulation 8, Rule 8	Wastewater (Oil-Water) Separators	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule limits organic compound emissions from wastewater collection and separation systems. The facility will continue to comply with this rule.
Regulation 8, Rule 9	Vacuum Producing Systems	NA	Applicable to pre-project operations	Will not be subject to rule	This rule limits organic compound emissions vacuum producing systems. Post-project, the facility will not have any process operated under a vacuum. Therefore, this rule will not be applicable.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 10	Process Vessel Depressurization	Petroleum Refinery: Any facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411 (1997). Chemical Plant: Any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes. Any facility or operation that has 325 as the first three digits in the North American Industrial Classification Standard (NAICS) code. Chemical plants may include, but are not limited to the manufacture of: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other man made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; re-refining.	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds from depressurizing and opening of process vessels at petroleum refineries and chemical plants. The rule shall continue to be applicable after the project.
Regulation 8, Rule 16	Solvent Cleaning Operations	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions from solvent cleaning operations which include any process, including wipe cleaning, used to clean or dry metal and non-metal surfaces typically using a cold, vapor or conveyorized solvent cleaner.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 18	Equipment Leaks	Petroleum Refinery: Any facility that processes petroleum products as defined in North American Industrial Classification Standard Number 32411, Petroleum Refining. Chemical Plant: Any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes, including (1) any facility or operation that has 325 as the first three digits in the North American Industrial Classification Standard (NAICS) code, (2) any facility that manufactures industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other manmade fibers; drugs; soap, detergents and cleaning preparations; perfumes, cosmetics, and other toilet preparations; paints, varnishes, lacquers, enamels, and allied products; agricultural chemicals; safflower and sunflower oil extracts; and (3) any facility engaged in re-	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of total organic compounds from equipment leaks at petroleum refineries, chemical plants, bulk plants and bulk terminals. This rule will continue to apply to the facility.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 22	Valves and Flanges at Chemical Plants	Chemical Plants: Any facility engaged in producing organic or inorganic and/or manufacturing products by chemical processes. Any facility or operation that has 28 as the first two digits in their Standard Industrial Classification Code as determined from the Standard Industrial Classification Manual published in 1972 by the Executive Office of the President, Office of Management and Budget. Chemical plants may include, but are not limited to the manufacture of: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other Bay Area Air Quality Management District June 1, 1994 8-22-3 man made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; re-	Not applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of precursor organic compounds from valves and flanges at chemical plants. The facility is exempt from this rule under Rule 8-22-115 since it complies with Regulation 8, Rule 18.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 28	Episodic Releases From Pressure Relief Devices at Petroleum Refineries and Chemical Plants	Petroleum Refinery: Any facility that processes petroleum as defined in the North American Industrial Classification Standard No. 32411 (1997). Chemical Plant: Any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes. Any facility or operation that has 325 as the first three digits in the North American Industrial Classification Standard (NAICS) Code. Chemical plants may include, but are not limited to the manufacture of: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other man-made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; and re-refining, not including petroleum refineries.	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to prevent the episodic emissions of organic compounds from pressure relief devices on equipment handling gaseous organic compounds at petroleum refineries, and to collect information on episodic organic and inorganic compound emissions from pressure relief devices at petroleum refineries and chemical plants. The facility will continue to be subject to the standards of this rule.
Regulation 8, Rule 33	Gasoline Bulk Terminals and Gasoline Delivery Vehicles	Gasoline Bulk Terminal: A gasoline storage and distribution facility that receives gasoline by marine tanker, barge, pipeline, or rail car, and loads it into gasoline cargo tanks for delivery to gasoline bulk plants, service stations, and other distribution points.	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds associated with gasoline transfer operations at gasoline bulk terminals and organic compounds from gasoline cargo tanks. The truck loading operation (S1025) will remain subject to this rule.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 8, Rule 39	Gasoline Bulk Plants and Gasoline Delivery Vehicles	Gasoline Bulk Plant: A storage and distribution facility that receives gasoline by gasoline cargo tanks, and loads it into gasoline cargo tanks for delivery to service stations and other distribution points	Not applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds associated with gasoline transfer operations at gasoline bulk plants and organic compounds from gasoline cargo tanks. The facility is not subject to this rule because it operates as a "Gasoline Bulk Terminal" and is therefore subject to Regulation 8, Rule 33. The facility does not operate a "Gasoline Bulk Plant."
Regulation 8, Rule 40	Aeration of Contaminated Soil and Removal of Underground Storage Tanks	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit the emission of organic compounds from soil that has been contaminated by organic chemical or petroleum chemical leaks or spills, and to describe an acceptable procedure for controlling emissions from underground storage tanks during removal or replacement. This rule will continue to be applicable to the facility.
Regulation 8, Rule 44	Marine Vessel Loading Terminals	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds into the atmosphere from marine tank vessel operations. The Amorco Wharf Terminal (S55) and the Avon Wharf (S1560) would remain subject to these requirements.
Regulation 8, Rule 49	Aerosol Paint Products	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds from the use of hand-held aerosol paint products. The facility will remain subject to this rule.
Regulation 8, Rule 51	Adhesive and Sealant Products	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit emissions of organic compounds from the use of adhesives and sealants. The facility will remain subject to this rule.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 9, Rule 1	Sulfur Dioxide	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule establishes emission limits for sulfur dioxide from all sources including ships, and limits ground level concentrations of sulfur dioxide. The facility will remain subject to the ground level concentration and sulfuric acid plant requirements of this rule.
Regulation 9, Rule 2	Hydrogen Sulfide	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule limits ground level concentrations of hydrogen sulfide (H2S). The rule applies facility-wide.
Regulation 9, Rule 7	Nitrogen Oxides And Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, And Process Heaters	NA	Not applicable to pre-project operations	No change in rule-level applicability	This rule limits the emissions of nitrogen oxides (NOx) and carbon monoxide (CO) from industrial, institutional and commercial boilers, steam generators and process heaters. The rule is intended to regulate fired sources that combust natural gas. The facility remains subject to Regulation 9, Rule 10 (see discussion below).
Regulation 9, Rule 8	Nitrogen Oxides And Carbon Monoxide from Stationary Internal Combustion Engines	NA	Applicable to pre-project operations	No change in rule-level applicability	This rule limits the emissions of nitrogen oxides and carbon monoxide from stationary internal combustion engines with an output rated by the manufacturer at more than 50 brake horsepower. Stationary engines at the facility will continue to be subject to the rule.

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Table G.2: BAAQMD Regulations

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 9, Rule 10	Nitrogen oxides And Carbon Monoxide From Boilers, Steam Generators And Process Heaters in Petroleum Refineries	Petroleum Refinery: Any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants or other products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives.	Applicable to pre-project operations	No change in rule-level applicability	This rule limits the emissions of nitrogen oxides and carbon monoxide from boilers, steam generators, and process heaters, including CO boilers, in petroleum refineries. The rule is intended to regulate fired sources that combust refinery fuel gas. Post-project, the facility will produce distillate fuel oils (diesel) via refinery processes, including cracking, distillation, and blending. Naphtha is also produced for blending or further processing offsite to make gasoline. Since the facility continues to combust gases that are similar to refinery fuel gas, the fired sources remain subject to this rule.
Regulation 10	Standards of Performance for New Stationary Sources	NA	Applicable to pre-project operations	See post-project statement	Establishes emission and/or performance standards for new plants and other sources. The rules are incorporated by reference to the provisions of Part 60, Chapter 1, Title 40, of the Code of Federal Regulations. See Table 1 Federal Rules.
Regulation 11, Rule 2	Asbestos Demolition, Renovation and Manufacturing	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to control emissions of asbestos to the atmosphere during demolition, renovation, milling and manufacturing and establish appropriate waste disposal procedures. Demolition activities will be subject to this rule.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 11, Rule 7	Benzene	NA	Applicable to pre-project operations	Will not be subject to rule	The purpose of this rule is to limit the emissions of benzene from the following sources intended to operate in benzene service; pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, flanges and other product accumulator vessels, and control devices or systems required by this rule. This rule will no longer apply because none of the equipment will be in benzene service (>10% by weight).
Regulation 11, Rule 10	Hexavalent Chromium Emissions from All Cooling Towers and Total Hydrocarbon Emissions from Petroleum Refinery Cooling Towers 2018 Amendment (Current)	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to reduce emissions of hexavalent chromium from all cooling towers and reduce total hydrocarbon emissions from cooling towers at petroleum refineries. The facility's cooling towers shall continue to be subject to this rule.
Regulation 11, Rule 12	National Emission Standard For Benzene Emissions From Benzene Transfer Operations and Benzene Waste Operations	NA	Applicable to pre-project operations	See post-project statement	See Table 1 Federal Rules discussion.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 11, Rule 18	Reduction of risk from air toxic emissions at existing facilities	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to reduce health risks from emissions of toxic air contaminants from existing facilities. This rule is implemented through the District's AB-2588 process. The facility will continue to comply with these requirements, as part of periodic updates to the air toxics emissions inventory and HRA.
Regulation 12, Rule 4	Sandblasting	NA	Applicable to pre-project operations	No change in rule-level applicability	The standards in this rule apply to sandblasting operations other than permanent abrasive blasting operations or equipment. Visible emissions from permanent operations or equipment are controlled by Regulation 6. The facility will continue to comply with this rule.
Regulation 12, Rule 6	Acid Mist From Sulfuric Acid Plants	NA	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to limit the emission of sulfuric acid mist from sulfuric acid production units, the construction, modification or reconstruction of which commenced on or before August 17, 1971. This rule is applicable to the Sulfuric Acid Plant which is not part of the renewables project but will remain permitted.
Regulation 12, Rule 10	Oleum Transfer Operations	NA	Not applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to prevent releases of oleum from tank truck and railroad tankcar transfer operations that impact the public. The facility does not currently produce oleum and will not do so in the future.

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 12, Rule 11	Flare Monitoring at Petroleum Refineries	Petroleum Refinery: A facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411, and including any associated sulfur recovery plant.	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to require monitoring and recording of emission data for flares at petroleum refineries. Since the facility is currently subject to these rules, no change in applicability is proposed. The facility elects to comply with this rule post-project.
Regulation 12, Rule 12	Flares at Petroleum Refineries	Petroleum Refinery: A facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411, and including any associated sulfur recovery plant.	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to reduce emissions from flares at petroleum refineries by minimizing the frequency and magnitude of flaring. Since the facility is currently subject to these rules, no change in applicability is proposed. The facility elects to comply with this rule post-project.

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Table G.2: BAAQMD Regulations

BAAQMD Rule No.	Rule Name	Key Definitions Considered for Applicability	Pre-Project Applicability to Martinez Refinery Operations	Change in Applicability Due to Renewable Fuels Project	Post-Project Statement of Regulatory Applicability
Regulation 12, Rule 15	Petroleum Refining Emissions Tracking 2019 Amendment (Current)	Petroleum Refinery: An establishment that is located on one or more contiguous or adjacent properties that processes crude oil to produce more usable products such as gasoline, diesel fuel, aviation fuel, lubricating oils, asphalt or petrochemical feedstocks. Petroleum Refinery processes include separation processes (e.g., atmospheric or vacuum distillation, and light ends recovery), petroleum conversion processes (e.g., cracking, reforming, alkylation, polymerization, isomerization, coking, and visbreaking), petroleum treating processes (e.g., hydrodesulfurization, hydrotreating, chemical sweetening, acid gas removal, and Bay Area Air Quality Management District December 4, 2019 12-15-4 deasphalting), feedstock and product handling (e.g., storage, crude oil blending, non-crude oil feedstock blending, product blending, loading, and unloading), and auxiliary facilities (e.g., boilers, waste water treatment, hydrogen production, sulfur recovery plant, cooling towers, blowdown systems, compressor engines, and power plants).	Applicable to pre-project operations	No change in rule-level applicability	The purpose of this rule is to track air emissions and crude oil composition characteristics from Petroleum Refineries and Support Facilities over time and to establish air monitoring systems to provide air quality data along refinery boundaries. The District is currently considering rule making to clarify that renewable fuels facilities will be subject to this rule.