APPENDIX D-1

Air Quality and Greenhouse Gas Emissions Report

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Orcem / VMT

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Report

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ORCEM / VMT PROJECT

AIR QUALITY AND GREENHOUSE GAS EVALUATION

RAMBOLL ENVIRON

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EXECUTIVE SUMMARY

This report contains an evaluation of the proposed Orcem California, Inc. (Orcem) and Vallejo Marine Terminal, LLC (VMT) projects in Vallejo, California ("the Project") with respect to air quality and greenhouse gas (GHG) California Environmental Quality Act (CEQA) thresholds adopted by the Bay Area Air Quality Management District (BAAQMD) in May, 2011[1]. This work has been conducted by Ramboll Environ US Corporation (Ramboll Environ) and AWN Consulting, Limited (AWN) and is supported by analyses prepared by Atmospheric Dynamics (AD).

The Orcem project will be sited on a portion of the VMT property and it is highly dependent on the VMT project for transporting raw materials. The VMT project will rely on the Orcem project for a certain percentage of its business. Each operation is briefly discussed below.

This report also evaluates the air quality and greenhouse gas emission from the Revised Operations Alternative (ROA) to the Project. The ROA incorporates permitting of the VMT project component by the BAAQMD, along with other measures designed to limit project emissions. "Alternative" here is not used in the CEQA sense of an alternative to the Project. Emissions for comparison with the BAAQMD May 2011 threshold were estimated for the Orcem Phase 2 Granulated Blast Furnace Slag (GBFS) + VMT Truck & Rail Alternative, as it represents the project configuration with the greatest emissions. Orcem Phase 2 refers to Orcem operations greater than 500,000 metric tons per year, also referred to as "Milestone 5." This is distinct from VMT Phase 2, which refers to the construction of a rock dike to allow shipment by barge.

The VMT project would reestablish industrial uses on a portion of the 34.3 acres designated as the VMT project site. The VMT project would involve the removal of a deteriorated timber wharf and construction of a modern deep-water terminal, including wharf improvements, laydown area, and trucking and rail connections, primarily servicing the import and export of bulk and break-bulk commodities within approximately 10.5 acres referred to as the VMT Terminal Site. Construction of the terminal would require fill and dredging activities within the water.

The VMT project would be constructed in two or more separate phases over a period of time. In addition to the construction and operation of this modern terminal, the VMT Project would also reuse several of the existing buildings formerly occupied by General Mills. Buildings and structures to remain would be used by VMT for administrative office and commercial office uses consistent with the City's Intensive Use zoning district standards. As an operational deep draft facility, the VMT Terminal, including Phases 1 and 2, is anticipated to handle a wide range of commodities. The Phase 1 wharf would include a concrete pile-supported wharf with structural concrete deck, associated mooring and fender systems, and related improvements for deep-water marine transportation operations, while the Phase 2 rock dike would consist of riprap and associated improvements of approximately 600 feet in length north of and adjoining the Phase 1 wharf.

The Orcem project would involve construction and operation of an industrial facility for the production of a high performance, less polluting replacement for the traditional portland cement material used in most California construction projects. In particular, Orcem is proposing to construct and operate a manufacturing plant on the site which focuses primarily on production of Ground Granulated Blast Furnace Slag (GGBFS). However, the Orcem Project may also produce cement from clinker. The Orcem Project would involve construction of approximately 73,000 square feet of buildings and equipment, together with outdoor storage areas, on a 4.83-acre portion of the former General Mills plant site leased from VMT. Several of the buildings and equipment previously used by

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[1] As of May 2012, the BAAQMD no longer recommends these thresholds pending the outcome of a lawsuit challenging these thresholds

General Mills within the Orcem Site would be demolished in order to accommodate construction and operation of the proposed cement products production facility. The project would be constructed in phases to coincide with the growth in demand for Orcem's products. Orcem would import most of the raw materials used in the proposed plant via the proposed wharf on the adjoining VMT Site.

The material throughput for both the Orcem and VMT projects would ramp up over time, as shown in Table ES.1, below. The greatest air quality impact would result from the activities described in #3 in Table ES.1, where the maximum material is moved through the facilities via trucks and rail. The maximum mode will not occur until at least 2020. Accordingly, the emissions are analyzed for 2020 fleet year for the shipping scenario described in #3, below. Prior to 2020, no more than three ships monthly averaged annually would arrive at the Project. This analysis assumes that once maximum operations are achieved in 2020, all subsequent years will also operate at maximum capacity.

Table ES.1 Transport Volumes for Various Activities

Average Monthly Transportation Activity	Ships (#)	Barge (tons)	Trucks (tons)	Rail (tons)	Total (tons)
#1 - Orcem Phase 1 GBFS + VMT Truck Only	2	0	81,700	0	81,700
#2 - Orcem Phase 2 GBFS + VMT Truck & Rail	3	0	44,000	76,000	120,000
#3 - Orcem Phase 2 GBFS + VMT Truck & Rail Alt.	4	0	91,900	68,100	160,000
#4 - Orcem Phase 2 GBFS/Cement + VMT Truck, Rail & Barge	4	48,300	81,200	30,500	160,000
#5 - Orcem Phase 2 GBFS/Cement + VMT Truck, Rail & Barge Alt.	4	6,600	89,200	64,200	160,000

Construction emissions calculations and the risk assessment for construction were conducted by Atmospheric Dynamics and the results are discussed in Section 4 of this report. The emissions estimates for criteria pollutants are described in Section 5 of this report. The GHG emissions estimates are contained in Section 6 of this report, and the estimate of ambient concentration of CO (Carbon monoxide) is described in Section 7 of this report. The Project and combined risk assessment, including estimated $PM_{2.5}$ concentration, consistent with BAAQMD guidelines, is discussed in Section 7 of this report.

The estimated operational and construction impacts from the Project are compared with the BAAQMD's most recently adopted May 2011 Thresholds in Table ES.2. As shown in the Table, the Project would exceed the BAAQMD's Thresholds for nitrogen oxides (NOx) emissions and health risks before mitigation. In addition, the Project would have a greater level of GHG emissions than identified in the BAAQMD's May 2011 Thresholds, without consideration of lifecycle emissions. With consideration of lifecycle emissions, the Project's GHG emissions are below the BAAQMD's May 2011 Thresholds. The project is also consistent with the Vallejo Climate Action Plan and does not impede statewide compliance with the Air Resources Board Scoping Plan for AB 32, California's Global Warming Solutions Act. After application of the measures contained in the ROA serving as mitigation for the effects of the original project, and phased mitigation to reduce health risks, the project remains significant for NOx emissions for operations, but less than significant after mitigation for health risks. The Project is not significant for any other threshold after mitigation. The Project's GHG emissions would also continue to be greater than identified in the BAAQMD's May 2011 Thresholds, when not considering lifecycle emissions. The Project impacts are estimated based on substantial evidence, including detailed calculations and engineering data, and characterize the Project at the combined maximum build out for the Project.

Table ES.2 Comparison of Operational Project Impacts with BAAQMD Adopted May 2011 CEQA Thresholds

	Units	Project	Threshold	Exceed Threshold?
Construction Emissions				
ROG	lb/day	8.2	54	No
NO_x		53.7	54	No
PM_{10}		2.5	82	No
$PM_{2.5}$		2.5	54	No
GHG	MT	94	--[a]	--
Operational Emissions				
ROG	tons/year	4.18	10	No
NO_x (unmitigated)		63.39	10	Yes
NO_x (mitigated)		24.54	10	Yes
PM_{10}		12.47	15	No
$PM_{2.5}$		3.74	10	No
ROG	lb/day	22.92	54	No
NOx		347.33	54	Yes
PM_{10}		68.36	82	No
$PM_{2.5}$		20.51	54	No
GHG – stationary source (lifecycle)	MT CO_2e/yr	<zero	10,000	No
GHG – stationary source (no lifecycle)	MT CO_2e/yr	13,900	10,000	Yes
GHG – other	Compliance with a Climate Action Plan	Yes	Yes	No
Construction Health Impacts on Off-site Receptors				
Excess Lifetime Cancer Risk	in a million	5.7	10	No
Chronic Hazard Index	unitless	0.009	1	No
$PM_{2.5}$ Concentration	μg/m^3	0.08	0.3	No
Acute Hazard Index	unitless	---	1	No
Operational Health Impacts on Off-site Receptors				
Excess Lifetime Cancer Risk (unmitigated)	in a million	13.3	10	Yes
Excess Lifetime Cancer Risk (mitigated)	in a million	9.9	10	No
Chronic Hazard Index	unitless	0.1	1	No
$PM_{2.5}$ Concentration	μg/m^3	0.13	0.3	No
Acute Hazard Index	unitless	0.01	1	No
Combined Health Impacts on Off-Site Maximum Exposed Impacted Receptor (MEISR)				
Excess Lifetime Cancer Risk	in a million	17	100	No
Chronic Hazard Index	unitless	0.1	10	No
$PM_{2.5}$ Concentration	μg/m^3	0.13	0.8	No
CO Hot Spot Analysis				
Local CO (8-hour average)	ppm	4	9.0	No

Local CO (1-hour average)	ppm	7	20	No

Notes:
[a] There is no construction threshold for GHGs but shown for information purposes as recommended by BAAQMD CEQA Guidance.

Abbreviations:

ROG	Reactive Organic Gases	MT	Metric Tonnes
PM_{10}	Particulate Matter up to 10 micrometers in size	Tons/ year	tons per year
$PM_{2.5}$	Particulate Matter up to 2.5 micrometers in size	$\mu g/m^3$	microgram per cubic meter
MT CO_2e/yr	metric tons of CO_2 equivalents	ppm	parts per million
lb/day	pounds per day		

The combined umitigated Project emissions are greater than the BAAQMD significance threshold for NOx. Therefore, the ROA has been developed to provide for implementation of all feasible mitigation measures are required for NOx. The BAAQMD requires that emissions from the combination of stationary sources, ocean going vessels and rail be offset if those emissions from any facility are greater than 10 tons per year. Only NOx emissions are greater than 10 tons per year from stationary sources, ocean going vessels and rail activities at both Orcem and VMT.

Permitted emissions of certain criteria pollutants that are greater than 10 tons per year, but less than 35 tons per year are provided offsets by the BAAQMD from its Small Facility (Offset) Banking Account. The only criteria pollutant greater with emissions greater than 10 tons per year from the Project is NOx. Emissions of NOx from ocean going vessels from Orcem are 12 tons per year, Orcem rail emissions are 0.7 tons per year, and stationary sources from Orcem are 5.6 tons per year. Emissions of NOx from ocean going vessels from VMT are 18.3 tons per year and emissions from rail from VMT are 2.2 tons per year. Therefore, the BAAQMD will provide Orcem with 18.29 tons of NOx emissions offsets, and, in the ROA also provide VMT with 20.56 tons of offsets for a total of 38.85 tons of offsets per year. Accordingly, these emissions are shown as mitigated emissions in Table ES.3. These emission offsets are estimates of the total emission offsets that will be provided by the BAAQMD upon permitting. However, the permitting will not be completed until after this Environmental Impact Report (EIR) is certified. Note that application of NOx offsets by the BAAQMD is only possible through modification of the original Project, as called for in the ROA, to subject the VMT project component to permitting (and associated operational regulation, including the use of Best Available Control Technology [BACT])

Application of NOx offsets for both VMT and Orcem, along with the pollutant reduced and the estimated reduction are contained in Table ES.3, below. The BAAQMD would be permitting Orcem and VMT shipping, and would, under the ROA, individually provide a permit for the both components. In permitting the Orcem and VMT operations, the BAAQMD would provide NOx offsets from its Small Facility (Offset) Banking Account, as each of the operation's NOx emissions are below 35 tons per year.

Table ES.3 outlines the combined annual mean emission totals (tons/yr) for the Orcem and VMT operations for each aspect of the operations, individually, and combined.

Table ES.3 Annual Emissions of Criteria Pollutants from the Combined Operations of VMT and Orcem (tons/yr).

Emissions (tons/year)	ROG	CO	NOx	Exhaust PM_{10}	Fugitive PM_{10}	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	DPM	SO_2
VMT	1.38	6.81	31.33	0.48	5.05	0.46	1.22	0.42	1.26
VMT Emissions Offsets	--	--	20.56	--	--	--	--	--	--
VMT Mitigated	1.38	6.81	10.77	0.48	5.05	0.46	1.22	0.42	1.26
Orcem	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03
Orcem Emissions Offsets	--	--	18.29	--	--	--	--	--	--
Orcem Mitigated	2.80	17.76	13.77	0.59	6.35	0.57	1.50	0.28	1.03
Orcem Plus VMT Unmitigated	4.18	24.57	63.39	1.07	11.40	1.03	2.71	0.70	2.29
BAAQMD Thresholds	10	--	10	15	--	10	--	--	--
Unmitigated Emissions Significant?	No	--	Yes	No	--	No	--	--	--
Orcem Plus VMT Mitigated	4.18	24.57	24.54	1.07	11.40	1.03	2.71	0.70	2.29
BAAQMD Thresholds	10	--	10	15	--	10	--	--	--
Mitigated Emissions Significant?	No	--	Yes	No	--	No	--	--	--

Abbreviations:
CO: Carbon Monoxide
DPM: Diesel Particulate Matter
NOx: Nitric Oxide
$PM_{2.5}$: Particulate Matter up to 2.5 micrometers in size
PM_{10}: Particulate Matter up to 10 micrometers in size
SO_2: Sulfur Dioxide

A robust series of project design features described in Table ES.4 reduce air emissions from the Project. The emissions reductions from these measures are already incorporated into the emissions estimates for the Project.

Table ES.4 Proposed Operational Mitigation Measures For Orcem

Potential Source of Emissions to Air	Project Design Features to Reduce Emissions	Basis
Handymax Ship	0.1% Sulphur Marine Fuel Within 24nm of California coast for the main, auxiliary and boiler engines	Regulatory Requirement
Grab Crane on ship transfers GBFS to Mobile Hopper	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Hopper drop to conveyor	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Conveyor drop to conveyor	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Conveyor drop to mound in GBFS storage area	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Front loader excavation of stockpile	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Loading of hopper by front loader	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Raw Material Storage Piles	Frequent watering of storage pile & 3-Sided Enclosure for 2 of the 3 stockpiling areas giving a control effectiveness of 90 - 97.5% (SCAQMD, 2007), AP42)	Mitigation
Orcem Main Emission Point (P-1)	The main emission point will have emissions of NO_X, CO and PM_{10} / $PM_{2.5}$ which are in accordance with BACT for the category of manufacturing.	Regulatory Requirement
Front Loader, Forklifts & Excavator	Dust suppression using $MgCl_2$ (magnesium chloride), frequent watering (3-times daily) & 15 mph speed limit giving a combined control effectiveness of 96.8%[Note 2] Excavator diesel and front loader engines on-site will be post-2014 low emission Tier 4 engines and will be operated on biodiesel (B20).	Regulatory Requirement
Industrial Paved Rd (Finished Product)	Watering 3 times daily giving a control effectiveness of 80% (SCAQMD, 2007)	Mitigation
Processing plant and material storage buildings	All air in contact with raw material or finished product, such as air from storage buildings, silos, elevators, is treated by bag filters or other types of filter prior to discharge to the atmosphere, with a not to exceed limit value of 2.5 mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Truck filling with finished product	Filling takes place in an enclosed area, isolated from the external environment with air discharged through bag filter to atmosphere, with a not to exceed limit of 2.5 mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Railcar Filling	Filling takes place in an enclosed area, isolated from the external environment with air discharged through bag filter to atmosphere, with a not to exceed limit of 2.5mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Railcar movement	Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) will be used for both switching and line haul. Reduction of 80-90% in PM_{10} compared to Tier II EPA emission rates.	Regulatory requirement

Note 1 Normalised to 298K & 101.325kPa.
Note 2 Western Governors' Association (WRAP) Fugitive Dust Handbook indicates 84% control efficiency for $MgCl_2$. The Alaska Cooperative Transportation and Public Facilities Research Program (Control of Dust Emissions from Unpaved Roads, 1992) reports up to 80% control for 15mph speed limitation. This results in a cumulative control of 96.8%.

The combined GHG emissions are also greater than the May 2011 BAAQMD Threshold for GHG emissions. As shown in an analysis contained in Section 6 of this report, the production of GGBFS by Orcem will lead to substantial lifecycle GHG emission savings when compared to greenhouse gas emissions from cement production. As shown in Table ES.5, the average percentage saving compared to portland cement production is greater than 90% and amounts to approximately 450,000 MTs (metric tons) of carbon dioxide equivalent (CO_2e) for Mode 1 Milestone 5.

Table ES.5 Annual CO_2 Savings Associated With the Production of GGBFS by Orcem (Mode 1) (MTs)

Orcem Mode	Milestone	GGBFS Tonnage Produced (Metric tonnes)	Equivalent CO_2 emissions associated with Cement Production (MTs) Note 1	CO_2 emissions associated with GGBFS (MTs)	Savings in terms of CO_2e (MTs)
1	1	109,299	94,000	8,010	85,990 (92% reduction)
	2	207,093	178,100	15,687	162,410 (91% reduction)
	3	293,381	252,310	23,309	229,000 (91% reduction)
	4	368,165	316,620	31,047	285,570 (90% reduction)
	5	582,928	501,320	48,581	452,740 (90% reduction)

Note 1 0.86 tonnes of CO_2 / MT of cement based on the presentation "Industry Background and Overview" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport)

In relation to Mode 2, the production of cement from clinker by Orcem will lead to a more modest greenhouse gas emission savings when compared to GHG emissions from portland cement production. As shown in Table ES.6, the average percentage saving compared to portland cement production is greater than 3% and amounts to approximately 27,000 MTs of CO_2e for Mode 2 Milestone 5.

Table ES.6 Annual CO_2 Savings Associated With the Production of Cement from Clinker by Orcem (Mode 2) (MTs)

Orcem Mode	Milestone	Cement Tonnage Produced (Metric tonnes)	Equivalent CO_2 emissions associated with Cement Production (MTs)[Note 1]	Orcem CO_2 emissions associated with Clinker Production (MTs)	Savings in terms of CO_2e (MTs)
2	1	133,333	114,666	110,815	3,852 (3.4% reduction)
	2	266,667	229,334	221,636	7,698 (3.4% reduction)
	3	400,000	344,000	332,441	11,559 (3.4% reduction)
	4	533,333	458,666	441,607	17,060 (3.7% reduction)
	5	844,444	726,222	699,149	27,073 (3.7% reduction)

[Note 1] 0.86 tonnes of CO_2 / MT of cement based on the presentation "*Industry Background and Overview*" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport)

Mode 3 operations will involve the production of mainly GGBFS from GBFS with some additional cement imported / exported from the facility. Under this mode of operation, GHG emission savings when compared to GHG emissions from portland cement production will be substantial. As shown in Table ES.7, the average percentage saving compared to portland cement production is greater than 70% and amounts to approximately 450,000 MTs of CO_2e for Mode 3 Milestone 5.

Table ES.7 Annual CO_2 Savings Associated With the Production of GGBFS / Cement by Orcem (Mode 3) (MTs)

Orcem Mode	Milestone	Cement Tonnage Produced (Metric tonnes)	Equivalent CO_2 emissions associated with Cement Production (MTs)Note 1	Orcem CO_2 emissions associated with GGBFS / Cement Production (MTs)	Savings in terms of CO_2e (MTs)
3	1	175,052	150,545	58,922	91,623 (61% reduction)
	2	310,103	266,689	83,214	183,475 (69% reduction)
	3	445,155	382,833	107,491	275,343 (72% reduction)
	4	488,165	419,822	131,907	287,915 (69% reduction)
	5	702,928	604,518	148,240	456,278 (75% reduction)

[Note 1] 0.86 tonnes of CO_2 / MT of cement based on the presentation "*Industry Background and Overview*" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport)

Although the life-cycle emissions will result in a reduction in GHGs, the stationary source emissions of the Project will be larger than the BAAQMD"s adopted May 2011 Threshold of 10,000 Metric Tonnes/year. Therefore, the Project is committed to reducing greenhouse gases as much as is feasible, and will be fully consistent with all implementation measures of the adopted 2012 City of Vallejo Climate Action Plan (CAP), and the California Air Resources Board (CARB) Scoping Plan, as is described in Section 6.0 of this report.

1. INTRODUCTION

This report contains an evaluation of the proposed Orcem California, Inc. (Orcem) and Vallejo Marine Terminal, LLC (VMT) projects in Vallejo, California ("the Project") with air quality and greenhouse gas California Environmental Quality Act (CEQA) thresholds proposed by the Bay Area Air Quality Management District (BAAQMD) in May, 2011[2]. This work has been conducted by Ramboll Environ US Corporation (Ramboll Environ)and is supported by analyses prepared by AWN Consulting Limited (AWN) and Atmospheric Dynamics (AD). This analysis also applies to the Reduced Operations Alternative (ROA).

The Orcem project will be sited on a portion of the VMT property and it is highly dependent on the VMT project for transporting raw materials, and the VMT project will be dependent on the Orcem project for a certain percentage of its business. Although the impacts from the project are described separately, each operation is briefly discussed below.

The VMT project would reestablish industrial uses on a portion of the 34.3 acres designated as the VMT Project Site. The VMT project would involve the removal of a deteriorated timber wharf and construction of a modern deep-water terminal, including wharf improvements, laydown area, and trucking and rail connections, primarily servicing the import and export of bulk and break-bulk commodities within approximately 10.5 acres referred to as the VMT Terminal Site. Construction of the terminal would require fill and dredging activities within the water.

The VMT project would be constructed in two or more separate phases over a period of time. Phase 1 is anticipated to begin in June 2016. The start of Phase 2 does not have a pre-determined date, as it will be based on market demand. In addition to the construction and operation of this modern terminal, the VMT Project would also reuse several of the existing buildings formerly occupied by General Mills. Buildings and structures to remain would be used by VMT for administrative office and commercial office uses consistent with the City's Intensive Use zoning district standards. As an operational deep draft facility, the VMT Terminal, including Phases 1 and 2, is anticipated to handle a wide range of commodities. The wharf would include a concrete pile-supported wharf with structural concrete deck, associated mooring and fender systems and related improvements for deep-water marine transportation operations.

The Orcem project would involve construction and operation of an industrial facility for the production of a high performance, less polluting replacement for the traditional portland cement material used in most California construction projects. In particular, Orcem is proposing to construct and operate a manufacturing plant on the site which focuses primarily on production of GGBFS (Ground Granulated Blast Furnace Slag. The Orcem Project would involve construction of approximately 73,000 square feet of buildings and equipment, together with outdoor storage areas, on a 4.83-acre portion of the former General Mills plant site leased from VMT. Several of the buildings and equipment previously used by General Mills within the Orcem Site would be demolished in order to accommodate construction and operation of the proposed cement products production facility. The project would be constructed in phases to coincide with the growth in demand for Orcem's products. Orcem would import most of the raw materials used in the proposed plant via the proposed wharf on the adjoining VMT Site.

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2 In March 2012, the Alameda County Superior Court ruled that the BAAQMD failed to comply with CEQA when it adopted these thresholds in June 2010. The Court determined that the adoption of thresholds was itself a project under CEQA, and that the BAAQMD was required to examine whether the adoption of the thresholds would have a significant impact on the environment under CEQA. However, the court did not rule on the merits of the thresholds themselves, and thus these thresholds are still used here to help identify significant impacts.

Orcem California Inc. (Orcem) has filed an application with the City of Vallejo to approve a Major Use Permit and Site Development Plan to construct and operate a processing plant for the manufacture of Ground Granulated Blast Furnace Slag (GGBFS) and other cement products. Orcem's primary finished product, GGBFS, will be produced on site, via the following major steps:

1. Receive via several alternative transport modes, various raw materials, including, Granulated Blast Furnace Slag (GBFS), clinker, portland cement, pozzolan, gypsum and limestone.
2. Store the GBFS, clinker, portland cement, pozzolan, gypsum and limestone on the site.
3. Process, by milling within a closed system, the GBFS granulate and gypsum into GGBFS powder, and all the materials into a variety of hydraulic cements.
4. Store the GGBFS and cement products within enclosed storage facilities on the site.
5. Distribute the GGBFS and cement from the enclosed storage facilities on the site for use in construction projects throughout California and neighboring states.

Orcem will import its raw materials (GBFS, Clinker, portland cement, gypsum, limestone and pozzolan) for production via several methods of transport including ocean going vessels which will berth at the VMT dock. The raw materials will be unloaded and transported to open or covered stockpiles on the site, as appropriate, to fully contain fugitive dust. The raw materials will then be reclaimed from these stockpiles by front end loaders to be transported by conveyors into sealed processing equipment for milling into fine powders (the finished products). The finished products will be transported in sealed convey systems into storage silos, for subsequent loading into truck or rail tankers for distribution to customers in the region. GGBFS is manufactured by recycling a by-product, GBFS, from the steel industry. It is used as a partial replacement for traditional cement, also known as portland cement.

The material throughput for both the Orcem and VMT projects would ramp up over time, as shown in Table 1.1, below. The greatest impact would result from #3 below, where the maximum material is moved through the facilities, but trucks are used instead of barges. For the same capacity, trucks have a greater environmental impact than barges or rail. The maximum activity will not occur until at least 2020. Accordingly, the emissions are analyzed for 2020 fleet year for #3 in Table 1.1. Prior to 2020, no more than three ships monthly averaged over a year would arrive.

Table 1.1

Average Monthly Transportation Activity	Ships (#)	Barge (tons)	Trucks (tons)	Rail (tons)	Total (tons)
#1 - Orcem Phase 1 GBFS + VMT Truck Only	2	0	81,700	0	81,700
#2 - Orcem Phase 2 GBFS + VMT Truck & Rail	3	0	44,000	76,000	120,000
#3 - Orcem Phase 2 GBFS + VMT Truck & Rail Alt.	4	0	91,900	68,100	160,000
#4 - Orcem Phase 2 GBFS/Clinker + VMT Truck, Rail & Barge	4	48,300	81,200	30,500	160,000
Orcem Phase 2 GBFS/Clinker + VMT Truck, Rail & Barge Alt.	4	6,600	89,200	64,200	160,000

This report covers the combined air quality impact on the local environment of these proposed developments operating simultaneously consistent with the requirements of the BAAQMD CEQA Guidelines.

The site in question is illustrated in Figure 1.1 below. The site is located adjacent to the Napa River (Mare Island Strait) and is bounded to the east by a steep incline with thick vegetation, to the west by the Napa River, to the south by undeveloped land and a residential development beyond and to the North by other industrial lands.

As identified in the Project Applications to the City of Vallejo, the entire VMT Terminal operations will be confined to the VMT Terminal Site as shown in Figure 1.1 below. The entirety of the Orcem operations will be confined to the Orcem Site as also shown in Figure 1.1. The nearest sensitive residential receptor locations to the site are located to the south-east at a distance of approximately 20' from the nearest VMT site boundary.

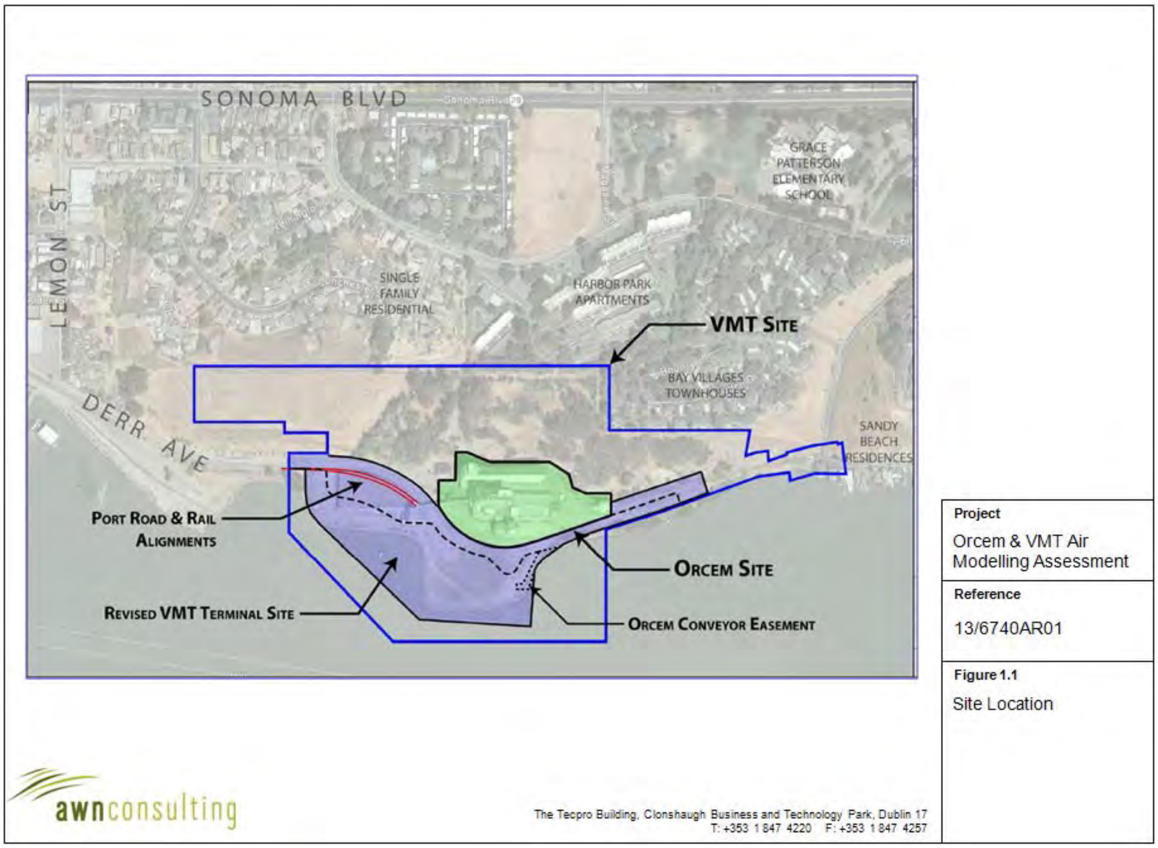

Figure 1.1

Maximum Modeled Sensitive Receptor

As part of the overall development of the site there will be new air and greenhouse gas emissions sources introduced. These can broadly be described as follows:

- Vehicle movements on site;
- New air emissions from emission point P-1 (Main Stack) and various minor emission points associated with bag filters;
- Fugitive dust emissions from hoppers & material transfer points;
- Truck movements on the local road network;

- Port activity, e.g. ship hoteling, ship unloading, stockpiling etc, and;
- Rail activity

2. AIR QUALITY AND GREENHOUSE GAS REGULATIONS

This section of the report contains a summary of air quality and greenhouse gas regulations that are specific to sources at the Project, including cement production and mobile source operation.

2.1 Air Quality Regulations

Emissions from stationary sources are primarily dealt with through the implementation of local rules and regulations. The local agency is the BAAQMD. The BAAQMD rules and regulations that are most relevant to the Project are listed below.

Regulation 1, Rule2: Notice to Comply. Establishes guidelines for implementing and conducting a Notice to Comply element within the enforcement program. Sets standards for minor violations, immediate correction of minor violations, testing, and failure to comply.

Regulation 2, Rule 1: General Requirements. Includes requirements to obtain authority to construct and permit to operate; fee requirements; applicability of CEQA; requirements for new or modified sources of toxic air contaminants (TACs) or hazardous air pollutants (HAPs); public nuisance source requirements; hazardous substance requirements; permit conditions; appeals process; public notice requirements; loss of exemption requirements; source pre-certification procedure; revocation procedure; procedure for ministerial evaluations; federal emissions statement requirements.

Regulation 2, Rule 2: New Source Review. Applies to all new and modified stationary sources that require an Authority to Construct or a Permit to Operate. Provides for the review of new and modified sources and provide mechanisms, including the use of Best Available Control Technology (BACT) and emission offsets, by which authorities to construct such sources may be granted. Includes Prevention of significant deterioration (PSD) rules for nitrogen oxides (NOx), particulate organic carbon (POCs), Sulfur dioxide ($SO_{2)}$, Carbon monoxide (CO), and $PM_{2.5}$ and PM_{10}. For sources that require an Authority to Construct or a Permit to Operate, if emissions from a new source or increase in emissions from a modified source has the potential to emit 10 pounds or more per highest day of POC, non-precursor organic compounds, NOx, SO_2, $PM_{2.5}$, PM_{10}, or CO, BACT is required to be applied. Emissions offsets are required for new NOx and POC emissions in accordance with Regulation 2-2-302 (facilities that emit more than 35 tons/yr). Offsets are also required for PM_{10} and SO_2 emissions in excess of 1.0 ton/year in accordance with Regulation 3-2-303. BAAQMD regulations do not require that increases in CO emissions be offset. While there is no threshold for providing offsets for CO emissions, dispersion modeling requirements are specified for facilities with a combined increase of CO emissions in excess of 100 tons/yr. Modeling must show that the proposed project would not interfere with attainment or maintenance of the state CO standards. Revisions to this rule have been adopted by BAAQMD's Board of Directors (December 19, 2012) and submitted to Environmental Protection Agency (EPA) for approval. The revisions establish New Source Review (NSR) requirements for $PM_{2.5}$ revise the definition of “modification,” and establish a new PSD program for sources in the San Francisco Bay Area Air Basin (SFBAAB) (currently BAAQMD simply administers the federal PSD rules). The revised rule will not become effective until EPA approves it.

Regulation 2, Rule 4: Emissions Banking. Provides for acquisition of emission offsets under the New Source Review regulation. Defines different types of bankable reductions, non-eligible emission reductions, and limitations on banking transactions. Includes guidelines for banking applications, decisions on applications, publication and public comment, and duration of deposits. Also includes guidelines on the creation and operation by the district of a small facility banking account to grant offsets to small facilities.

Regulation 2, Rule 6: Major Facility Review. Implements the operating permit requirements of Title V of the Federal Clean Air Act (FCAA) as amended in 1990. It requires any facility to apply for a Major Facility Review Permit if it has a potential to emit criteria pollutants in excess of 100 tons/yr, or any single hazardous air pollutant in excess of 10 tons/yr, or any combination of HAPs in excess of 25 tons/yr. A major facility review involves a plant- wide review of sources, emissions, and regulatory requirements. This rule also provides a means by which facilities may avoid the Title V or other requirements by limiting their potential to emit.

Regulation 6, Rule 1: General Requirements. Limits the quantity of PM in the atmosphere through the establishment of limitations on emission rates, concentration, visible emissions, and opacity. Includes source specific requirements for tube cleaning, sulfuric acid manufacturing plants, and sulfur recovery units; sampling facilities and instruments requirements; and data, records, and reporting requirements.

Regulation 9, Rule 3: Nitrogen Oxides from Heat Transfer Operations. Limits NOx emissions from existing, new or modified heat transfer operations, by regulating NOx level in exhaust.

Regulation 9, Rule 7: Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters. Limits NOx and CO emissions from industrial, institutional and commercial boilers, steam generators and process heaters, by limiting concentrations in exhaust. Also sets stack gas temperature limits, and registration and recordkeeping requirements.

Regulation 9, Rule 13: Inorganic Gaseous Pollutants Nitrogen Oxides, Particulate Matter, and Toxic Air Contaminants from Portland Cement Manufacturing. This rule limits the emissions of nitrogen oxides, particulate matter, and toxic air contaminants from the manufacture of Portland cement.

2.2 State and Federal Air Toxics Regulations

There are certain Federal and State rules regarding the release of toxic chemicals, in addition to those contained in the BAAQMD Rules and Regulations. These are discussed below.

2.2.1 Toxic Release Inventory (40 CFR Part 372)

Toxic Chemical Release Inventory Reporting is part of the Emergency Planning and Community Right-to-Know Act (EPCRA), which is intended to alert the public of emergency releases of chemicals by requiring facilities to report releases. This allows planning for emergencies, as well as addresses the public right-to-know. Under EPCRA, any facility with more than 10 employees that manufactures, processes, or otherwise uses certain chemicals in amounts greater than a specified threshold is required to submit an annual toxic chemical release report. The EPA then compiles these annual toxic chemical release forms and the national Toxic Release Inventory (TRI) database.

TRI database is the most comprehensive national source of information about toxic chemical releases. However, TRI may not accurately represent the actual amount released, because TRI reporting does not require emission monitoring and companies may estimate their releases using factors of varying quality. TRI is not inclusive of all the emission sources and some emissions sources may be excluded through de minimis exemption, as facilities are not required to report if a listed chemical is present at concentrations of less than 1.0% (or 0.1% for carcinogen) by weight in products received or manufactured by facilities.

TRI database categorizes the air releases of toxic chemicals as fugitive air and stack air. In the most recent TRI report year (2011), there are a total of 593 individually listed chemicals and 30 chemical categories that are subject to reporting. The EPA included these chemicals on the TRI list based on the acute human health risks, cancer or chronic (non-cancer) human health effects and/or environmental effects criteria set forth in EPCRA Section 313(d)(2). Some of the TRI chemicals are also TACs as defined by CARB and/or HAPs as defined by the EPA at the federal level. There are currently over 200 TACs and HAPs, with many of the pollutants overlapping as both a California TAC and a federal HAP.

2.2.2 State Regulations

2.2.2.1 Tanner Air Toxics Act and AB 2588

TACs in California are primarily regulated through the Tanner Air Toxics Act (Assembly Bill [AB] 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588, or the Hot Spots Act). AB 1807 sets forth a formal procedure for CARB to designate substances as TACs. Research, public participation, and scientific peer review are necessary before CARB can designate a substance as a TAC. To date, CARB has adopted the EPA's list of HAPs as TACs and has identified more than 20 additional TACs.

Once a TAC is identified, CARB then adopts an ATCM for sources that emit that particular TAC. If there is a safe threshold at which there is no toxic effect from a substance, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate BACT to minimize emissions.

The Hot Spots Act, AB2588, requires that existing facilities that emit toxic substances above a specified level prepare a toxic-emissions inventory and a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

2.2.2.2 Diesel Risk Reduction Plan

In August 1998, the CARB identified DPM (i.e., PM from diesel-fueled engines) as a TAC. After identifying DPM as a TAC, CARB adopted a comprehensive Risk Reduction Plan in 2000 (CARB, 2000a). Pursuant to this Plan, CARB adopted diesel-exhaust control measures and stringent emission standards for various on-road mobile sources of emissions, including transit buses and off-road diesel equipment (e.g., tractors, generators). In 2001, CARB adopted the Public Transit.

Bus Fleet Rule and Emissions Standards for New Urban Buses, which established emissions limits on 1985 and subsequent model year heavy-duty bus engines and vehicles for Nitric Oxide (NO), CO, nonmethane hydrocarbons, Particulate Matter (PM), and formaldehyde. The emissions standards apply to all heavy-duty urban buses, including diesel-fueled buses. Therefore, the rule limits the emissions of two TACs identified by CARB: DPM and formaldehyde. In 2007, a low-sulfur diesel fuel requirement and tighter emission standards for heavy-duty diesel trucks was put into effect, followed in 2011 by the same standards being applied to off-road diesel equipment.

Over time, the replacement of older vehicles will result in a fleet that produces substantially lower levels of TACs than the replaced vehicles. Mobile-source emissions of TACs (e.g., benzene, 1,3-butadiene, DPM) decreased significantly over the last decade and will be reduced further in California through a progression of regulatory measures (e.g., Low-Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. The California Port Regulations for At-Berth Ocean-Going Vessels (approved in 2007) requires operators of vessels meeting specified criteria to turn off auxiliary engines for most of their stay in port. The Commercial Harbor Craft Regulation adopted in November 2007 and amended in June 2011 limits DPM emissions from commercial harbor craft operating within California waters and within 24 nautical miles of the California coast. This regulation sets emission standards for new engines, as well as requirements for replacement or retrofitting of pre-Tier 1 and Tier 1 engines for in-use fleets .

With implementation of CARB's Risk Reduction Plan, DPM concentrations are expected to be reduced by 75% in 2010 and 85% in 2020 from the estimated year- 2000 level. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

2.2.2.3 Air Quality and Land Use Handbook

CARB, 2005 provides guidance concerning land-use compatibility with TAC sources. Although not a law or adopted policy, the handbook offers recommendations for the siting of sensitive receptors (e.g., proposed residential units) near uses associated with TACs to help limit the exposure of children and other sensitive populations to TACs. The Modernization Project does not involve siting of new sensitive land uses.

2.3 Greenhouse Gas Regulations

2.3.1 Federal Regulations for Mobile Sources

This section describes the EPA's recent regulatory activities with respect to mobile sources, which include vehicles that operate on roads and highways as well as non-road vehicles, engines, and equipment. Examples of mobile sources include cars, trucks, construction equipment, lawn mowers, railroad locomotives, ships, and airplanes.

2.3.1.1 Corporate Average Fuel Economy

First enacted by Congress in 1975 as part of the 1975 Energy Policy Conservation Act in response to the 1973-1974 oil crises, Corporate Average Fuel Economy (CAFE) standards seek to reduce energy consumption by increasing the fuel economy of passenger cars and light-duty trucks. The CAFE regulation requires each car manufacturer to meet a standard for the sales-weighted fuel economy for the entire fleet of vehicles sold in the U.S. in each model year. Fuel economy, expressed in miles per gallon (mpg), is defined as the average distance travelled by an automobile (in miles) per gallon of gasoline or equivalent amount of other fuel. The National Highway Traffic Safety Administration (NHTSA) of the U.S. Department of Transportation (DOT) administers the CAFE program, and the EPA provides the fuel economy data. NHTSA sets fuel economy standards for passenger cars and light-duty trucks sold in the U.S. while the EPA calculates the average fuel economy for each manufacturer.

2.3.1.2 EPA and NHTSA Joint Rulemaking for Vehicle Standards

In response to a *U.S. Presidential Memorandum Regarding Fuel Efficiency Standards* dated May 21, 2010, the EPA and NHTSA are taking coordinated steps to enable the production of a new generation of clean vehicles, through reduced GHG emissions and improved fuel efficiency from on-road vehicles and engines. In April 2010, the EPA and NHTSA issued a Final Rulemaking establishing new federal GHG and fuel economy standards for model years 2012 to 2016 passenger cars, light-duty trucks, and medium-duty passenger vehicles. The agencies extended the national program of harmonized GHG and fuel economy standards to model years 2017 through 2025 in a joint Final Rulemaking issued on August 28, 2012. These standards are projected to achieve a fleet-wide average CO_2 emission level of 163 grams per mile in model year 2025. (This would be equivalent, on a mpg-equivalent basis, to 54.5 mpg if all of the CO_2 emissions reductions were achieved with fuel economy technology.)

In addition, on August 9, 2011, the EPA and NHTSA finalized regulations to reduce GHG emissions and improve fuel efficiency of medium- and heavy-duty vehicles, including large pickup trucks and vans, semi-trucks, and all types and sizes of work trucks and buses. The regulations incorporate all on-road vehicles rated at a gross vehicle weight at or above 8,500 pounds, and the engines that power them. Under the regulations, fuel economy will be improved and GHG emissions will be reduced in model years 2014-2018.

2.3.2 Council on Environmental Quality National Environmental Policy Act Guidelines on GHGs

On February 18, 2010, the White House Council on Environmental Quality (CEQ published draft guidance on the consideration of GHGs and climate change for National Environmental Policy Act (NEPA) analyses. It recommends that proposed federal actions that are reasonably expected to directly emit 25,000 metric tonnes of CO_2e per year should prepare a quantitative and qualitative NEPA analysis of direct and indirect GHG emissions.

The draft guidance provides reporting tools and instructions on how to assess the effects of climate change. The draft guidance does not apply to land and resource management actions, nor does it propose to regulate GHGs. CEQ received public comment on this guidance for 90 days. Although CEQ has not yet issued final guidance, various NEPA documents are beginning to incorporate the approach recommended in the draft guidance.

2.3.3 CARB GHG Regulations for Mobile Sources

This section contains a description of the state regulations for GHG emissions from mobile sources.

2.3.3.1 Mobile Source Reductions (Pavley) (AB 1493)

AB 1493 required CARB to adopt regulations by January 1, 2005, to reduce GHG emissions from non-commercial passenger vehicles and light-duty trucks of model years 2009 through 2016 (State of California, 2002a). The bill required the California Climate Action Registry (CCAR) to develop and adopt protocols for the reporting and certification of GHG emissions reductions from mobile sources for use by CARB in granting emission reduction credits. The bill authorizes CARB to grant emission reduction credits for reductions of GHG emissions prior to the date of the enforcement of regulations, using model year 2000 as the baseline for reduction.

In 2004, CARB applied to the EPA for a waiver under the federal Clean Air Act to authorize implementation of these regulations. The waiver request was formally denied by the EPA in December 2007 after California filed suit to prompt federal action. In January 2008, the State Attorney General filed a new lawsuit against the EPA for denying California's request for a waiver to regulate and limit GHG emissions from these vehicles. In January 2009, President Obama issued a directive to the EPA to reconsider California's request for a waiver. On June 30, 2009, the EPA granted the waiver to California for its GHG emission standards for motor vehicles. As part of this waiver, the EPA specified the following provision: CARB may not hold a manufacturer liable or responsible for any non-compliance caused by emission debits generated by a manufacturer for the 2009 model year. CARB has adopted a new approach to passenger vehicles – cars and light trucks – by combining the control of smog-causing pollutants and GHG emissions into a single coordinated package of standards. The new approach also includes efforts to support and accelerate the numbers of plug-in hybrids and zero-emission vehicles in California. These standards will apply to all passenger and light-duty trucks used by employees of and deliveries to the Project.

2.3.3.2 Low Carbon Fuel Standard

Executive Order S-01-07 (January 18, 2007) requires a 10% or greater reduction in the average fuel carbon intensity for transportation fuels in California regulated by CARB. CARB identified the Low Carbon Fuel Standard (LCFS) as a Discrete Early Action item under AB 32, and the final resolution (09-31) was issued on April 23, 2009. In 2009, CARB approved for adoption the LCFS regulation, which became fully effective in April 2010 and is codified in Title 17, California Code of Regulations, Sections 95480-95490. The LCFS will reduce GHG emissions by reducing the carbon intensity of transportation fuels used in California by at least 10% by 2020. Carbon intensity (CI) is a measure of the GHG emissions associated with the various production, distribution, and use steps in the "lifecycle" of a transportation fuel. The LCFS applies to fuel producers, importers, and distributers. To comply with the LCFS, refineries could consider measures to reduce GHG impacts along the full "lifecycle" of the transportation fuel, for example choosing to purchase crude oils and feeds of lower carbon content, improving the energy efficiency of refinery processes and equipment, and/or producing fuels of lower carbon content, such as ethanol-blended gasoline products. A recent study reported that in response to increased worldwide demand and oil prices, the number of types of crude oils being traded worldwide is growing, with the current 160 crude oil types varying widely in terms of geographic source, carbon content, and energy intensity associated with extraction and processing (Gordeon, 2012).

On December 29, 2011, the U.S. District Court for the Eastern District of California issued several rulings in the federal lawsuits challenging the LCFS. Opponents argued that the LCFS violates the Supremacy Clause (US Constitution, Article VI, Clause 2)[3] and Commerce Clause (US Constitution, Article 1, Section 8, Clause 3)[4] of the U.S. Constitution by discriminating against fuel produced out-of-state. One of the district court's rulings preliminarily enjoined CARB from enforcing the regulation. In January 2012, CARB appealed that decision to the Ninth Circuit Court of Appeals (Ninth Circuit), and then moved to stay the injunction pending resolution of the appeal. On April 23, 2012, the Ninth Circuit granted CARB's motion for a stay of the injunction while it continued to consider CARB's appeal of the lower court's decision. On September 18, 2013, the Ninth Circuit issued its decision affirming the district court's conclusion that LCFS ethanol and initial crude-oil provisions are not facially discriminatory, but remanded to the district court to determine whether the LCFS ethanol provisions are discriminatory in purpose and effect. Additionally, the Ninth Circuit remanded to the district court with instructions to vacate the preliminary injunction against CARB's enforcement of the regulation (*Rocky Mountain Farmers Union v. CARB*, 2013).

CARB staff is developing proposed amendments for consideration by the CARB Board.[5] Amendments under consideration specifically concerning refineries include allowing individual refiners a one-time opportunity to "opt out" of using the California average to calculate LCFS credits or deficits and instead use a refinery-specific or hybrid approach, and accounting for lifecycle carbon intensity associated with low-energy refineries. Additional amendments under consideration include updating the Indirect Land Use Change (iLUC) values, allowing electricity credits for electric rail and electric forklifts, adding a provision to address cost containment, incorporating additional fuel pathways for alternative fuels including biodiesel, and developing sustainability provisions for awarding carbon intensity credits (e.g., for biofuel facilities).

2.3.3.3 SmartWay Truck Efficiency Regulation

The SmartWay Truck Efficiency Regulation, approved by CARB in December 2008, requires heavy-duty long-haul tractors and box-type trailers to be equipped with technologies that reduce GHG emissions by improving fuel economy. These technologies include fuel-efficient and rolling-resistant tires and devices to improve truck aerodynamics. To comply with the regulation, fleet operators must either use EPA SmartWay-certified tractors and trailers or retrofit their existing fleet with SmartWay-verified technologies. All tractors and trailers must comply with the regulation when operated on California highways, regardless of where the vehicle is registered (CCR Title 17, Sections 95300 to 95312).

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[3] The Supremacy Clause establishes the U.S. Constitution, federal statues, and the U.S. Treaties as "the supreme law of the land," establishing that federal laws take precedence over state laws.

[4] The Commerce Clause grants the federal government the authority "To regulate Commerce within foreign Nations, and among the several States and with the Indian Tribes." Case law has determined that pollution and hazardous materials can be considered "commerce" because they can be produced in one state but dispersed or transported to other states.

[5] According to the CARB LCFS website (http://www.arb.ca.gov/fuels/lcfs/regamend13/regamend13.htm), these amendments were scheduled for consideration at the October 2013 Board hearing. As of the date of the publication of this DEIR, CARB has not taken action to finalize or implement these amendments.

2.3.4 CARB Measures to Reduce Emissions from Goods Movement Activities

The Goods Movement Emission Reduction Program (CARB, 2013c) and the 2006 Emission Reduction Plan for Ports and Goods Movement (Plan) in California (CARB, 2006) establish measures that reduce emissions (NOx, PM, and GHGs) from the main sources associated with port cargo handling activities, including ships, harbor craft, terminal equipment, trucks, and locomotives. These measures reduce emissions, including GHG emissions, by requiring cleaner technologies and upgrades, low-carbon fuels, and/or programs that reduce fuel consumption through reduction of vehicle use or vehicle miles traveled. The Goods Movement Emission Reduction Program is a partnership among CARB, local air districts, and local seaports to reduce emissions and health risks from freight movement. This program does not apply to oil loading and unloading that occurs via pipeline.

In addition, the California Environmental Protection Agency (Cal/EPA) (CARB's parent agency) has partnered with the California Business, Transportation and Housing Agency to prepare the Goods Movement Action Plan (GMAP). The GMAP guides state-wide policy and planning for freight transport, trade corridors, and related air quality issues, as well as guides project selection for the allocation of funds under the Trade Corridors Improvement Fund (TCIF) Program, a state-wide fund used for infrastructure improvements along federally designated trade corridors of national significance (State of California, 2007). The GMAP was issued in two phases in 2005 and 2007. The Phase I report described the goods movement industry and its growth potential, the four priority regions and corridors (Los Angeles/Inland Empire, San Diego/Border, Central Valley, and Bay Area), the environmental and community impacts and preliminary mitigation approaches, and public safety and security issues. The Phase II report presents guidelines for integrating state-wide efforts to improve the goods movement system while mitigating environmental impacts (BTH and Cal/EPA, 2007).

2.3.4.1 CARB Vessel Speed Reduction for Ocean-Going Vessels

CARB is in the process of evaluating a state-wide vessel speed reduction program for ocean-going vessels. This program would require vessels within a certain distance of a port to slow to a specified speed. Reducing vessel speeds to an optimal value that minimizes fuel consumption on a per-distance basis translates into reduced GHG emissions. Voluntary vessel speed reduction programs are already in place at several ports including the Port of Long Beach, the Port of Los Angeles, and the Port of San Diego.

2.3.4.2 CARB Low Sulfur Fuel Requirement

CARB adopted CCR Title 13 (Section 2299.2) "Fuel Sulfur and Other Operational Requirements for Ocean-going Vessels with California Waters and 24 Nautical Miles of the California Baseline" in 2008. The regulation requires the use of low sulphur marine distillate fuels from the use of auxiliary diesel and diesel-electric main propulsion engines and auxiliary boilers on ocean-going vessels within "Regulated California Waters".

2.3.4.3 Drayage Truck Regulation

In December 2007 the ARB approved the State-wide Drayage Truck Regulation (CCR, Title 12, Section 2027) to reduce emissions from drayage trucks transporting cargo to and from California's ports and intermodal rail yards. The regulation applies to all on-road Class 7 and 8 (GVWR > 26,000 lbs) diesel-fueled vehicles. For Class 7 trucks, the regulation requires that all trucks 2006 and older either reduce emissions by 85% of, by 2014, meet the 2007 engine emission standard. Trucks which have 2007 and newer engines are fully compliant (2007 – 2009 up to Year 2022) with the Drayage regulations.

2.3.4.4 Regulation of Trains

In response to the goals of AB 32, Measure T-6 “Freight Transport Efficiency” of CARB’s Scoping Plan is intended to address GHG emissions from the freight transport sector by achieving at least a 3.5 MMT CO_2e reduction in GHG emissions from the sector by 2020. In May 2009, CARB held a workshop to outline objectives and research topics for further investigation; as of October 2013, however, CARB has not yet implemented any regulations or issued any formal regulatory documents for this measure.

2.4 Local Greenhouse Gas Regulation

The City of Vallejo Climate Action Plan (CAP) was published in 2012 and details the road map which will enable Vallejo to reduce greenhouse gas emissions between now and 2035. The CAP outlines a range of actions which will be targeted including policies relating to green building practices, energy efficiency, transit-orientated development, mixed-use higher density development, recycling and composting, water conservation and renewable energy. This project will comply with the applicable reduction policies outlined in the CAP including the following greenhouse gas reducing policies:

- The Orcem facility will lead to greenhouse gas emission savings over the next 20 years as a partial replacement for portland cement. The average Mode 1 percentage saving compared to portland cement production is greater than 90% and amounts to approximately 450,000 MTs of CO_2e for Mode 1 Milestone 5.
- The project will be in line with the CAP by ensuring that only post-2007 vehicles will export or import material from the VMT or Orcem sites. Secondly, the operational front loaders used on-site will be powered by Tier 4 low emission diesel engines using biodiesel[6] which will have wide ranging environmental benefits and will be compatible with CAP policy OR-2.
- Rail switchers and rail line haul engines will be based on Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) and thus will reduce transport related GHG emissions. In addition, idling times for switchers will be limited as the engines will be turned off completely during loading. Orcem / VMT are committed to using post-2013 Tier 4 engines in all diesel powered off-road vehicles (excavators / forklifts).

Specific policies which can be directly linked to the strategies CAP include the following:

Strategy - CG-3 (Lighting)

Orcem will install street / outdoor lighting with high-efficiency lights such as light-emitting diode (LED) or induction lighting.

Orcem will adjust the lighting schedule for exterior lighting to minimize the use of lighting at unnecessary or underutilized times.

Strategy - CG-8 (Employee Commute Alternatives)

Orcem are committed to encouraging where possible employee commute alternatives such as carpool, biking options etc in line with CAP policy CG-8.

Strategy - E-2 (Building Standards)

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[6] Biodiesel is defined as a mixture of 20% biodiesel (B20) in diesel fuel.

Orcem / VMT are committed to ensure that all new buildings on-site will adopt the California Title 24 minimum requirements and that new construction will adhere to a Tier 1 or Tier 2 standard of the CALGreen Code requirements.

Strategy – E-3 (Smart Meters)

Orcem will install PG&E's SmartMeters onsite. Furthermore, the facility will install indoor real-time energy monitors. In addition, the facility will investigate the rebate programs that give priority to appliances with smart grid technology.

Strategy – E-4 (Cool Roofs and Pavements)

Orcem will meet new building Title 24 requirements for cool roofs, which require a minimum solar reflectance index (SRI) of 10 for steep slope roofs and 64 for low slope roofs.

Orcem will reduce exterior heat gain for 50% of non-roof impervious site surfaces (roads, sidewalks, parking lots, driveways) through one or both of the following mechanisms:

- Achieve 50% paved surface shading within five to ten years by planting trees and other vegetation and / or installing solar panels or shading structures above parking.
- Use paving materials with an SRI of at least 29 for all surfaces. Where appropriate, Orcem's GGBFS product may be used to achieve SRI values of up to 60 in exchange for flexibility in other areas.

Orcem are committed to planting trees onsite to the greatest extent which is feasible whilst allowing for operational flexibility.

Strategy - RE-1 (Renewable Energy Usage)

Orcem will investigate the option of installing solar energy panels onsite. Orcem will also pre-wire and pre-plumb the facility for solar and solar thermal installations.

Strategy - TDM-1 (Local Businesses)

Orcem will actively investigate options to buy local goods, food supplies and services.

Orcem will participate in award programs which recognize local employers who provide outstanding contributions to the quality of life in the community, including "green businesses".

Orcem will support strategies to increase local business-to-business commerce.

Strategy - TDM-4 (Parking)

Orcem will provide accommodations for employees and visitors using bicycles, based on actual demand. Strategy - TDM-7 (Commute Behavior)

Orcem will support guaranteed ride home programs including preferential parking spaces, employer-assisted ride-matching databases, recognition programs, and other incentives.

Strategy - TDM-8 (Jobs / Housing Balance)

Orcem will support the City General Plan and corresponding regulations by providing jobs and economic revitalization that improves Vallejo's jobs / housing balance.

Strategy - OT-3 (Anti-Idling and Traffic Calming)

Orcem will ensure that Commercial Vehicle Idling Regulations as adopted by the Air Resources Board for heavy-duty vehicles are complied with onsite.

Strategy - W-1 (Water Conservation Efforts)

Orcem will investigate options for conservation techniques, services, devices and rebates.

Strategy - W-2 (Development Standard for Water Conservation)

Orcem, as per the minimum requirements of the 2010 CALGreen Code, will install individual water meters for each space projected to consume more than 100 gallons per day.

Orcem, as per the minimum requirements of the 2010 CALGreen Code, will install an additional water meter or sub-meter for landscaping uses.

Orcem will investigate the feasibility of using greywater, recycled water and rainwater catchment systems.

Strategy - W-4 (Development Standards for Recycling and Composting)

Orcem will investigate the feasibility of using recycled content products during construction based on a minimum of 10% of total products used for onsite construction.

Strategy - OR-1 (Lawn and Garden Equipment)

Orcem will investigate the feasibility of using native vegetation in lieu of high-maintenance landscapes (like grass turf) to reduce the need for gas-powered lawn and garden equipment.

Strategy - OR-2 (Construction Equipment)

Orcem / VMT will also strictly enforce the Commercial Vehicle Idling Regulations as adopted by the Air Resources Board for heavy-duty vehicles in line with policy OT-3 and OR-2 and ensuring that idling is limited to 3 minutes (in line with policy OR-2).

Clear signage will be provided at all access points to remind construction workers of idling restrictions.

All construction equipment will be maintained as per manufacturer’s specifications.

Orcem and VMT will investigate the options for limiting GHG emissions from construction equipment through the use of the following measures:

- Substituting electrified equipment for diesel- and gasoline-powered equipment where practical.
- Used alternatively fuelled construction equipment on-site, where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, biodiesel or ultra-efficient diesel.

2.5 Thresholds of Significance

This report compares impacts of the Project with the thresholds of significance adopted in the 2011 BAAQMD CEQA Guidelines (BAAQMD significance thresholds) for evaluating the significance of CAP and TAC emissions impacts. The BAAQMD significance thresholds for construction and operation are summarized in Table 2.1, and Table 2.2, respectively. The BAAQMD significance thresholds are divided between CAPs and TACs, and are set for evaluating a project's short-term construction emissions, long-term operational emissions, and cumulatively considerable impacts.

Generally, the BAAQMD significance thresholds for CAPs address the first three Appendix G air quality CEQA thresholds and the TAC thresholds address the fourth Appendix G threshold. Finally, BAAQMD has established an operational threshold for odors, consistent with the fifth Appendix G threshold.

Table 2.1 outlines the project-level Air Quality and GHG construction thresholds of significance, and Table 2.2 outlines the project-level Air Quality and GHG operational CEQA Thresholds of Significance.

Table 2.1 Construction Air Quality CEQA Threshold of Significance

Pollutant	Construction	
Criteria Air Pollutants and Precursors (Regional)	**Average Daily Emissions (lb/day)**	**Maximum Annual** Emissions (tpy)
ROG	54	10
NO_X	54	10
PM_{10}	82	15
$PM_{2.5}$	54	10
PM_{10} / $PM_{2.5}$ (fugitive dust)	Construction Dust Ordinance or other Best Management Practices	
Local CO	N/A	
GHGs	None	
Risk and Hazards for new sources and receptors (Individual Project)	Compliance with Qualified Community Risk Reduction Plan Or Increased cancer risk of > 10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase > 0.3 μ g/m^3 annual average Zone of Influence: 1,000-foot radius from property line of source or receptor	
Risk and Hazards for new sources and receptors (Combined Project)	Compliance with Qualified Community Risk Reduction Plan Or Increased cancer risk of > 100 in a million (from all local sources) Increased non-cancer risk of > 10.0 Hazard Index (from all local sources) (Chronic) Ambient $PM_{2.5}$ increase > 0.8 μ g/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from property line of source or receptor	
Accidental Release of Acutely Hazardous Air Pollutants	Storage or use of acutely hazardous material locating near receptors or new receptors locating near stored or used acutely hazardous materials considered significant	

Table 2.2 Operational Air Quality CEQA Threshold of Significance

Pollutant	**Operational-Related**	
Criteria Air Pollutants and Precursors (Regional)	**Average Daily Emissions (lb/day)**	**Maximum Annual Emissions (tpy)**
ROG	54	10
NO_X	54	10
PM_{10}	82	15
$PM_{2.5}$	54	10
PM_{10} / $PM_{2.5}$ (fugitive dust)	None	
Local CO	9.0 ppm (8-hr average), 20.0 ppm (1-hr average)	
GHGs – Projects other than Stationary Sources	Compliance with Qualified GHG Reduction Strategy Or 1,100 MT of CO_2e/yr Or 4.6 MT CO_2e/SP/yr (residents + employees)	
GHGs – Stationary Sources	10,000 MT of CO_2e/yr	
Risk and Hazards for new sources and receptors (Individual Project)	Compliance with Qualified Community Risk Reduction Plan Or Increased cancer risk of > 10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase > 0.3 $\mu g/m^3$ annual average Zone of Influence: 1,000-foot radius from property line of source or receptor	
Risk and Hazards for new sources and receptors (Combined Project)	Compliance with Qualified Community Risk Reduction Plan Or Increased cancer risk of > 100 in a million (from all local sources) Increased non-cancer risk of > 10.0 Hazard Index (from all local sources) (Chronic) Ambient $PM_{2.5}$ increase > 0.8 $\mu g/m^3$ annual average (from all local sources) Zone of Influence: 1,000-foot radius from property line of source or receptor	
Accidental Release of Acutely Hazardous Air Pollutants	Storage or use of acutely hazardous material locating near receptors or new receptors locating near stored or used acutely hazardous materials considered significant	
Odors	5 confirmed complaints per year averaged over three years	

The CEQA Threshold of Significance was adopted by the BAAQMD in June 2010. However, due to a court challenge, the Air District cannot recommend specific thresholds of significance for use by local governments at this time. The BAAQMD has stated that lead agencies may still rely on the Air District's CEQA Guidelines for assistance in calculating air pollution emissions, obtaining information regarding the health impacts of air pollutants and identifying potential mitigation measures.

3. EXISTING AIR QUALITY ASSESSMENT

3.1 Environmental Setting

The BAAQMD operates a regional 32-station monitoring network that measures the ambient concentrations of criteria pollutants. During the past three years (2011 – 2013), no exceptional event designations were requested by the Air District. Therefore, design values listed in the tables below have not been adjusted for exceptional events. In the Bay Area, exceptional events would generally be restricted to wildfires or industrial accidents that contribute to exceedances of the NAAQS.

Representative background concentrations for Ozone, NO_2, SO_2, CO, O_3 and $PM_{2.5}$ are based on the ambient monitoring station located on Tuolumne Street, Vallejo, CA (Station No. 06-095-0004) and covers the three most recent complete years (2011-2013). The station is designated a neighborhood scale station (with a range of 500m – 4km) and is suitable for assigning a background concentration for determining project impacts. The monitoring station is located 2.5km north-east of the proposed facility. The monitoring station is also located approximately downwind of the facility based on the wind rose data for both Vallejo and Conoco-Phillips Rodeo meteorological stations and thus should be broadly representative of the location at which the maximum emissions from the facilities will occur. In relation to fugitive emissions from the facilities, the use of the Tuolumne Street station is likely to overestimate the background levels of $PM_{2.5}$ due to the remote nature of the project site relative to the ambient monitoring station. The background data for the relevant pollutants is outlined below in Table 3.1 for the last three years where data is available.

In relation to PM_{10} the Tuolumne Street station ceased collection of PM_{10} data in 2008. As an alternative the PM_{10} concentration outlined in the BAAQMD publication "2013 Air Monitoring Network Plan" (*BAAQMD, 2014*) for Solano County which was based on the measurements conducted at Vacaville (in Yolo-Solano Air Quality Management District) (AQS ID 060953001) have been used in the assessment.

3.2 Regional Topography, Meteorology and Climate

The SFBAAB is characterised by complex terrain, consisting of coastal mountain ranges, inland valleys and bays, which distort normal wind flow patterns. The greatest distortion occur when low-level inversions are present and the air beneath the inversion flows independently of air above the inversion (*BAAQMD, 2012*).

The climate is dominated by the strength and location of a semi-permanent, sub-tropical high-pressure cell. During the summer, the Pacific high pressure cell is centered over the north-eastern Pacific Ocean resulting in stable meteorological conditions and a steady north-westerly wind flow. The high pressure cell leads to low precipitation levels in summer months. In terms of wind patterns, during summer months, the wind flows from the northwest inland through the Golden Gate and over the lower portions of the San Francisco Peninsula (*BAAQMD (2012)*).

In the winter, the Pacific high-pressure cell weakens and shifts southward resulting in wind flow offshore, the absence of upwelling and the occurrence of storms. Weak inversions coupled with moderate winds result in low air pollution potential. In relation to wind patterns, the SFBAAB frequently experiences stormy conditions with moderate to strong winds as well as periods of stagnation with very light winds. Rain fall levels rise and account for typically 75% of the annual average (*BAAQMD, 2012*).

In terms of the Orcem / VMT facility, the climate falls within the Carquinez Straits sub-region (BAAQMD, 2012). The prevailing winds are generally from the West with high pressure offshore during summer and fall months leading to marine air flowing eastwards through the Carquinez Strait.

The wind is generally strongest in the afternoon with speeds of 15 – 20 mph common. Summer temperatures peak at around 90°F with mean winter temperatures in winter of high 30's°F.

Table 3.1 Available Ambient Air Quality Data in Tuolumne St, Vallejo, California (& Vacaville, California for PM_{10}) 2011 – 2013

Pollutant	**Year**	**Maximum 1-Hour Concentration (ppb)**	**4^{th} Highest Maximum 1-hr Concentrations Averaged Over 3-Years (ppb)**	**Maximum 8-Hour Concentration (ppb)**
	2013	82	57	68
	2012	85	59	62
	2011	90	61	69
		Maximum 1-Hour Concentration (ppb)	**98^{th} %ile of Maximum 1-hr Concentrations (ppb)**	**Annual Mean Concentration (ppb)**
NO_2	2013	49.4	36.5	9.85
	2012	52.4	32.7	9.12
	2011	47.4	34.7	10.20
	Year	**Maximum 1-Hour Concentration (ppb)**	**99^{th} %ile of Maximum 1-hr Concentrations (ppb)**	**Maximum 24-hr Concentration (ppb)**
SO_2	2013	8.1	3.3	2.5
	2012	14.2	3.9	2.5
	2011	7.4	5.1	2.6
	Year	**Maximum 24-Hour Concentration ($\mu g/m^3$)** Note 1	**98^{th} %ile of Maximum 24-hr Concentrations ($\mu g/m^3$)**	**Annual Mean Concentration ($\mu g/m^3$)**
PM_{10} (Vacaville)	2013	35.4 (36.6)	NA	12.85
	2012	26.0 (25.5)	NA	11.30
	2011	35.8 (38.4)	NA	13.76
	Year	**Maximum 24-Hour Concentration ($\mu g/m^3$)**	**98^{th} %ile of Maximum 24-hr Concentrations ($\mu g/m^3$)**	**Annual Mean Concentration ($\mu g/m^3$)**
$PM_{2.5}$	2013	NA	32.8	10.42
	2012	NA	21.4	8.96
	2011	NA	31.0	10.08
	Year	**Maximum 1-Hour Concentration (ppm)**	**Maximum 8-Hour Concentration (ppm)**	
Carbon Monoxide	2013	2.8	2.3	
	2012	2.8	2.2	
	2011	3.0	2.4	

Note 1 Concentrated reported at STP. Data in ( ) reported as local conditions.
Source: BAAQMD Air Quality Monitoring Summaries for 2011-2013. EPA AIRS Data System, EPA Website, 2014.

4. CONSTRUCTION ASSESSMENT

The air quality and greenhouse gas emission impacts associated with the construction of the proposed Project were evaluated by AD. The complete analysis can be found in Appendix CONST, and the results are summarized in this section. The AD construction analysis was completed in August of 2014, and presumes a project start of January 2015. It also assumes simultaneous construction of the Orcem portion of the project, and the Phase 1 and Phase 2 construction in sequence. The project has now been delayed until January 2016. Because construction fleets are modernizing over time, the emission estimates provided in the AD report are conservative, and overestimate the emissions that would be expected from a construction project that starts a year later.

The Proposed Orcem Project include Site preparation; structure demolition; development of major buildings, storage facilities, conveyance systems and processing equipment; construction of ancillary buildings; and Improvement of site infrastructure and supporting facilities. The project will be constructed in phases to coincide with the growth in demand for Orcem’s products, but is anticipated to be constructed from January 2016 through June 2017.

The VMT Terminal involves two separate phases of construction based on projected growth of cargo over the first several years of operations. Phase 1 includes the replacement of the timber wharf with a concrete pile-supported wharf with structural concrete deck, associated mooring and fender systems, and related improvements for deep-water marine transportation operations. This would include approximately 10,847 cubic yards of solid fill, most of which is which is within the footprint of the existing wharf. Minimal dredging of approximately 89,739 cubic yards will be required, subject to a permit from the U.S. Army Corps of Engineers (the Corps), for the initial establishment of the design depth of -38 feet Mean Lower Low Water (MLLW) in accordance with the Pile Supported Pier Layout. In addition to the wharf construction, the Phase 1 wharf would include a concrete pile-supported wharf with structural concrete deck, associated mooring and fender systems, and related improvements for deep-water marine transportation operations, while the Phase 2 rock dike would consist of riprap and associated improvements of approximately 600 feet in length north of and adjoining the Phase 1 wharf.

4.1 Construction Schedule

The construction schedule now calls for construction of the Orcem Project from January 2016, through June 2017, and construction of the VMT Phase 1 project during the Orcem construction period, lasting for 4-6 months. The VMT Phase 2 project will be constructed after the Orcem Phase 1 construction period is complete. Orcem’s Phase 2 construction includes minor changes and improvements which have been accounted for in the analysis. All Orcem construction and VMT Phase 1 construction is expected to be completed by October 2017. 2018 will be the first full operational year.

4.2 Construction Mass Emissions Thresholds

Air quality impacts due to temporary construction emissions from these projects were predicted. On-site construction emissions were computed using the California Emissions Estimator Model (CalEEMod®) version 2013.2.2. Tug boat emissions associated with dredging were computed using emission factors developed by the CARB. Resulting community risk and hazard impacts associated with these emissions were evaluated as part of a health risk assessment (HRA). Impacts from this activity were evaluated using significance thresholds adopted by the BAAQMD in 2010 and published in their 2011 CEQA Air Quality Guidelines[7].

Table 4.1 shows the emissions associated with the Orcem construction, and Table 4.2 shows the emissions associated with Phase 1 and Phase 2 of VMT construction. Table 4.3 shows the emissions associated with the combined Orcem and VMT Phase 1 construction that may happen simultaneously. All construction emissions are below the BAAQMD thresholds of significance for construction.

Table 4.1 Orcem Construction Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust	GHG Emissions
2015 Construction emissions (tons)	0.70 tons	3.34 tons	0.16 tons	0.15 tons	369 metric tons
2016 Construction emissions (tons)	0.23 tons	0.43 tons	0.02 tons	0.02 tons	62 metric tons
Average daily emissions (pounds)[1]	4.7 lbs.	19.2 lbs.	0.9 lbs.	0.9 lbs.	--
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.	--
Exceed Threshold?	No	No	No	No	--

Table 4.2 VMT Phase 1 and Phase 2 Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust	GHG Emissions
VMT Phase 1					
2015 Construction emissions From CalEEMod®	0.08 tons	0.85 tons	0.04 tons	0.04 tons	68 metric tons
2015 Construction emissions For Tug operations	0.03 tons	0.22 tons	0.01 tons	0.01 tons	26 metric tons
Average daily emissions (pounds)[1]	3.5 lbs/day	34.5 lbs/day	1.6 lbs/day	1.6 lbs/day	94 metric tons
VMT Phase 2					
2016 Construction emissions From CalEEMod®	0.21 tons	1.70 tons	0.07 tons	0.07 tons	68 metric tons
2016 Construction emissions For Tug operations	0.04 tons	0.31 tons	0.02 tons	0.02 tons	37 metric tons
Average daily emissions (pounds)[2]	6.3 lbs/day	50.3 lbs/day	2.3 lbs/day	2.3 lbs/day	105 metric tons/year
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.	--
Exceed Threshold?	No	No	No	No	--
[1] Assumes 62 workdays,[2] 80 workdays and[3] total of 142 workdays					

Table 4.3 Orcem and VMT Phase 1 Combined Construction Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust	GHG Emissions
Orcem Average Daily Emissions	4.7 lbs.	19.2 lbs.	0.9 lbs.	0.9 lbs.	--
VMT Phase 1 Average Daily Emissions	3.5 lbs	34.5 lbs	1.6 lbs	1.6 lbs	94 metric tons
Combined Average Daily	8.2 lbs	53.7 lbs	2.5 lbs	2.5 lbs	94 metric

[7] Bay Area Air Quality Management District. 2011. *BAAQMD CEQA Air Quality Guidelines*. May.

Emissions					tons
BAAQMD Average Daily Thresholds	54 lbs	54 lbs	82 lbs	54 lbs	--
Exceed Threshold?	No	No	No	No	--

4.3 Construction Fugitive $PM_{2.5}$ Emissions

Construction activities, particularly during site preparation and grading would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. The BAAQMD does not require the evaluation of entrained road dust. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are employed to reduce these emissions.

Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality and fugitive dust-related impacts associated with grading and new construction to a less than significant. The contractor shall implement the following Best Management Practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

4.4 Health Risk Assessment for Construction

Construction equipment and associated heavy-duty truck traffic along with dredging activities generate diesel exhaust, which is a known TAC. Diesel exhaust poses a potential health risk to nearby receptors.

A health risk assessment of the project construction activities was conducted that evaluated potential health impacts to sensitive receptors at these nearby residences from construction emissions of diesel particulate matter (DPM).[8] A dispersion model was used to predict the off-site DPM and $PM_{2.5}$ concentrations resulting from project construction so that lifetime cancer risks and $PM_{2.5}$ annual average concentrations could be predicted.

The health risk assessment focused on modeling on-site construction activity using construction fleet information included in the project design features. Construction period emissions were modeled using the California Emissions Estimator Model, Version 2013.2.2 (CalEEMod®) along with projected construction activity. The number and types of construction equipment and diesel vehicles, along with the anticipated length of their use for different phases of construction were based on site-specific construction activity schedules provided by Orcem and VMT. The emissions used to estimate health risks were calculated assuming that the construction of the projects would occur over a 18-month period, beginning in January 2015 and going through June 2016. As noted above, the project will not begin before January 2016, and will extend for a longer period than estimated in the AD report, Appendix CONST. A later construction date will likely mean newer, cleaner equipment, and a longer construction period reduces the calculated impact from age sensitivity. As a result, the estimated health impact will be lower than that presented in the report.

The CalEEMod® model provided total annual $PM_{2.5}$ exhaust emissions (assumed to be diesel particulate matter) for the off-road construction equipment and for exhaust emissions from on-road vehicles (haul trucks, vendor trucks, and worker vehicles). As described in Appendix CONST, a trip length of 0.65 miles was used to calculate emissions for the HRA. The on-road emissions are a result of haul truck travel, worker travel, and vendor deliveries during building demolition, grading and construction activities. Fugitive $PM_{2.5}$ dust emissions were also calculated by CalEEMod®. Table 4.4 provides the emissions of exhaust and fugitive $PM_{2.5}$.

Table 4.4 On- and Near-Site Construction DPM and $PM_{2.5}$ Emissions

Scenario	$PM_{2.5}$ Exhaust (DPM)	$PM_{2.5}$ Fugitive
Orcem		
2015 Construction emissions from CalEEMod®	0.1431 tons	0.0800 tons
2016 Construction emissions from CalEEMod®	0.0209 tons	0.0004 tons
VMT Phase 1		
2015 Construction emissions from CalEEMod®	0.0403 tons	0.0024 tons
2015 Construction emissions from Tug operations	0.01 tons	0.00 tons
VMT Phase 2		
2016 Construction emissions from CalEEMod®	0.0668 tons	0.0013 tons
2016 Construction emissions from Tug operations	0.02 tons	0.00 tons

Air quality modeling of annual average DPM and fugitive $PM_{2.5}$ concentrations was conducted using the EPA's atmospheric dispersion modeling system (AERMOD). The AERMOD model is a steady-state, multiple-source, dispersion model designed to calculate pollutant concentrations from single or multiple sources. The model is recommended by BAAQMD for predicting air pollutant/contaminant concentrations associated with various emissions sources.

The model used a 5-year data set (2007-2010, 2012) of hourly meteorological data from the Conoco-Phillips Rodeo monitoring program with supplemental data from the Napa County Airport used for the 2010 year. This data was developed based on inputs provided by the BAAQMD. Annual DPM concentrations from construction activities were predicted for 2015 and 2016 with the annual average concentrations based on the 5-year average concentrations from modeling 5 years of

8 DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.

meteorological data. DPM concentrations were calculated at nearby sensitive receptors at heights of 1.5 meters (4.9 feet) representative of the ground level exposures for the nearby residential structures.

A receptor gird system was used to provide sufficient spatial coverage of the surrounding project area to ensure that the extent of the significant impacts and the maximum impact locations on sensitive receptors are identified. No receptors were placed on directly on roadways, overwater, or at other locations where long-term exposure would not occur.

The location of the maximum modeled DPM and $PM_{2.5}$ concentrations is identified on Figure 4.1. Increased cancer risks were calculated using the modeled concentrations and BAAQMD recommended risk assessment methods for both a child exposure (3rd trimester through 2 years of age) and adult exposure.[9] Since the modeling was conducted under the conservative assumption that emissions occurred daily for a full year during each construction year, the default BAAQMD exposure period of 350 days per year was used.[10]

Results of this assessment indicate that for project construction the incremental child cancer risk at the maximally exposed individual (MEI) receptor would be 5.7 in one million and the adult incremental cancer risk would be 0.3 in one million.

The maximum annual $PM_{2.5}$ concentration was 0.08 micrograms per cubic meter ($\mu g/m^3$) occurring at the same location where maximum cancer risk would occur. This $PM_{2.5}$ concentration is below the BAAQMD threshold of 0.3 $\mu g/m^3$ used to judge the significance of health impacts from $PM_{2.5}$.

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. The chronic inhalation reference exposure level (REL) for DPM is 5 $\mu g/m^3$. The maximum predicted annual DPM concentration was 0.043 $\mu g/m^3$, which is much lower than the REL. The Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, is 0.009. This HI is much lower than the BAAQMD significance criterion of a HI greater than 1.0.

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9 Bay Area Air Quality Management District (BAAQMD), 2012, *Recommended Methods for Screening and Modeling Local Risks and Hazards*, May.

10 Bay Area Air Quality Management District (BAAQMD), 2010, *Air Toxics NSR Program Health Risk Screening Analysis Guidelines*, January.

U:\Orcem - VMT\GIS\Updated Risk Results.mxd

RAMBOLL ENVIRON

MEIR Location
Orcem-VMT
Vallejo, California

FIGURE

DRAFTED BY: MJH

DATE: 7/1/2015

0336906A

5. AIR QUALITY EMISSIONS AND GHG EMISSIONS FROM SHIPS AND TRUCKS

The operational phase of the development will see both Orcem and VMT operating their respective areas of the site simultaneously. This section contains a description of the emissions of criteria pollutants and toxic air contaminants from all operations described below. GHG emission calculations for ship activities are included with the criteria emissions, in sections 5.2.2 and 5.4.2 for Orcem and VMT, respectively. GHG emissions for Orcem trucks are also included with criteria emissions, in section 5.2.6.GHG emission calculation details for the Orcem main stack are also included in section 6.2.5.

The GHG emissions from the sources described here are then added to the GHG emissions from the main stack in Section 6 of this report.

- Transportation
  - Port activity, e.g. ship exhaust emissions, tugs, ship unloading;
  - Truck movements both onsite and on the local road network;
  - Rail activity;
  - Barge activity
  - Offroad vehicle movements on site, e.g. front end loaders, forklifts;
- Material Handling Emissions – stockpiling, uploading of material, material drop points etc;
- Fugitive Dust Emissions From Hopper & Bag Filters;
-
- Air emissions from emission point P-1 (Main Stack);
-
-
- .

The material throughput for both the Orcem and VMT projects would ramp up over time, as shown in Table 1.1. As noted earlier, the greatest air quality impact would result from the activities described in #3 in Table 1.1, where the maximum material is moved through the facilities via trucks and rail. The maximum mode will not occur until at least 2020. Accordingly, the emissions are analyzed for 2020 fleet year for the shipping scenario where 160,000 metric tonnes of material is shipped to the facility monthly via four vessels, and of that, 91,900 metric tonnes is shipped by truck, and 68,100 metric tons is shipped by rail. This is equivalent to two 100-car trains per week, or eight per month. While there may be up to 12 100-car trains per month, such a scenario would result in lower emissions, as there would be fewer truck trips. Note that the ROA would have the same number of cars, but it would be delivered in 50-car trains rather than 100-car trains.

5.1 Orcem Operational Phase

The primary raw material utilized at the Orcem Plant is granulated blast furnace slag or GBFS, a recycled beneficiated by-product from the first stage in the production of steel. It is a by-product of converting iron ore to metallic iron in a blast furnace. The resultant vitrified material (granulate), is called GBFS. GBFS has the appearance and handling characteristics of a coarse beach sand. This GBFS is the primary raw material to be delivered to the Orcem site in Vallejo. At the Orcem facility this GBFS will then be further processed by drying and grinding to a very fine powder called GGBFS.

The project will be constructed in phases to coincide with the growth in demand for the products in Orcem's product portfolio. The total throughput of raw materials of the Plant at full capacity will be between 850,000 and 900,000 tons. A maximum of 760,000 tons can be processed by the mill, and the remainder of raw materials are non-milled. It is not expected that the Plant will achieve full production in the first few years of operation. For this reason it is proposed that minor changes to the basic site infrastructure (but not the main processing plant) will be made in accordance with the growth pattern of production. The trigger for the proposed infrastructure changes will be the following production milestones:

Phase 1: Up to a production of 500,000 tons per year.

Phase 2: Above 500,000 tons per year.

The proposed project will use a Vertical Roller Mill (VRM). Raw material is fed to the VRM via an airlock and onto the center of a rotating grinding table. The raw material is thrown outward and under heavy steel rollers riding over the table by centrifugal force. A dam ring on the periphery of the grinding table contains the material and helps form it into a layer or "bed". The steel rollers are coupled to high pressure hydraulic arms to forcefully pull the rollers onto the grinding table to grind the bed of raw material to fine powder.

The milling process requires high flow of air (approximately 4,400,000 cubic feet per hour) to pass through the mill. As a result, the material within the mill is subject to a high velocity airflow, which passes up, around and over the grinding table. The airflow's primary function is to lift ground material particles from the table and convey them into an internal particle size classifier, aka high efficiency separator. This internal high efficiency separator classifies the incoming particles into two streams: (a) one stream of particles sufficiently small to meet the finished product specification passes through the separator with the air flow and leaves the mill; and (b) another stream of oversize particles, which is diverted back down to the grinding table for additional processing.

The GBFS will enter the mill with a moisture content between 6% and 12%, but to properly store and transport the finished GGBFS product the material must be dried to a moisture content of less than 0.2% water.

The high volume of air required for the milling process of the VRM is also very effective at simultaneously drying the material being processed; however, when processing materials with especially high moisture content, such as GBFS, additional heat is often required to complete the drying process. In this project the additional heat will be supplied by a natural gas fired Hot Air Generator (HGG) which will preheat the air coming into the VRM to a temperature sufficient to evaporate the excess GBFS moisture during milling.

Emissions of NO_X, SO_2, CO, Reactive organic gasses (ROG, PM_{10} and $PM_{2.5}$ to the atmosphere from the Hot Air Generator will be released via a 50m stack (stack P-1). The emission rates were calculated based on vendor data and default USEPA AP-42 emission rates and additional conservative assumptions related to emission variability. In accordance with BAAQMD Regulation 2-2-301, BACT is triggered if NO_X, SO_2, POC or NPOC exceed 10 pounds per day. Estimations of emissions indicate that BACT will be required for the Hot Air Generator as outlined in Table 5.1.

An estimate of the maximum day and annual emission rate of the criteria pollutants and GHGs from the Orcem process emission points / transfer points onsite is outlined in Tables 5.1 and 5.2. As shown in Tables 5.1 and 5.2, the largest source of emissions varies by pollutant, but is generally trucks, ships, or the main stack. The estimates are based on detailed calculations, engineering data and based on 7,600 hours of operation at maximum build-out (Milestone 5). Example calculations are outlined in Appendix AQ-EMITS. Given that the estimated facility emission totals are significantly below the PSD threshold of 250 tons per year per pollutant, the project will not be subject to PSD review.

Table 5.1 Daily Emissions of Criteria Pollutants from Orcem under Milestone 5 (lbs/day).

Source	ROG	CO	NOx	Exhaust PM_{10}	Fugitive PM_{10}	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	DPM	SO_2	CO_2	CH_4	N_2O
Shipping[1]	3.47	7.74	65.76	1.53	-	1.45	-	1.30	4.38	4,890	0.49	0.28
Material Handling	-	-	-	-	0.49	-	0.07	-	-	-	-	-
Raw Material Storage	-	-	-	-	0.00	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)[2]	0.05	0.55	0.15	0.04	-	0.04	-	0.04	0.02	781	-	-
Unpaved Rd (Front Loader & Excavator)[2]	1.11	6.80	2.87	0.05	0.47	0.04	0.05	0.05	0.05	5,271	-	-
Industrial Paved Rd (finished product)[2]	0.32	0.37	1.44	0.00	0.19	0.00	0.05	0.00	0.00	317	-	-
Public Paved Rd [2]	1.95	18.57	67.99	0.22	32.65	0.21	8.03	0.10	0.19	17,562	-	-
Bag Filters	-	-	-	-	0.99	-	-	-	-	83,953	3.35	0.93
Stack	8.39	61.93	30.62	1.35	-	1.35	-	-	0.98	44,437	-	-
Rail	0.03	1.35	3.83	0.03	-	0.03	-	0.03	0.01	708	0.06	0.02
Onsite[3]	-	-	-	-	-	-	-	-	-	2,287	-	-
Total (lbs/day)	**15.33**	**97.33**	**175.68**	**3.22**	**34.80**	**3.13**	**8.19**	**1.52**	**5.65**	**160,205**	**3.90**	**1.23**

1. Includes all ship and tug engines
2. Includes engine exhaust and fugitive dust emissions
3. GHG emissions from onsite electricity consumption

Table 5.2 Annual Emissions of Criteria Pollutants from Orcem under Milestone 5 (tons/year).

Source	ROG	CO	NOx	Exhaust PM_{10}	Fugitive PM_{10}	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	DPM	SO_2	GHG Emissions (MT/year) CO_2	CH_4	N_2O
Shipping	0.63	1.41	12.00	0.28	-	0.26	-	0.24	0.80	809	0.08	0.05
Material Handling	-	-	-	-	0.09	-	0.01	-	-	-	-	-
Raw Material Storage Piles	-	-	0.55	-	0.00	-	0.00	-	-	-	-	-
Barge	-	-	-	-	-	-	-	-	-	-	-	-
Unpaved Rd (Forklift)	0.01	0.10	0.03	0.01	-	0.01	-	0.01	0.00	130	-	-
Unpaved Rd (Front Loader & Excavator)	0.20	1.24	0.52	0.01	0.09	0.01	0.01	0.01	0.01	873	-	-
Industrial Paved Rd (finished product)	0.06	0.07	0.26	0.00	0.03	0.00	0.01	0.00	0.00	53	-	-
Public Paved Rd	0.36	3.39	12.41	0.04	5.96	0.04	1.46	0.02	0.04	2908	-	-
Bag Filters	-	-	-	-	0.18	-	-	-	-	13899	0.55	0.15
Stack	1.53	11.30	5.59	0.25	-	0.25	-	-	0.18	7357	-	-
Rail	0.01	0.25	0.70	0.00	-	0.00	-	0.00	0.00	117	0.01	0.00
Onsite	-	-	-	-	-	-	-	-	-	378	-	-
Total (tons/year)	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03	26,524	0.64	0.21

5.2 Derivation of Emission Rates for Each Emission Source in Use at the Orcem Facility

Air emissions from the proposed Orcem facility were derived using various sources including the ARB Ocean Going Vessels (OGV) Marine Emissions Model[11], ARB California Harbor Craft Emissions Inventory Database[12], ARB OFFROAD2011, ARB EMFAC2014 on-road vehicle emissions modeled, AP-42 and vendor data. A discussion of each mode of operation and associated emission source is outlined below.

5.2.1 Milestones & Modes of Operation

While the Orcem facility primarily will produce GGBFS, this manufacturing plant will operate in a number of finished product operational modes within any given timeframe based upon market demand for GGBFS and various cement products. These modes include:

- Mode 1 - GGBFS production only.
- Mode 2 - Cementing products production only.
- Mode 3 - GGBFS production & cement.

The material production associated with these modes and the associated phases are summarized in Table 5.3 and in Figures 5.1 – 5.6.

Clinker is transported to the Orcem Site from the VMT Project terminal (in Mode 2) via the conveyor system to be developed as part of the Orcem Phase 1 improvements. Cement is transported via rail from Arizona in Mode 3, and unloaded at the Orcem Site via truck tanker transfer and closed pipe into one of the fully sealed Storage Silos. Gypsum is transported in all Operational Modes via truck or rail from Nevada or by sea from Mexico. Limestone is transported in Operational Mode 2 via truck or rail from nearby sources in California, or sea from Canada. Table 5.4 outlines the various modes of transport (rail, truck, shipping) for each mode for both raw material imports and finished product exports.

Table 5.5 indicates the proposed ramp-up at the Orcem facility for each mode of operation. It is envisaged that five milestones will be reached on a year-by-year basis with Milestone 5 being achieved after five years of operation. In this analysis, Milestone 5 (i.e. Phase 2) is assumed to be full capacity of 760,000 MTs/year.

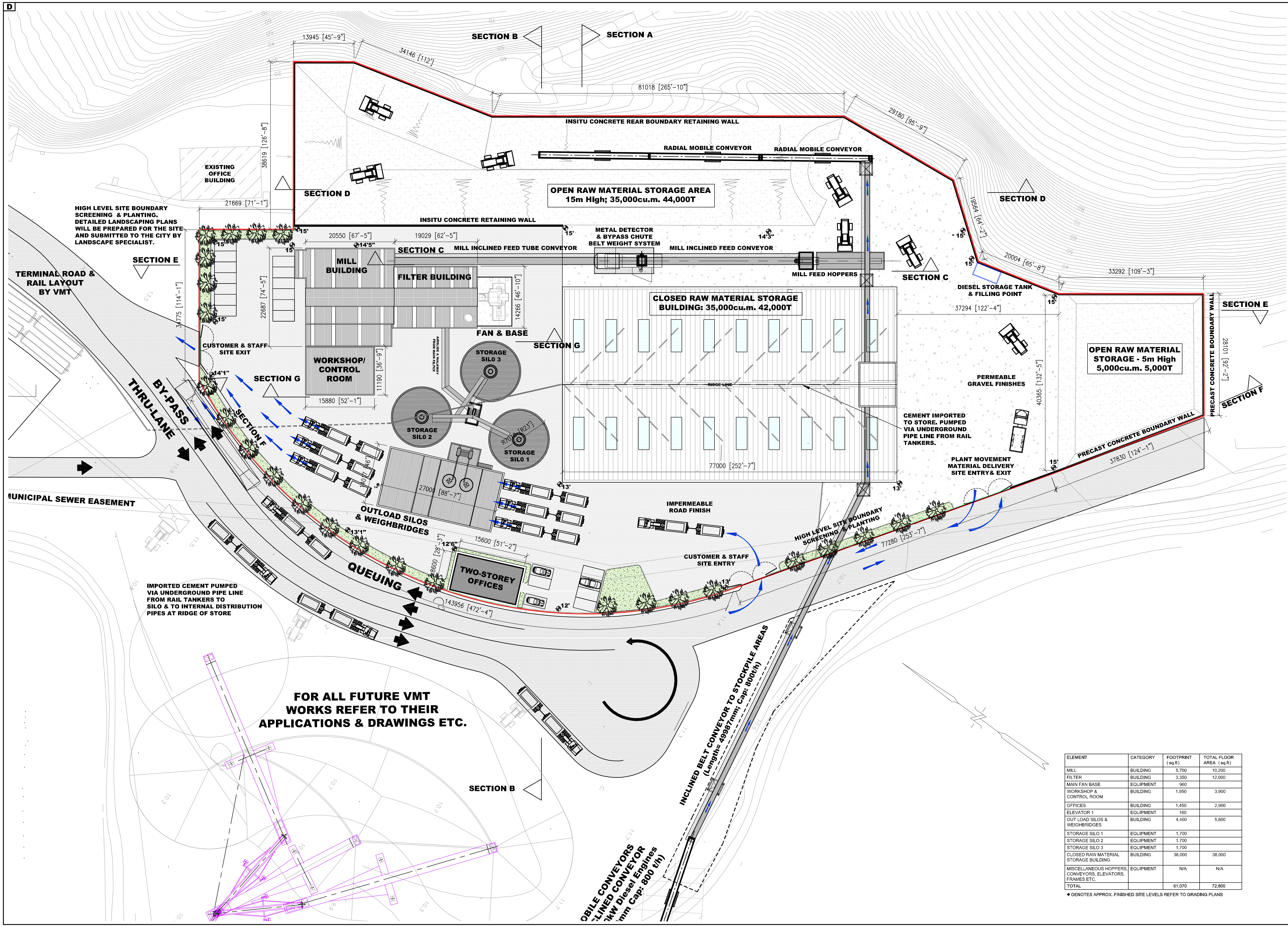
Table 5.3 Orcem Project Plant Production Modes

Orcem Modes / Phases	OPERATIONAL MODE	PHASE	PRODUCTION
M1-P1	GGBFS Only	1	<500,000 MTs / annum
M2-P1	Cement Only	1	<500,000 MTs / annum
M3-P1	GGBFS & Cement	1	<500,000 MTs / annum
M1-P2	GGBFS Only	2	>500,000 MTs / annum
M2-P2	Cement Only	2	>500,000 MTs / annum
M3-P2	GGBFS & Cement	2	>500,000 MTs / annum

[11] http://www.arb.ca.gov/msei/categories.htm#ogv_category

[12] http://www.arb.ca.gov/msei/categories.htm#chc_category

Figure 5.6



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL ROOM	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	4,400	5,800
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
STORAGE SILO 3	EQUIPMENT	1,700	
CLOSED RAW MATERIAL STORAGE BUILDING	BUILDING	38,000	38,000
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		61,070	72,800

⌖ DENOTES APPROX. FINISHED SITE LEVELS REFER TO GRADING PLANS

Notes

Rev.	Date	By	Details Of Revision	Chk.	App.
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Client
ORCEM CALIFORNIA INC.

Project
VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 3:CEMENT & GBFS
PHASE 2: OUTPUT CAPACITY MORE THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS:
VALLEJO MARINE TERMINAL
780 AND 790 DERR STREET
VALLEJO
CALIFORNIA
Tel: +353 (0)1 449 3244

PROPERTY OWNER:
VALLEJO MARINE TERMINAL LLC
4171 CANYON ROAD
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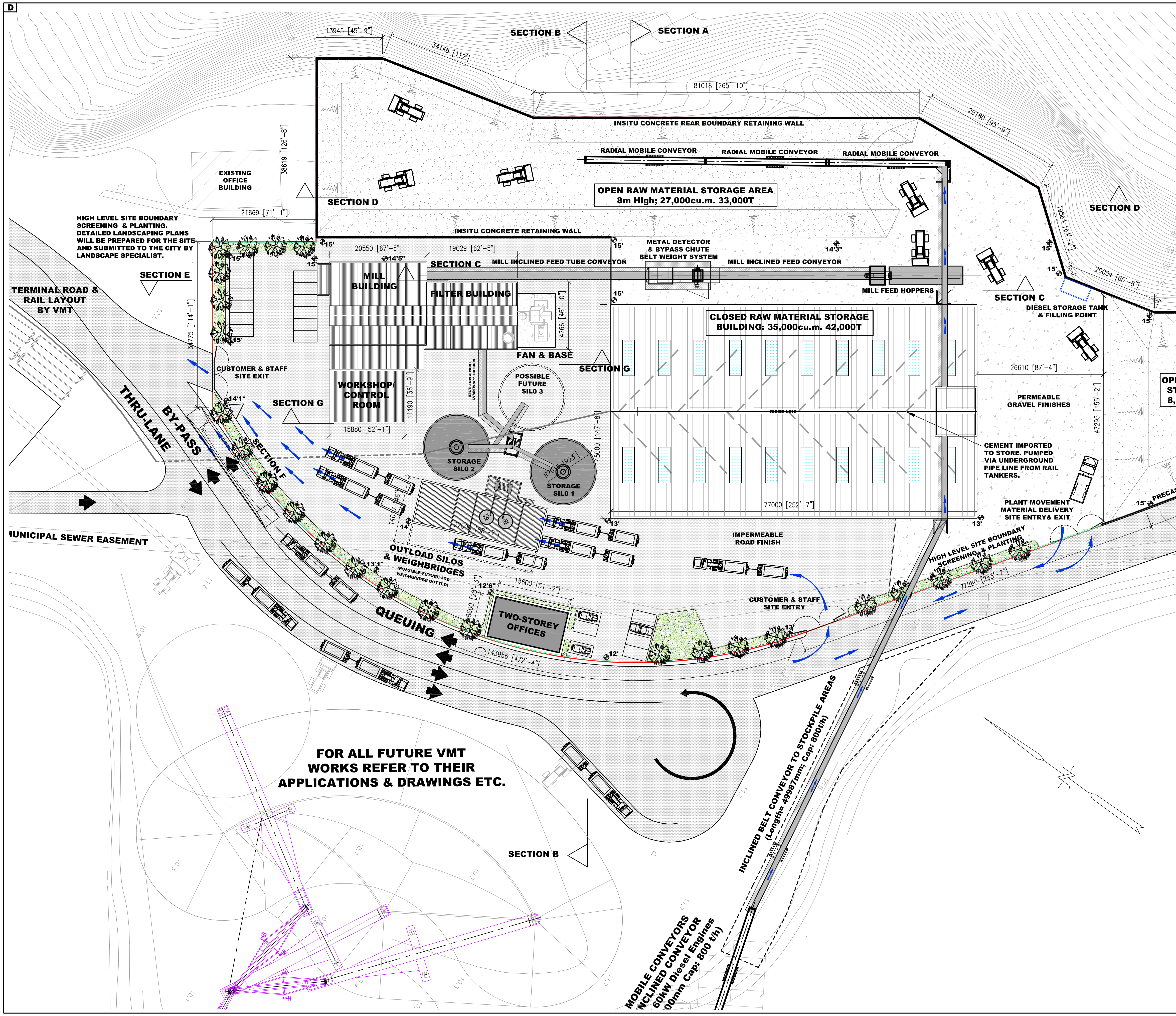
Figure 5.5



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL ROOM	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	3,100	5,300
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
CLOSED RAW MATERIAL STORAGE BUILDING	BUILDING	38,000	38,000
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		58,070	72,300

⌖ DENOTES APPROX. FINISHED SITE LEVELS REFER TO GRADING PLANS

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Client
ORCEM CALIFORNIA INC.

Project
VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 3:CEMENT & GBFS
PHASE 1: OUTPUT CAPACITY LESS THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS:
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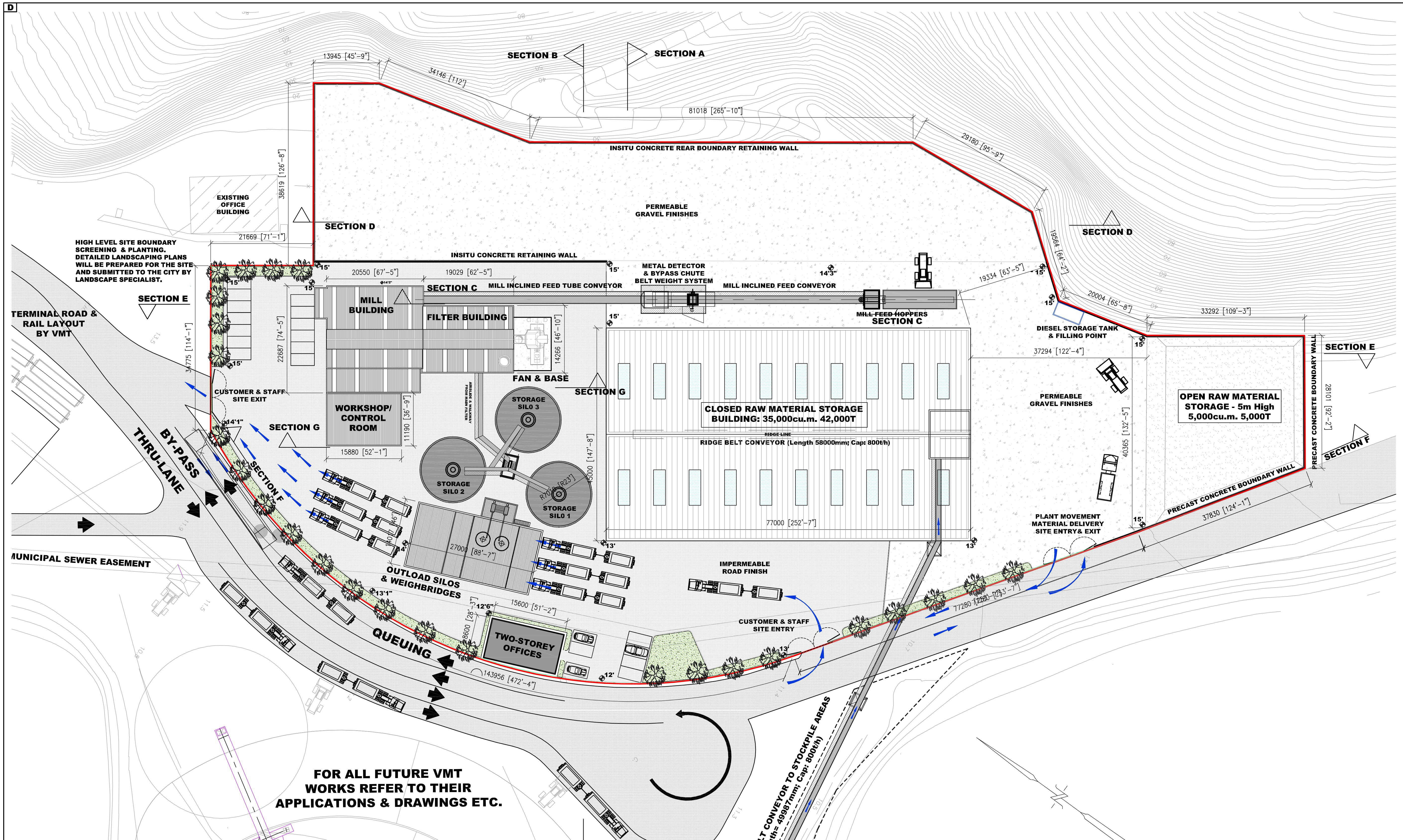
Figure 5.4



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL ROOM	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	4,400	5,800
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
STORAGE SILO 3	EQUIPMENT	1,700	
CLOSED RAW MATERIAL STORAGE BUILDING	BUILDING	38,000	38,000
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		61,070	72,800

◆ DENOTES APPROX. FINISHED SITE LEVELS REFER TO GRADING PLANS

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Client
ORCEM CALIFORNIA INC.

Project
VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 2: CLINKER ONLY
PHASE 2: OUTPUT CAPACITY MORE THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS:
VALLEJO MARINE TERMINAL
780 AND 790 DERR STREET
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PROPERTY OWNER:
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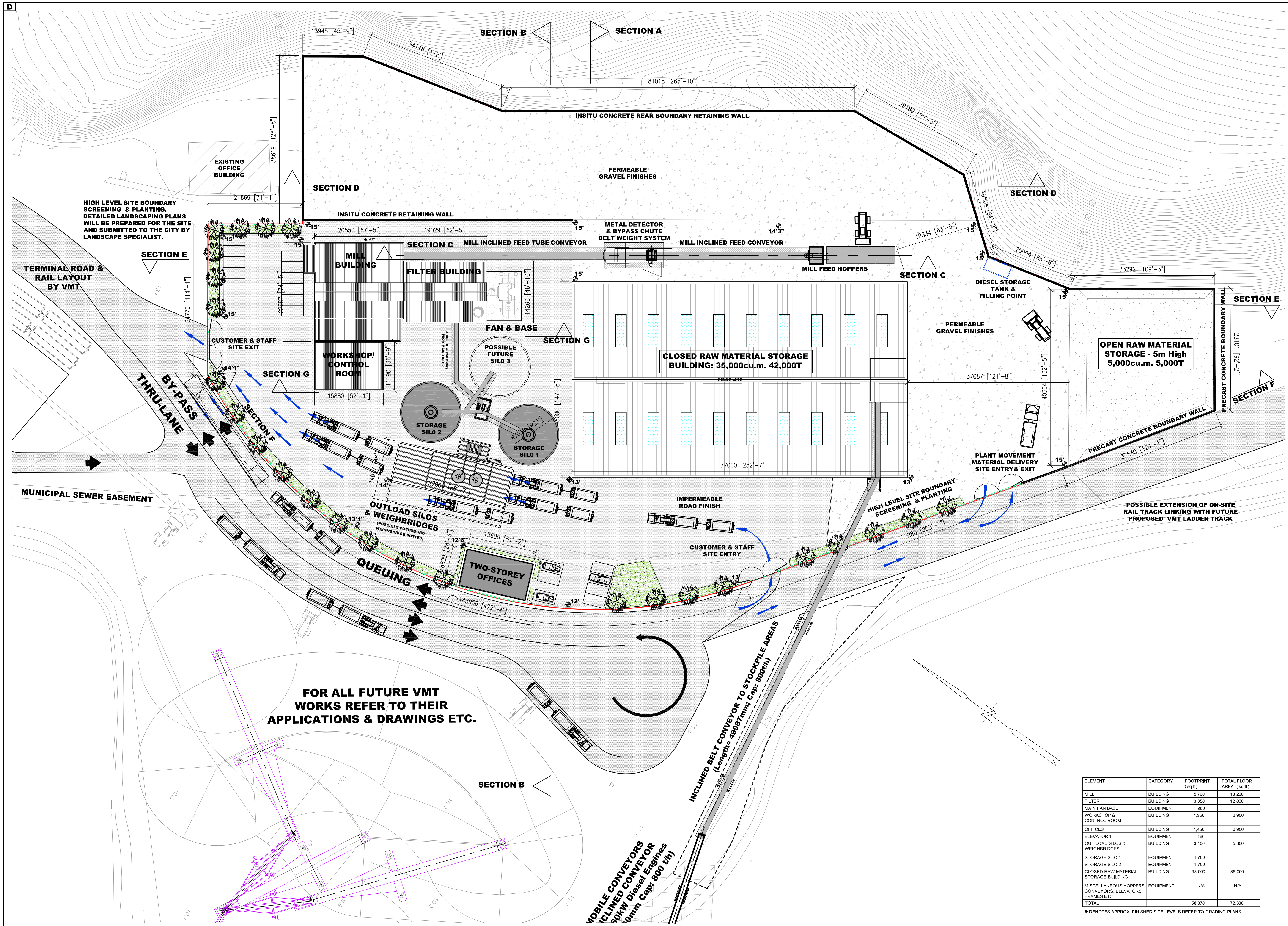
Figure 5.3



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL ROOM	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	3,100	5,300
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
CLOSED RAW MATERIAL STORAGE BUILDING	BUILDING	38,000	38,000
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		58,070	72,300

⊕ DENOTES APPROX. FINISHED SITE LEVELS REFER TO GRADING PLANS

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Client
ORCEM CALIFORNIA INC.

Project
VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 2: CLINKER ONLY
PHASE 1: OUTPUT CAPACITY LESS THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS:
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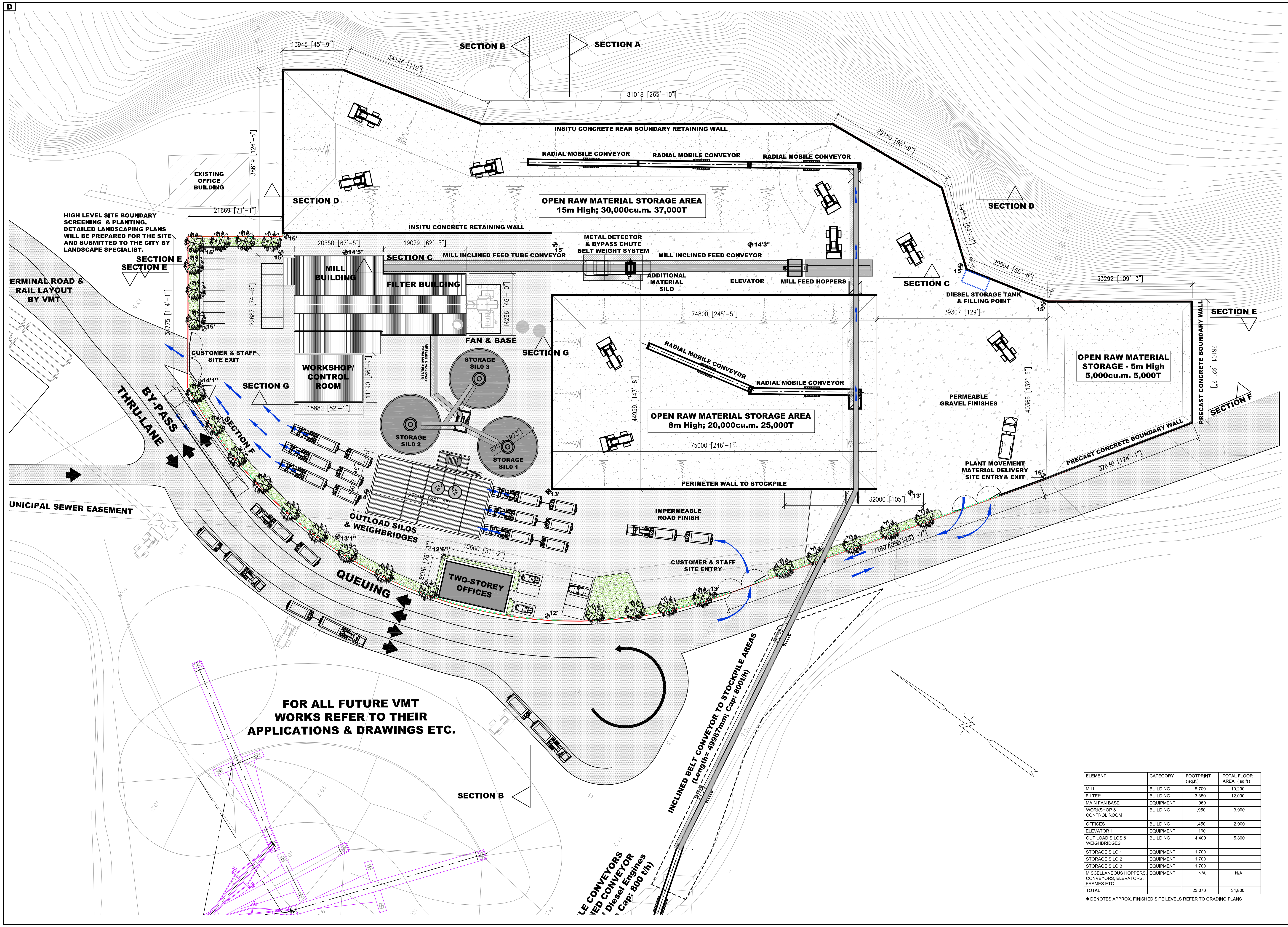
Figure 5.2



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL ROOM	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	4,400	5,800
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
STORAGE SILO 3	EQUIPMENT	1,700	
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		23,070	34,800

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Client
ORCEM CALIFORNIA INC.

Project
VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 1: GBFS ONLY
PHASE 2: OUTPUT CAPACITY MORE THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS:
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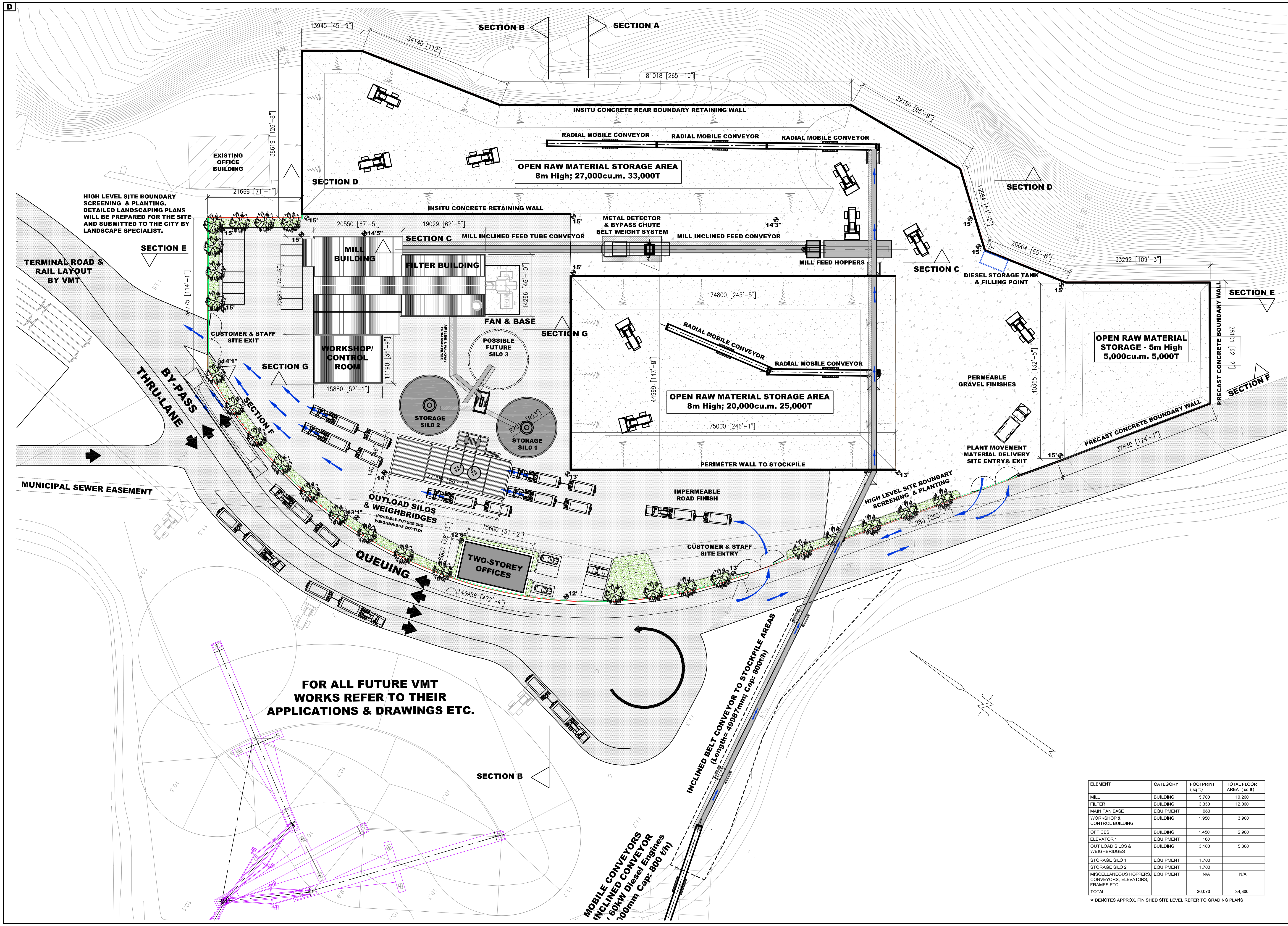
Figure 5.1



ELEMENT	CATEGORY	FOOTPRINT (sq.ft)	TOTAL FLOOR AREA (sq.ft)
MILL	BUILDING	5,700	10,200
FILTER	BUILDING	3,350	12,000
MAIN FAN BASE	EQUIPMENT	960	
WORKSHOP & CONTROL BUILDING	BUILDING	1,950	3,900
OFFICES	BUILDING	1,450	2,900
ELEVATOR 1	EQUIPMENT	160	
OUT LOAD SILOS & WEIGHBRIDGES	BUILDING	3,100	5,300
STORAGE SILO 1	EQUIPMENT	1,700	
STORAGE SILO 2	EQUIPMENT	1,700	
MISCELLANEOUS HOPPERS, CONVEYORS, ELEVATORS, FRAMES ETC.	EQUIPMENT	N/A	N/A
TOTAL		20,070	34,300

⌖ DENOTES APPROX. FINISHED SITE LEVEL REFER TO GRADING PLANS

Rev.	Date	By	Details Of Revision	Chk.	App.
P1	11.05.15	RG	UPDATED PERMIT APPLICATION		

Client: ORCEM CALIFORNIA INC.

Project: VALLEJO SITE, PROPOSED PRODUCTION PLANT FACILITY

MAIN SITE PLAN
OPERATION MODE 1: GBFS ONLY
PHASE 1: OUTPUT CAPACITY LESS THAN 500,000 TONNES PER ANNUM

PROPERTY ADDRESS: VALLEJO MARINE TERMINAL, 780 AND 790 DERR STREET, VALLEJO, CALIFORNIA, Tel: +353 (0)1 449 3244

PROPERTY OWNER: VALLEJO MARINE TERMINAL LLC, 4171 CANYON ROAD, LAFAYETTE, CALIFORNIA 94549, PHONE: 510.261.2400

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File Ref.:

Drawing No.: 5387-M1P1-202 | Rev.: P1

Table 5.4 Source and Quantity of Materials under Alternative Orcem Modes (tons) at Milestone 5.

Orcem Mode Sources	Source of Materials			Raw Material Quantities (MT)					
	Shipping (VMT Dock)	Rail	Road	GBFS	Clinker	Cement	Gypsum	Limestone	Total
GBFS - via VMT Only	GBFS	-	Gypsum	760,000	-	-	22,306	-	782,306
Clinker - via VMT Only	Clinker	-	Gypsum+ Limestone	-	760,000	-	43,084	43,084	846,168
GBFS + Cement	GBFS	Cement	Gypsum	760,000	-	120,000	22,306	-	902,306

Table 5.5 Tonnages of Raw Materials and Finished Products under Each Orcem Mode / Milestone

Orcem Mode	Milestone	Raw materials in (tons)					Finished Product Out (tons)	
		GBFS	Clinker	Cement	Gypsum	Limestone	GGBFS	Cement
1	1	120,000	0	0	3,522	0	109,299	0
	2	240,000	0	0	7,044	0	207,093	0
	3	360,000	0	0	10,566	0	293,381	0
	4	480,000	0	0	14,088	0	368,165	0
	5	760,000	0	0	22,306	0	582,928	0
2	1	0	120,000	0	6,803	6,803	0	133,333
	2	0	240,000	0	13,605	13,605	0	266,667
	3	0	360,000	0	20,408	20,408	0	400,000
	4	0	480,000	0	27,211	27,211	0	533,333
	5	0	760,000	0	43,084	43,084	0	844,444
3	1	120,000	0	60,000	3,522	0	115,052	60,000
	2	240,000	0	80,000	7,044	0	230,103	80,000
	3	360,000	0	100,000	10,566	0	345,155	100,000
	4	480,000	0	120,000	14,088	0	368,165	120,000
	5	760,000	0	120,000	22,306	0	582,928	120,000

5.2.2 Orcem Facility - Ship Unloading

The principal raw materials to be processed in the Orcem facility will be GBFS and Clinker. These materials will arrive by ship at the proposed upgraded dock to be owned and operated by VMT. Two types of ship will be utilized as follows:

Geared Ships	Nominally a 40,000 MTs bulk carrier with on board cranes (geared ship). This ship will berth at the dock and the raw material on board will be discharged from the ship using clamshell grabs fitted to the on board cranes. The clamshell grabs will lift the raw material from the ship holds and deposit it into mobile hoppers located on the dock.
Self-Discharge Ships	Nominally a 70,000 MTs bulk carrier with on board reclaim conveyors and a discharge boom with an integral belt conveyor (self-discharge ship). This ship will berth at the dock and the raw material on board will be discharged from the ship via the self-discharge boom which will swing into the required position and transport the raw material from the ship and deposit it into receiving hopper located on the shore.

The following text describes the raw material transport systems:

Phase 1 (<500,000 tons annually)

- The discharge rate using either geared ships or self-discharge ships will be a maximum of 600 MTs per hour (660 tons / hr) with a 24-hour mean of 303 MTs per hour (334 tons/hr).
- The ship side hoppers will have a capacity of 80 tons. In Phase 1 the mobile hoppers at the dockside will feed onto a common mobile conveyor system. Raw materials (GBFS and clinker) will be loaded onto a continuous, covered belt conveyor system from the shipside all the way to the storage areas (a distance of up to 1,000 feet). This conveyor system will operate at an average rate of 334 tons per hour, and will be located within an easement area across the VMT Site as shown in Figures 5.1, 5.3 and 5.5.
- In the case of GBFS, during Phase 1, the conveyor will discharge the material in the open storage area. This material will then be consolidated into a managed pile (see Figure 5.1).
- In the case of clinker, during Phase 1, the conveyor will discharge the material into the Raw Material Storage Building (see Figure 5.3).

Phase 2 (>500,000 tons annually)

- In Project Phase 2 the mobile hoppers at the dockside will continue to feed onto a common mobile conveyor system. Raw materials (GBFS and clinker) will be loaded onto a continuous, covered belt conveyor system from the shipside all the way to the storage areas (a distance of up to 1,000 feet). This conveyor system will operate at a maximum rate of 660 tons per hour, and will be located within an easement area across the VMT Site (see Figures 5.2, 5.4 and 5.6).
- In the case of GBFS during Phase 2, the conveyor system will discharge the GBFS in the area of the open stockyard floor. This material will then be consolidated into a managed pile (see Figure 5.2).
- In the case of clinker, during Phase 2, the conveyor system will discharge the clinker using an internal conveyor with a belt tripper in the Orcem Project's covered Raw Material Storage Building (see Figure 5.4).

Shipping Emission Factor

The principal raw materials to be processed in the Proposed Project will be GBFS and Clinker as shown in Table 5.5. These materials will be transported to the proposed upgraded dock to be owned and operated by VMT by nominally 40,000 MTs Handymax vessels. The air emissions associated with the transportation of GBFS from the Sea Buoy are outlined below. This emissions endpoint is consistent with the City of Richmond's Chevron Modernization Project EIR, which was prepared with the guidance of the BAAQMD (*City of Richmond, 2014*). The frequency of vessel calls per phase is outlined in Table 5.6:

Table 5.6 Number of Vessel Calls per Orcem Mileston

Orcem Mode 1, 2 & 3 Milestones	Tonnage	Vessel	Calls
1	120,000	40,000 tonne Handymax	3
2	240,000	40,000 tonne Handymax	6
3	360,000	40,000 tonne Handymax	9
4	480,000	40,000 tonne Handymax	12
5	760,000	40,000 tonne Handymax	19

The emission estimation calculation has followed the California Air Resources Board (CARB) "*Emission Estimation Methodology For Ocean-Going Vessels (OGVs)*" (*CARB, 2011)* that was programmed in the ARB OGV Marine Emissions Model.

Air emissions have been quantified for the three distinct operating modes of ocean-going vessels, namely: transit (emissions from vessels operations between ports), maneuvering (slow speed vessel operations while in port areas) and hoteling while moored to a dock. No emissions from any anchorage activities were estimated, as it is speculative to estimate emissions for anchorage for this type of project. In any case, any emissions from anchorage are likely to be small for the following reasons: 1) vessel arrivals are timed to tides to avoid anchorage; 2) berth congestion is a highly unlikely event due to the single berth nature of the facility, and the ability to convey timing to vessels; 3) should vessels go to anchorage, they go into hotelling mode which avoids main engine emissions; and 4) any anchorage locations would be close to shipping route to VMT site, and would not result in additional travel.Air emissions have also been quantified for the two types of engines and a boiler found on OGVs. The main engine is used for propulsion and is used during both transit and maneuvering modes. Auxiliary engines are used for on-board electrical power whilst smaller boilers are present to provide steam heat for fuel heating and hot water. Auxiliary engines are used in all three modes of operations (transit, maneuvering and hoteling) whilst boilers tend to be used only during maneuvering and hoteling (*CARB, 2011)*.

The time in mode and load for propulsion engines was calculated based on the vessel speed and the distance traveled in each mode. The time in mode for the transit mode of the vessel was determined from Sea Buoy (approximately latitude 37.74993 and longitude -122.6928 degrees) about 9.4 nm beyond the Golden Gate Bridge to within 3 km of the facility based on a travel speed of 12 knots and between 3 km and 1.3 km at a travel speed of 7 knots.

The maneuvering mode was determined from 1.3 km from the berth to berthing. The maneuvering time was based on the distance traveled divided by speed plus 15 minutes for docking or undocking. Maneuvering inbound was assumed to occur at 5 knots whilst outbound ships were assumed to maneuver at 7 knots (*CARB, 2011).*

Hoteling was determined by the time spent at berth. Hoteling time was estimated based on the number of hours required for ship unloading to take place plus one hour before and after ship unloading. During hoteling it is assumed the ships auxiliary engine and boiler engines are in operation.

Engine power rates were taken from CARB (2011) for bulk carriers as shown in Table 5.7 with the exception of a boiler power rating of 109kW was conservatively used in the assessment.

Table 5.7 Average Vessel Characteristics (CARB (2011))

Vessel Type	Speed	Main Power	Auxiliary Power	Boiler Power
	(knots)	(kilowatts)		
Bulk	15	7,803	2,459	82

The load factor for the main engine was taken from the CARB (2011) report whilst the load factor for the auxiliary engines were derived from loads outlined in the Port of Los Angeles Emission Inventory 2012 (POLA, 2013).

As outlined in the CARB report (CARB, 2011), the main engine load at cruise speed is 82.5%. Variations in engine load at lower speeds can be determined by the propeller law:

Load Factor = $(\text{Vessel Speed} / \text{Vessel Maximum Speed})^3$

At main engine loads of less than 20%, engine emissions are multiplied by an adjustment factor which accounts for higher engine emission rates at low loads using the low load adjustment factors outlined in Table 5.8.

Table 5.8 Low Load Adjustment Factors (USEPA (2009)

Load (%)	NO_X	HC	CO	PM	SO_2	CO_2
1	11.47	59.28	19.32	19.17	5.99	5.82
2	4.63	21.18	9.68	7.29	3.36	3.28
3	2.92	11.68	6.46	4.33	2.49	2.44
4	2.21	7.71	4.86	3.09	2.05	2.01
5	1.83	5.61	3.89	2.44	1.79	1.76
6	1.60	4.35	3.25	2.04	1.61	1.59
7	1.45	3.52	2.79	1.79	1.49	1.47
8	1.35	2.95	2.45	1.61	1.39	1.38
9	1.27	2.52	2.18	1.48	1.32	1.31
10	1.22	2.20	1.96	1.38	1.26	1.25
11	1.17	1.96	1.79	1.30	1.21	1.21
12	1.14	1.76	1.64	1.24	1.18	1.17
13	1.11	1.60	1.52	1.19	1.14	1.14
14	1.08	1.47	1.41	1.15	1.11	1.11
15	1.06	1.36	1.32	1.11	1.09	1.08
16	1.05	1.26	1.24	1.08	1.07	1.06
17	1.03	1.18	1.17	1.06	1.05	1.04
18	1.02	1.11	1.11	1.04	1.03	1.03
19	1.01	1.05	1.05	1.02	1.01	1.01
20	1.00	1.00	1.00	1.00	1.00	1.00

In relation to auxiliary engines, the load factor is the actual engine power divided by the total installed auxiliary engine power. The load factor associated with bulk carriers is shown in Table 5.9 based on the loads outlined in the Port of Los Angeles Emission Inventory 2012 (POLA, 2013) for bulk carriers:

Table 5.9 Bulk Carrier Auxiliary Engine Load Characteristics (based on loads quoted in POLA, 2013)

Vessel Type	Load Factor (%)		
	Hoteling	Maneuvering	Transit
Bulk	**6.1%**	**27.5%**	**10.4%**

The air emission factors associated with bulk carriers were derived from the CARB OGV Marine Emissions Model for the transit operating mode for each calendar year. For bulk carriers accessing the VMT berth, slow main engine speed and 0.1% S marine distillate were assumed as shown in Table 5.10 for main engines adjusted for maneuvering mode by the factors in Table 5.8 whilst for auxiliary engines a 0.1% S marine distillate was also assumed as shown in Table 5.11 because both the California and Emission Control Area requires that fuel sulfur level. Shown in Table 5.12 is the emission factor for boilers.

Table 5.10 Main Engine Emission Factors – Transit Mode (g/kW-hr)

Year	Engine	ROG	CO	NOx	PM	$PM_{2.5}$	SOx	CO_2
2016	Main	0.684	1.373	16.486	0.250	0.244	0.351	690.0
2017	Main	0.687	1.381	16.594	0.250	0.244	0.350	921.5
2018	Main	0.687	1.380	15.165	0.250	0.244	0.351	589.0
2019	Main	0.687	1.380	14.344	0.250	0.244	0.351	690.0
2020	Main	0.687	1.380	13.748	0.250	0.244	0.351	921.5

Table 5.11 Auxiliary Engine Emission Factors – Transit, Maneuvering & Hoteling (g/kW-hr)

Year	Engine	ROG	CO	NOx	PM	$PM_{2.5}$	SOx	CO_2
2016	Auxiliary	0.520	1.100	12.792	0.250	0.230	0.399	590.5
2017	Auxiliary	0.520	1.100	12.247	0.250	0.230	0.399	690.0
2018	Auxiliary	0.520	1.100	11.634	0.250	0.230	0.399	921.5
2019	Auxiliary	0.520	1.100	10.985	0.250	0.230	0.399	589.0
2020	Auxiliary	0.520	1.100	10.534	0.250	0.230	0.399	690.0

Table 5.12 Auxiliary Boiler Emission Factors (g/kW-hr)

Year	Engine	ROG	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
2016	Auxiliary	0.110	0.200	1.995	0.133	0.130	1.502	921.5
2017	Auxiliary	0.110	0.200	1.995	0.133	0.130	1.502	589.0
2018	Auxiliary	0.110	0.200	1.995	0.133	0.130	1.502	690.0
2019	Auxiliary	0.110	0.200	1.995	0.133	0.130	1.502	921.5
2020	Auxiliary	0.110	0.200	1.995	0.133	0.130	1.502	589.0

The emission methodology was based on the following formula:

$$Emissions_{t,\,om,\,e} = \Sigma\ Pop * EF_{e,\,om,\,f} * Hrs_{om,\,t} * VP_{om,\,t} * \%Load_{om,\,t} * Activity$$

Where:

Pop = Population

HP_{ave} = Maximum rated average horsepower (kW)

LF = load factor, unitless

Activity = Activity or annual operation (hr/yr)

EF = Emission factor (g/kW*hr)

om = operating mode (transit, maneuvering, hoteling)

t = vessel type

f = fuel

e = engine type.

Tug Boat Emissions

Tug boat emissions were calculated using the *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009). The emission methodology was based on the following formula:

$$\text{Emissions} = EF_0 \times F \times (1 + D \times A/DL) \times HP \times LF \times Hr$$

Where:

Emissions	= amount of pollutant emitted during one period;
EF_0	= model year, horsepower and engine use specific zero hour emission factor (new engine);
F	= fuel correction factor which accounts for emission reduction benefits from burning cleaner fuel;
D	= horsepower and pollutant specific engine deterioration factor;
A	= the age of the engine when the emissions are estimated;
UL	= the vessel type and engine use specific engine useful life;
HP	= rated horsepower of the engine;
LF	= vessel type and engine use specific engine load factor;
Hr	= number of annual operating hours of the engine.

It was assumed that two tug boats were required both inward and outward to escort the Handymax bulk carrier to the port.

Tug Boat - Main Engines

In relation to the main engines likely to be used for the tugs escorting the Handymax bulk carrier (40,000 MTs) into port, the following assumptions were made:

- 2172 hp was assumed as the rated horsepower of the main engine(s). This is approximately the average size of tug boats in California waters.
- The emission factors for tugs was estimated from the California Harbor Craft Emissions Inventory Database model as follows in Table 5.13 for the fleet average Bay Area harbor craft:

Table 5.13 Main Engine (ME) & Auxiliary Engine (AE) Emission Factors – Tug Boat (g/hp-hr)

Calendar Year	Harbor Craft	Engine	ROG	CO	NOx	PM	SOx	CO_2
2016	Tug Boats	ME	0.59	3.74	5.99	0.22	0.0060	587.2
2016	Tug Boats	AE	0.86	4.11	5.69	0.24	0.0060	587.2
2017	Tug Boats	ME	0.58	3.95	5.58	0.19	0.0060	587.2
2017	Tug Boats	AE	0.85	4.19	5.32	0.21	0.0060	587.2
2018	Tug Boats	ME	0.59	4.01	5.54	0.19	0.0060	587.2
2018	Tug Boats	AE	0.86	4.21	5.31	0.20	0.0060	587.2
2019	Tug Boats	ME	0.59	4.06	5.54	0.19	0.0060	587.2
2019	Tug Boats	AE	0.87	4.24	5.33	0.21	0.0060	587.2
2020	Tug Boats	ME	0.59	4.24	5.20	0.16	0.0060	587.2
2020	Tug Boats	AE	0.87	4.24	5.29	0.20	0.0060	587.2

The engine load of the tug boat is assumed to be 0.31 for the propulsion engine.

Tug Boat - Auxiliary Engine

In relation to the auxiliary engine likely to be used for the tugs escorting the Handymax bulk carrier (40,000 mtonnes) into port, the following assumptions were made:

- 128 hp was assumed as the rated horsepower of the auxiliary engine.
- The emission factors for tug auxiliary engine was provided in Table 5.13:
- The engine load of the tug boat is assumed to be 0.43 for the auxiliary engine.

Thus, for NOX:

Auxiliary Engine Emissions = EF_0 x F x (1 + D x A/DL) x HP x LF x Hr

NO_X Emissions = (EF g/hp-hr) x 128hp x 0.43 x 38hrs

Auxiliary Engine NO_X Emissions = 0.153 g/sec

Tugs air emissions were modelled as a series of volume sources. In order to determine appropriate release heights and initial vertical dimensions for modelling air emissions from the tugs, SCREEN3 was used to determine the plume height for both D stability (representing daytime 06:00 – 18:00) and F stability (representing night-time 18:00 – 06:00). The procedure was similar to the approach adopted for the *CARB Roseville Rail Yard Study (CARB, 2004)* to determine plume heights associated with locomotive emissions. In the calculation, the wind speed used in SCREEN3 was equal to the tug's velocity in line with the *CARB (2004)* approach. The calculated plume rise is presented in Appendix AQ-MODEL.

Emission rates for GHGs were taken from the *Port of Los Angeles Emission Inventory 2012* (POLA, 2013). Detailed emission calculations for each pollutant and mode / milestone are outlined in Appendix AQ-EMITS.

5.2.3 Orcem Facility - Material Unloading and Handling

The raw material transport system for unloading material from the dockside to storing in the raw material storage area is outlined below:

The mobile hoppers at the dockside will feed onto a common mobile conveyor system. A continuous, covered belt conveyor system will transport material from the shipside hopper to the internal and external storage areas (depending on Mode) on-site.

In the case of GBFS material, the conveyor system will discharge the GBFS in the area of the open stockyard floor (see Figures 5.1 and 5.2).

In the case of clinker material, the conveyor system will discharge the clinker using an internal conveyor with a belt tipper in the Orcem facility's covered storage building (see Figures 5.3 and 5.4).

GBFS (and other raw materials except for clinker) will be stored in open stockpiles for management in the designated storage areas. As the material is naturally coarse and moist (with between 6% and 12% moisture content on delivery), fugitive dust emissions will be suppressed. When stored in a pile over a prolonged period of time the material has a tendency to harden on the surface through agglomeration to form a crust which seals the stockpile. However on reclaim, this material may be less moist and in these circumstances a stockpile water spray system will be in place to prevent fugitive dust emissions.

The GBFS stockpile will be different during Phase 1 and Phase 2, described as follows:

Phase 1 GBFS Stockpile Management

The GBFS would be transported from the ship to the stockpile by a series of covered belt conveyors. The conveyor would discharge the GBFS in the designated stockpile areas and the material would be distributed with mobile stacker conveyors to form a stockpile of a maximum height of 40 feet. The stockpile was modeled at a lower release height, to represent the sloped face of the pile. A front-end loader would move and lift this material as necessary. GBFS would be excavated using the same front-end loader, and placed into the reclaim hopper for transport to the processing plant.

Phase 2 GBFS Stockpile Management

During Phase 2 the GBFS will continue to be transported to the stockpile by a series of covered belt conveyors. The final belt conveyor (modified in Phase 2) will be supported on gantries at a level of 60 feet above ground level. A belt tripper car will travel along the main convey line and at sequential positions will discharge the GBFS in the designated stockpile area to form a linear chevron stockpile with a maximum height of 48 feet. Reclaim from this stockpile will be by excavating from the face of the stockpile using a front end loader and excavator, and placing the GBFS into the reclaim hopper for transport to the processing plant.

Storage Area for Clinker

Clinker will be stored in the designated enclosed storage building. As this material is naturally dry and hygroscopic, there is a need to enclose this stockpile to prevent rainfall and atmospheric moisture damaging the product. The clinker stockpile will be managed as follows:

Phase 1 Clinker Stockpile Management

During Phase 1 the clinker will be transported to the stockpile area by a series of covered conveyors. The conveyors will dump the clinker in the designated receiving hopper at the southerly end of the Open Material Storage Area, from which point front loaders will place the material to a height of approximately 27 feet (8 meters). Reclaim from this stockpile will be by excavating from the face of the stockpile using front end loaders and placing the clinker into the reclaim hopper of the conveyor feed to the processing plant.

Phase 2 Clinker Stockpile Management

During Phase 2 the clinker will continue to be transported to the stockpile area by covered belt conveyor from the dockside. A bucket elevator will lift and discharge the clinker on to a horizontal belt conveyor which will run the length of the covered Raw Material Storage Building. The horizontal belt conveyor will be fitted with a travelling tripper which will allow the clinker to be discharged at sequential positions along the storage building floor to form a chevron stockpile with a maximum height of approximately 50 feet. The Raw Material Storage Building will be equipped with an air filtration system which will ensure that any particulate emissions created by either the stockpiling or reclaim process will be captured in the filters, and fugitive particulate emissions will be maintained within agreed permit limits, thereby allowing only clean air to leave the building.

Fugitive dust emissions will occur at each external storage area, upload point, transfer point and drop point as the raw material is moved from the ship to the raw material storage area and thereafter transferred to the Mill for processing. A range of mitigation measures will be put in place to minimize these emissions including frequent watering, aspirated hoppers, bag filtration and 3-sided enclosures as outlined in Table 5.14. Detailed emission calculations based on AP-42 and similar emission calculations associated with material handling are outlined in Appendix AQ-EMITS.

Table 5.14 Proposed Operational Mitigation Measures For Orcem

Potential Source of Emissions to Air	Project Design Features to Reduce Emissions	Basis
Handymax Ship	0.1% Sulphur Marine Fuel Within 24nm of California coast for the main, auxiliary and boiler engines	Regulatory Requirement
Grab Crane on ship transfers GBFS to Mobile Hopper	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Hopper drop to conveyor	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Conveyor drop to conveyor	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Conveyor drop to mound in GBFS storage area	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Front loader excavation of stockpile	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Loading of hopper by front loader	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD, 2007)	Mitigation
Raw Material Storage Piles	Frequent watering of storage pile & 3-Sided Enclosure for 2 of the 3 stockpiling areas giving a control effectiveness of 90 - 97.5% (SCAQMD, 2007), AP42)	Mitigation
Orcem Main Emission Point (P-1)	The main emission point will have emissions of NO_X, CO and PM_{10} / $PM_{2.5}$ which are in accordance with BACT for the category of manufacturing.	Regulatory Requirement
Front Loader & Excavator	Dust suppression using $MgCl_2$ (magnesium chloride), frequent watering (3-times daily) & 15 mph speed limit giving a combined control effectiveness of 96.8%[Note 2] Excavator diesel engines on-site will be post 2013 whilst front loaders will be operated on CNG / propane.	Regulatory Requirement
Industrial Paved Rd (Finished Product)	Watering 3 times daily giving a control effectiveness of 80% (SCAQMD, 2007)	Mitigation
Processing plant and material storage buildings	All air in contact with raw material or finished product, such as air from storage buildings, silos, elevators, is treated by bag filters or other types of filter prior to discharge to the atmosphere, with a not to exceed limit value of 2.5 mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Truck filling with finished product	Filling takes place in an enclosed area, isolated from the external environment with air discharged through bag filter to atmosphere, with a not to exceed limit of 2.5 mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Railcar Filling	Filling takes place in an enclosed area, isolated from the external environment with air discharged through bag filter to atmosphere, with a not to exceed limit of 2.5mg/Nm^3 [Note 1] (0.0011 grains/dscf) $PM_{2.5}$.	Project design feature
Railcar movement	Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) will be used for both switching and line haul. Reduction of 80-90% in PM_{10} compared to Tier II EPA emission rates.	Regulatory requirement

Note 1 Normalised to 298K & 101.325kPa.
Note 2 Western Governors' Association (WRAP, 2006) Fugitive Dust Handbook indicates 84% control efficiency for $MgCl_2$. The Alaska Cooperative Transportation and Public Facilities Research Program (Control of Dust Emissions from Unpaved Roads, 1992) reports up to 80% control for 15mph speed limitation. This results in a cumulative control of 96.8%.

5.2.4 Orcem Facility - Front Loader & Excavator Offroad Diesel Engines

Up to two biodiesel (B-20) powered front wheeled loader with a bucket capacity of approximately $16yd^3$ will be in operation. The loaders will transfer raw material from the external and internal (depending on Mode) raw material storage areas to the mill feed hopper.

In addition, one diesel powered excavator will be in operation. The excavator will manage and transfer raw material from the external and internal (depending on Mode) raw material storage areas to the front wheeled loader. The exhaust and fugitive emissions associated with their operations is outlined below.

The methodology for estimating PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2 and NO_X emissions from each type of off-road equipment (front loader, excavator) is based on the following equation:

Emissions = Pop * HP_{ave} * LF * Activity * (EF_{zh} +dr * CHrs) x FCF x B20

Where:

Pop	=	Population
HPave	=	Maximum rated average horsepower (hp)
LF	=	load factor, unitless
Activity	=	Activity or annual operation (hr/yr)
EFzh	=	Zero-hour Emission factor (g/hp*hr)
dr	=	deterioration rate as equipment is used (gr/bhp-hr2)
CHrs	=	cumulative hours accumulated on the equipment
FCF	=	fuel control factor (% reduction) to allow for use of California diesel fuel
B20	=	Biodiesel, B20, emission reduction factor

The Off-Road Emission Factors for Off-road Sources were based on CHE and OFFROAD2011 and based on an equipment model year of 2015. All front loaders and excavators used on-site by Orcem will be used Tier 4 engines and no older than model year 2015. Appendix AQ-EMITS details the emission calculations associated with both the exhaust and fugitive emissions associated with both the front loaders and excavators.

Recent alternative diesel regulations will require biodiesel blends to be NOx neutral, and ARB[13] provided estimates for biodiesel effects on direct particulate emissions as shown in Table 5.15 regardless of the feedstock (low or high saturation levels) used to produce the biodiesel.

Table 5.15 ARB Reported Relative Effect using Emission Sums

Blend Level	PM
B5	-6%
B10	-10%

[13] http://www.arb.ca.gov/fuels/diesel/altdiesel/20141017_ADF_workshop_proposal.pdf

B20	-18%

While ARB published the reduction of PM by using biodiesel, no such reduction was published for HC and CO. However, an extrapolation method was conducted using the literature for HC and CO emissions. Investigating the latest summary data provided by ARB[14] afforded an estimate of the impact of biodiesel use on HC and CO emissions. Hydrocarbons (HC) are considered to be a surrogate for ROG emissions effects. ARB indicated that this data was appropriate for evaluating biodiesel blend impacts, but only included B5 (5%) and B10 (10%) from soy and animal feedstocks used to represent low and high saturated biodiesel.

There were two ways to estimate average emissions impacts: (1) averaging the tests (combination of vehicle and test cycle) and averaging the average impact, and (2) summing emissions for all tests and comparing the overall impact. The average of average impacts weights each test equally, while comparing emission sums weights higher emitting engines and test cycles results more. The results for the two methods are shown in Tables 5.16 and 5.17. Because emissions sums comparisons are conducted without separate samples, it is difficult to determine uncertainty.

Table 5.16 Relative HC and CO Impact of Biodiesel using Average of Average Emissions Relative Change (Significant at the 90% confidence level in Blue Shade)

Blend Level	Feedstock	Tests	HC	CO	PM
B5	Soy	12	2.0%	-1.7%	-7.4%
B10	Soy	6	-4.1%	-2.2%	-9.3%
B5	Animal	10	-0.7%	-4.3%	-7.4%
B10	Animal	6	-3.0%	-6.7%	-9.4%

Table 5.17 Relative HC and CO Impact of Biodiesel using Emission Sums

Blend Level	Feedstock	HC	CO	PM
B5	Soy	-0.3%	0.2%	-2.8%
B10	Soy	-2.8%	-1.6%	-7.7%
B5	Animal	-1.7%	-3.6%	-5.0%
B10	Animal	-1.4%	-6.7%	-10.0%

Overall, the emission impacts were comparable for Table 2 and Table 3 results. The PM impacts that we calculated using the two methods together were similar to the -6% for B5 and -10% for B10 that ARB reported providing confidence that this dataset is valid to use for estimating the impact of biodiesel use on HC and CO emissions.

The emission impacts for B5 were much less certain and more variable because the best estimate of the emission change is lower. Given that impact of biodiesel found for both NOx and PM are nearly proportional to amount of biodiesel, we will assume that B20 impact will be twice the effect estimated for 10% biodiesel (B10). The B10 results for HC and CO shown in Tables 2 and 3 indicate that HC impact was not largely dependent upon the feedstock while CO appeared to show such a difference. The average HC impact was -2.8% HC with B10. The CO impact for soy B10 was -1.9%, and -6.7% for animal B10. Applying a 56/44 soy/animal market share typical to how the California market is expected to supply fuel, an estimated a -4.0% average CO impact for B10. Using the B10 and a linear extrapolation for B5 and B20 emission impacts, the estimated impacts for B5 and B20 are shown in Table 5.18

Table 5.18 Relative HC, CO, and PM Impact of Biodiesel

Blend Level	HC	CO	PM
B5	-1.4%	-2.0%	-6%

[14] http://www.arb.ca.gov/fuels/diesel/altdiesel/biodocs.htm

B10	-2.8%	-4.0%	-10%
B20	-5.6%	-8.0%	-18%

5.2.5 Orcem Facility - Process Building Operations & Associated Emissions

The raw materials will be reclaimed as described above from the stockpile areas and will be placed into a reclaim hopper of 2,000 ft^3 capacity at ground level in the storage area. From this point the clinker or GBFS will be conveyed by covered belt conveyor to a bucket elevator which will discharge the material into a mill feed hopper of 5,000 ft^3. Alongside this mill feed hopper will be a smaller mill feed hopper of 1,500 ft^3, which will contain limestone and/or gypsum and other raw materials.

The clinker or GBFS will discharge from these mill feed hoppers via weigh belts which will regulate the flow of clinker or GBFS and gypsum/limestone (and other raw materials) onto the inclined covered belt conveyor to the processing plant, and ensure that this conveyor feeding the processing plant receives the desired total feed rate of material for processing in the mill, typically between 70 and 100 tons per hour.

The Processing Plant

The processing plant will consist primarily of a milling process (using a Vertical Roller Mill, or "VRM", with an internal particle size classifier), a drying process (a supplemental hot air generator to facilitate drying of moist raw materials as required), and product collection process (a main bag filter unit to capture the finished product). All of this equipment will be contained within the Mill & Filter Buildings.

Milling Process

The proposed Orcem Project will use an electric powered VRM, as depicted in Figure 5.7 below. Raw material is fed to the VRM via an airlock and onto the center of a rotating grinding table. The raw material is thrown outward and under heavy steel rollers riding over the table by centrifugal force. A dam ring on the periphery of the grinding table contains the material and helps form it into a layer or "bed". The steel rollers are coupled to high pressure hydraulic arms to forcefully pull the rollers onto the grinding table to grind the bed of raw material to fine powder.

The milling process requires high flow of air (approximately 4,400,000 ft^3/hr) to pass through the mill. As a result, the material within the mill is subject to a high velocity airflow, which passes up, around and over the grinding table. The airflow's primary function is to lift ground material particles from the table and convey them into an internal particle size classifier, aka a high efficiency separator. This internal high efficiency separator classifies the incoming particles into two streams: (a) one stream of particles sufficiently small to meet the finished product specification passes through the separator with the air flow and leaves the mill; and (b) another stream of oversize particles, which is diverted back down to the grinding table for additional processing.

Drying Process

The GBFS will enter the mill with a moisture content of between 6% and 12%, but to properly store and transport the finished GGBFS product the material must be dried to a moisture content of less than 0.2% water (H_2O).

Fortunately, the high volume of air required for the milling process of the VRM is also very effective at simultaneously drying the material being processed; however, when processing materials with especially high moisture content, such as GBFS, additional heat is often required to complete the drying process. In this project the additional heat will be supplied by a natural gas fired hot air generator which will preheat the air coming into the VRM to a temperature sufficient to evaporate the excess GBFS moisture during milling.

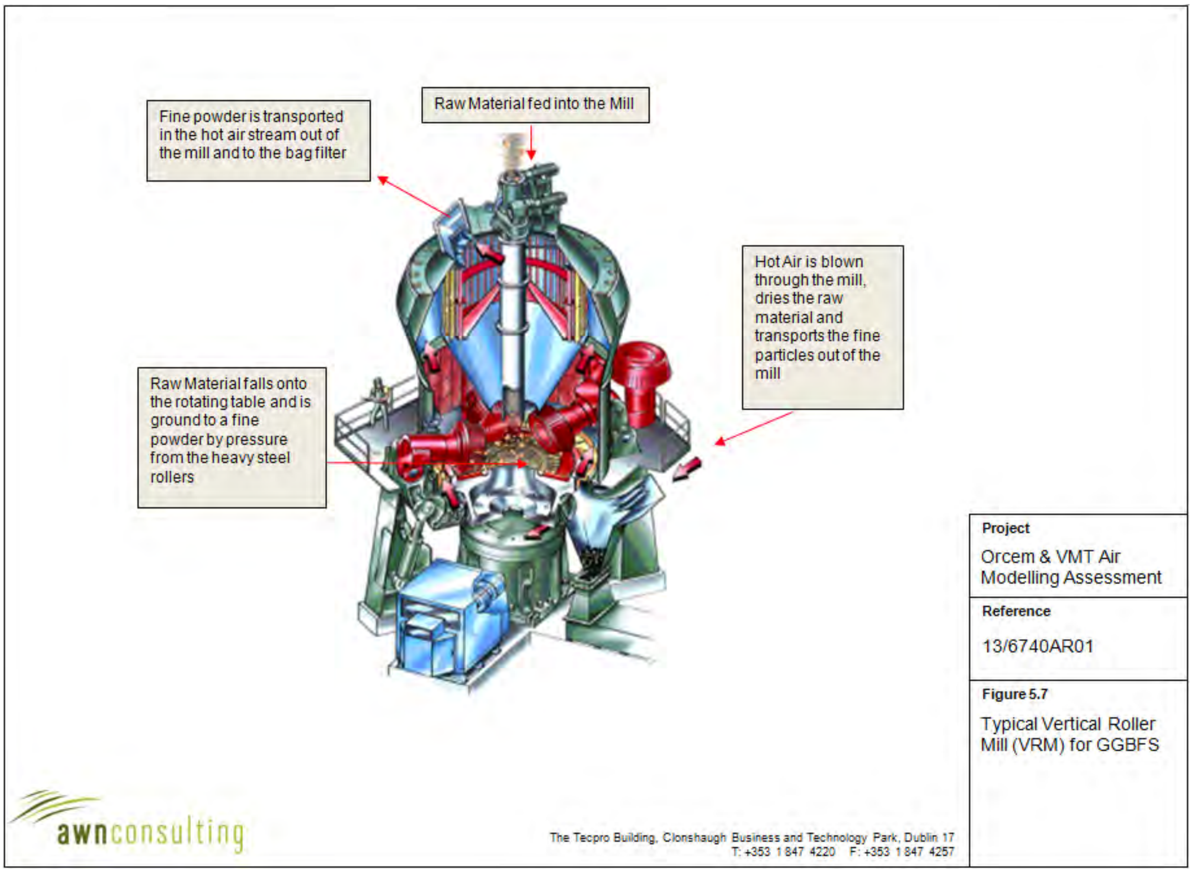

Figure 5.7

Typical Vertical Roller Mill (VRM) for GGBFS.

Product Collection Process

The process air pulled through the mill and internal separator exits the mill with the particles sufficiently small to meet the finished product specification entrained. This combined air and finished product stream then enters the main bag filter unit where the finished product is collected on the surfaces of fabric filters and the clean moist air is drawn through the filter unit by an induced draft fan, commonly called the main mill fan.

The outlet of the main mill fan leads to a vertical vent stack where the air leaves the processing plant along with any moisture evaporated from the raw materials. The finished product collected in the main bag filter is transported by an enclosed air-slide conveyor to a bucket elevator which lifts the product and discharges it to the product Storage Silos.

Controlled Storage of Finished Product

The finished product will be stored in three (3) large sealed finished product Storage Silos, each with a capacity of up to 4,000 tons. These Storage Silos will hold the various finished products prior to transport to the Loading Silos. Each silo will be up to 46 feet in diameter and approximately 140 feet in height.

Finished Product out - Loading System

The bottoms of the large finished product Storage Silos are aerated to fluidize (the process of converting granular material from a static solid-like state to a dynamic fluid-like state) the finished product powder for discharge. When the finished product is withdrawn from the Storage Silos it is transported in enclosed conveyor systems into smaller Loading Silos of approximately 80 ton capacity each for loading of tanker trucks and rail tankers (via tanker truck transfer).

There will be two (2) Loading Silos configured at the Outload Building for loading of tanker trucks. Each Loading Silo will have its own below-ground weighbridges to monitor truck weight as they are loaded. The road transport vehicles will be tractor trailer configurations, with standard tractors and single or double pneumatic dry bulk tank trailers. The tank trailers are sealed and have loading hatches on top. In order to load the trailers with product, the hatches will be opened, and loading bellows will descend and their nozzle(s) will seal onto the tanks to be loaded. A computer controlled filling system will be activated and the tankers will be loaded to the desired level by the control system monitoring the weighbridge. After the loading process is complete, a bill of lading will be printed for the driver to document that all tanker trucks leave the plant with the prescribed load on board.

Rail tanker cars will be served from the filling facility via tanker truck transfer using the upgraded and realigned California Northern rail spur line which currently extends into the adjoining VMT Site, running parallel to Orcem's westerly boundary. Rail tanker cars will be loaded at a location just north of the Orcem Site boundary.

The Orcem main processing plant will have the following principal components which are of significance with respect to air emissions:

- A 36 Million British Thermal Units per hour (MMBTU/hr (10.8MW) natural gas fired drier (called the Hot Gas Generator), which will produce hot air for drying incoming GBFS, this hot air stream is then directed to:
- A Main Bag Filtration System, through which natural gas combustion emissions and hot air from the Vertical Roller Mill discharge.
- Smaller bag filtration systems on hoppers, silos and the clinker store.

The emissions from the Hot Gas Generator and Main Bag Filter will exit the facility via emission point P-1 (Main Stack). The exit point of the stack will be at a height of 50m above ground level. As this is considerably lower than the Good Engineering Practice stack height of 100m, building downwash will be a consideration. BPIP-PRIME was used to generate the wind-direction specific building dimensions for input into AERMOD.

It has been determined that BACT applies to the Hot Gas Generator as NO_x emissions will exceed 10 pounds per day (under BAAQMD Rule 2-2-301 BACT applies if this threshold is exceeded) as outlined in Table 5.19. Detailed air emission calculations associated with the Main Emission Point (P-1) and smaller bag filter emission points are outlined in Appendix AQ-EMITS.

Table 5.19 Orcem P-1 Main Stack Process Emission Details

Orcem P-1 (Main Stack) Normalized To 298K	Conc. (ppm)	Conc. (mg/ Nm^3)	Duct Diameter (m)	surface area (m^2)	stack temp (K)	Velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m^3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emissions		
												lb/ hr	lb/ day	tons/ yr
NO_X (as NO_2)	30.0	44.0	2.00	3.142	381.05	1.71	1.34	15174	0.67	667	0.185	1.47	35.3	5.59
SO_2	1.06	2.78	2.00	3.142	381.05	1.71	1.34	15174	0	42	0.012	0.0928	2.23	0.35
CO	153.5	175.84	2.00	3.142	381.05	1.71	1.34	15174	2.67	2668	0.741	5.88	141.2	22.36
PM_{10}	N/A	15.91	2.00	3.142	381.05	1.71	1.34	15174	0.24	241	0.067	0.53	12.8	2.02
$PM_{2.5}$	N/A	14.32	2.00	3.142	381.05	1.71	1.34	15174	0.22	217	0.060	0.48	11.5	2.02
TOC (as C)	46.9	23.03	2.00	3.142	381.05	1.71	1.34	15174	0.35	349	0.097	0.77	18.5	2.93
CO_2	66,957	120,523	2.00	3.142	381.05	1.71	1.34	15174	1829	1828880	508	4032	96767	15322
CH_4	7.33	4.81	2.00	3.142	381.05	1.71	1.34	15174	0.07	73	0.020	0.16	3.87	0.61
N_2O	0.75	1.34	2.00	3.142	381.05	1.71	1.34	15174	0.02	20	0.006	0.045	1.08	0.17

5.2.6 Orcem Facility - Truck Movements on Local Road Network

During the operational phase of the Orcem facility there will be additional heavy truck movements to and from the site using the local road network. The truck movements will be a combination of bulk material import (as outlined in Table 5.20) and also the export of finished product from the facility (as outlined in Table 5.21). The number of truck movements serving the site therefore depends on the mode and phase of operation.

Table 5.20 Details of raw materials to be imported via road to Orcem

Orcem Mode / Milestone	Gypsum (MT/yr)	Limestone (MT/yr)	Annual trucks (Based on 25 ton (22.7 MT) per truck)
1.1	3,522		155
1.2	7,044		310
1.3	10,566		465
1.4	14,088		620
1.5	22,306		981
2.1	6,803	6,803	598
2.2	13,605	13,605	1198
2.3	20,408	20,408	1796
2.4	27,211	27,211	2392
2.5	43,084	43,084	3792
3.1	3,522		155
3.2	7,044		310
3.3	10,566		465
3.4	14,088		620
3.5	22,306		981

Table 5.21 Details of finished product to be exported via road from Orcem.

Orcem Mode / Milestone	GGBFS (MT/yr)	Cement (MT/yr)	Annual One-Way Truck Movements (Based on 25 US ton (22.67 MT) per truck)
1.1	109,299		4,819
1.2	207,093		9,131
1.3	293,381		12,936
1.4	368,165		16,233
1.5	582,928		25,702
2.1		133,333	5,879
2.2		266,667	11,758
2.3		400,000	17,637
2.4		533,333	23,516
2.5		844,444	37,233
3.1	115,052	60,000	7,718
3.2	230,103	80,000	13,673
3.3	345,155	100,000	19,628
3.4	368,165	120,000	21,524
3.5	582,928	120,000	30,994

Table 5.22 below lists the average hourly and daily one-way truck movements to the site during each operational day for each mode of operation as follows:

1. GGBFS production only;
2. Cement Production only;
3. Both GGBFS & Cement Production together but in independent production runs.

The traffic volumes listed in Table 5.22 are to be considered as worst-case as they assume that bulk deliveries by road occur simultaneously to the export of finished product. However, bulk deliveries to the site will be much less frequent over the course of a full year's production than that presented below in Table 5.22. In addition, as outlined in Table 5.23, annual mean traffic numbers (averaged over 8,760 hours) are significantly lower than the maximum day figure.

Table 5.22 Details of peak hourly and daily one-way truck movements on public roads accessing the Orcem site.

Time Of Day	% Distribution	Orcem Mode / Milestone		
	Truck Movements	Mode 1 Milestone 5	Mode 2 Milestone 5	Mode 3 Milestone 5
		One – Way Truck Movements On Public Road		
0:00 to 1:00	0.03	4.1	6.2	4.9
1:00 to 2:00	0.04	5.4	8.3	6.5
2:00 to 3:00	0.06	8.1	12.5	9.7
3:00 to 4:00	0.07	9.5	14.6	11.3
4:00 to 5:00	0.08	10.8	16.6	13.0
5:00 to 6:00	0.08	10.8	16.6	13.0
6:00 to 7:00	0.08	10.8	16.6	13.0
7:00 to 8:00	0.08	10.8	16.6	13.0
8:00 to 9:00	0.08	10.8	16.6	13.0
9:00 to 10:00	0.08	10.8	16.6	13.0
10:00 to 11:00	0.08	10.8	16.6	13.0
11:00 to 12:00	0.08	10.8	16.6	13.0
12:00 to 13:00	0.07	9.5	14.6	11.3
13:00 to14:00	0.03	4.1	6.2	4.9
14:00 to 15:00	0.03	4.1	6.2	4.9
15:00 to 16:00		0.0	0.0	0.0
16:00 to 17:00		0.0	0.0	0.0
17:00 to 18:00		0.0	0.0	0.0
18:00 to 19:00		0.0	0.0	0.0
19:00 to 20:00		0.0	0.0	0.0
20:00 to 21:00		0.0	0.0	0.0
21:00 to 22:00		0.0	0.0	0.0
22:00 to 23:00	0.01	1.4	2.1	1.6
23:00 to 00:00	0.02	2.7	4.2	3.2
Total		135.3	207.6	162.2
Note 1 Includes two third-party deliveries at 10:00 and two third-party deliveries at 14:00				

Table 5.23 Details of daily and annual one-way truck movements on public roads accessing the Orcem site.

Orcem Mode / Milestone	Annual trucks (Based on 25 US ton trucks)	One-Way Truck Movements / Hr	One-way Truck Movements / Operational Day
1.1	4,964	0.57	13.6
1.2	9,422	1.08	25.8
1.3	13,374	1.53	36.6
1.4	16,819	1.92	46.1
1.5	26,630	3.04	73.0
2.1	6,465	0.74	17.7
2.2	12,931	1.48	35.4
2.3	19,396	2.21	53.1
2.4	25,859	2.95	70.8
2.5	40,948	4.67	112.2
3.1	7,857	0.90	21.5
3.2	13,955	1.59	38.2
3.3	20,052	2.29	54.9
3.4	22,099	2.52	60.5
3.5	31,910	3.64	87.4

The haul route to and from the site will be via Lemon Street to the junction with Sonoma Boulevard at which point the traffic will either:

- Route 1 – Turn south onto Sonoma Boulevard and continue towards the I-80;
- Route 2 – Turn north onto Sonoma Boulevard, or;
- Route 3 – Continue onto Lemon Street east of Sonoma Boulevard to the Curtola Parkway.

The distribution of traffic to each of these routes has been provided by the project team as follows:

- Route 1 – 39%;
- Route 2 – 5%; and
- Route 3 – 56%.

Thus, for the maximum day, the breakdown of traffic along each of the three routes is presented in Table 5.24 based on these distributions.

Table 5.24 Details of peak hourly and daily one-way truck movements on public roads accessing the Orcem site.

Time Of Day	% Distribution	Orcem Mode / Milestone			Orcem Mode / Milestone			Orcem Mode / Milestone		
	Truck Movements	Mode 1 Milestone 5	Mode 2 Milestone 5	Mode 3 Milestone 5	Mode 1 Milestone 5	Mode 2 Milestone 5	Mode 3 Milestone 5	Mode 1 Milestone 5	Mode 2 Milestone 5	Mode 3 Milestone 5
		One – Way South onto Sonoma Boulevard Road			One – Way North onto Sonoma Boulevard Road			One – Way Lemon Street east of Sonoma Boulevard Road		
0:00 to 1:00	0.03	1.6	2.4	1.9	0.2	0.3	0.2	2.3	3.5	2.7
1:00 to 2:00	0.04	2.1	3.2	2.5	0.3	0.4	0.3	3.0	4.7	3.6
2:00 to 3:00	0.06	3.2	4.9	3.8	0.4	0.6	0.5	4.5	7.0	5.4
3:00 to 4:00	0.07	3.7	5.7	4.4	0.5	0.7	0.6	5.3	8.2	6.4
4:00 to 5:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
5:00 to 6:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
6:00 to 7:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
7:00 to 8:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
8:00 to 9:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
9:00 to 10:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
10:00 to 11:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
11:00 to 12:00	0.08	4.2	6.5	5.1	0.5	0.8	0.6	6.1	9.3	7.3
12:00 to 13:00	0.07	3.7	5.7	4.4	0.5	0.7	0.6	5.3	8.2	6.4
13:00 to14:00	0.03	1.6	2.4	1.9	0.2	0.3	0.2	2.3	3.5	2.7
14:00 to 15:00	0.03	1.6	2.4	1.9	0.2	0.3	0.2	2.3	3.5	2.7
15:00 to 16:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16:00 to 17:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17:00 to 18:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18:00 to 19:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19:00 to 20:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20:00 to 21:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21:00 to 22:00		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22:00 to 23:00	0.01	0.5	0.8	0.6	0.1	0.1	0.1	0.8	1.2	0.9
23:00 to 00:00	0.02	1.1	1.6	1.3	0.1	0.2	0.2	1.5	2.3	1.8
Total		52.8	81.1	63.2	6.8	10.4	8.1	75.8	116.5	90.8

The air emissions associated with the movement of road haulage trucks both on-site and on public roads was calculated using the EMFAC2014 emission model (*CARB, 2014)*[15]). The model includes the latest data on California's car and truck fleet and travel activity. The model also reflects the emission benefits of CARB's recent rulemaking including on-road diesel fleet rules, Pavley Clean Car Standards and the Low Carbon Fuel Standard. The haul truck fleet was assumed to meet the drayage truck rule where all trucks must use engines meeting or exceeding the 2007 engine emission standards, which includes trucks with model year 2008 or later. CARB also requires that by 2023, all engines be 2010 or newer. The average emissions for trucks with 2008 to the calendar year model years were used to estimate the haul truck emission rates, up to 13 model years.

Emissions of PM_{10}, $PM_{2.5}$, NO_X, CO, SO_2 and CO_2 were calculated based on the number of vehicle trips per hour, the distance travelled on each specific link (each link is classified as a trip segment with a uniform traffic speed) of the trip and the link-specific emission factor. The emission factor for each link was a function of the average vehicle speed and the % of time in idling mode. Details of the modeled trip segments are outlined in Table 5.25.

Table 5.25 Details of trip movements on onsite and public roads accessing the Orcem and VMT sites.

Trip Starting Point	Trip End Point	One-Way Trip Length (miles)	Average Speed (mph)
Entrance To Orcem Facility	Exit From Orcem Facility	0.469	10
Entrance To VMT Facility	Exit From VMT Facility	0.451	10
Exit From VMT / Orcem Facilities	Junction of Lemon St / Sonoma Boulevard	0.447	20
Junction of Lemon St / Sonoma Boulevard	Lemon St North approaching Curtola Parkway	0.510	20
Junction of Lemon St / Sonoma Boulevard	Junction of Sonoma Boulevard South / Magazine Street	0.457	40
Junction of Lemon St / Sonoma Boulevard	Sonoma Boulevard North	0.326	40
Junction of Sonoma Boulevard South / Magazine Street	Sonoma Boulevard South Approaching I-80	0.434	40

Truck Movements Accessing the Detailed emission calculations based on EMFAC2014 both on-site and on the nearby public roads is presented in Appendix AQ-EMITS.

5.2.7 Orcem Facility – Rail Operations

The existing California Northern Railroad short line currently extends into the VMT Site, running parallel to Orcem's westerly boundary which serves Vallejo and the North Bay, and connects to the Union Pacific Railroad. It is proposed that as part of this development the line be upgraded with capacity for the storage of railcars and loading/unloading of materials. Rail tanker cars will be loaded at a location immediately north of the Orcem Site, along the westerly side of the main access road. Trucks will transfer materials to the railcars from the Loading Silos and Outload Building; materials arriving via rail will be transferred by enclosed pipeline to the material storage areas.

In terms of raw materials for the Orcem process, consignments of gypsum, limestone, pozzolan and portland cement may be delivered via train. Cement will be transported via rail from Arizona in Mode 3, and unloaded via truck tanker transfer and closed pipe into one of the fully sealed Storage Silos.

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[15] http://www.arb.ca.gov/msei/categories.htm

Gypsum will be transported in all Operational Modes via truck or rail from Nevada or by sea from Mexico. Limestone will be transported in Operational Mode 2 via truck or rail from nearby sources in California, or by sea from Canada.

An area for transferring goods and materials between railcars and trucks (“Rail Transloading” area) will be established. A wheel loader reclaim hopper will be positioned opposite the Orcem Plant (between VMT the Phase 1 and 2 boundaries), and connected to a railcar loading station via an enclosed transfer conveyor. This common mobile system makes it possible for both VMT and Orcem to load and unload railcars, while maximizing the efficiency of lay-down areas for VMT ship and barge cargoes. A maximum of three 100-car trains would be serving the facility. However, the worst-case emissions scenario would involve a maximum of two 100-car trains with the balance of the shipment occurring by truck, a higher emissions transportation method. In the ROA, the train length will be reduced to 50 cars, with a doubling of the number of trains. For the purposes of this analysis which evaluates the worst-emissions scenario, processing and movement of bulk cargo through the use of rail transportation serving the combined VMT Terminal Phases 1 and 2 will require up to 8 monthly unit trains of up to 100 cars per episode (800 total monthly cars). The Rail Transloading area has a capacity to accommodate up to sixteen (16) railcars for loading at any one time. The existing California Northern Railroad track spurs that adjoin the VMT Site's northerly entrance will be used to store railcars during the loading process. The VMT Project anticipates the use of 2 switch-mobiles or a small locomotive to handle railcar movements on the VMT Site and to and from the California Northern Railroad track spurs adjacent to the Site.

The project rail movements for Orcem are outlined in Table 5.26 and are broken down into raw material imports (cement only under Mode 3) and finished product exports (GGBFS under both Mode 1 and 3). Also shown in Table 5.26 is the equivalent reduction in truck movements associated with the use of rail to export GGBFS finished product. Thus, in the event that GGBFS be exported by rail the truck numbers outlined in Table 5.21 will be scaled back by an equivalent number.

Table 5.26 Annual Train Movements to the Orcem Site

Orcem Mode	Milestone	Raw Materials In		Finished Product Out		
		Cement (MT/yr)	Rail Movements / Annum	GGBFS (MT/yr)	Rail Movements / Annum	Reduction In Trucks
1	1			5748	4	253
	2			23016	16	1014
	3			51756	36	2280
	4			92040	63	4055
	5			145732	100	6420
2	1					
	2					
	3					
	4					
	5					
3	1	60000	41			
	2	80000	55			
	3	100000	69			
	4	120000	83	92040	63	4055
	5	120000	83	145732	100	6420

The following narrative outlines the import and export methodology by rail for the Orcem site:

- Cement is likely to be the only raw material imported by rail to the site;
- Arriving trains, either laden or unladen, will be parked in the existing rail yard area outside the site boundary. This area has capacity for approximately 89 railcars;
- The railcars will then be shunted from this yard area to the rail transloading area on the VMT site where there is capacity for 16 railcars;
- Raw material (cement) import or finished product export will be transloaded to or from the railcars using an enclosed pipe system, and;
- Loaded or unloaded railcars will be shunted back to the rail yard area outside the site boundary to await collection by the locomotive.

Emission Factor Methodology for Locomotive Movements

The locomotives used at the facility will be both line-haul (long-haul trains to transport material to market and import raw material for processing) and switching locomotives which will be used to move the rail wagons to assemble the train prior to departure.

During switching the engines will be in operation when moving the shuttle cars from the siding to the loading area and will be turned off outside of this time. In the case of Orcem, where 16 empty cars will be loaded over a 10 hour period, the switchers will only operate for approximately 20 minutes when empty (requiring one 700 horsepower [hp] engine) and again when fully loaded (when three 700 hp engines will be required).

The National Railway Equipment Company will supply ultra-low emissions road-switcher locomotives for both switching and line-haul. The NO_X, hydrocarbon (HC), CO and PM_{10} emission factors associated with both modes of operation are outlined in Table 5.27. Emission rates for GHGs and SO_2 were taken from the *Port of Los Angeles Emission Inventory 2012* (*POLA, 201*3).

Table 5.27 Emission Factors (g/bhp-hr) associated with the use of ultra-low emissions road switcher locomotives.

Emissions	**Switcher**	**Line Haul**
(g/bhp-hr)		
NO_X	3.37	2.88
ROG	0.04	0.02
CO	1.51	0.93
PM_{10}	0.050	0.020
$PM_{2.5}$ Note 1	0.0485	0.0194

Note 1 Based on the CARB default $PM_{2.5}$ / PM_{10} ratio for locomotive diesel engines of 0.97.
Note 2 A conversion from HC to ROG of (HC*1.053) was used in the assessment. (CARB, 2013) Carl Moyer Program Guidelines)

The switching time in mode for each notch setting was taken from the *Commercial Rail Yard (Davis Yard) Emission Inventory, Los Angeles* (*Sierra Research,2007)* based on "trim" operations. The switching notch settings and associated emission rates for PM_{10} is outlined in Table 5.28 when the railcars are fully loaded. The line haul time in mode was based on the EPA duty cycle with the exception that Notch setting 7 & 8 are assumed not to occur within the modelling domain (rail traffic is modeled for a distance of 1.0 mile from the facility). The line haul notch settings and associated emission rates for PM_{10} is outlined in Table 5.29. Table 5.30 outlines the air model input parameters for both switching and line haul (idling and travelling). Volume sources have been assigned differing release heights and initial vertical dimensions for daytime (06:00 – 18:00) and night time (18:00 – 06:00) based on the average of values outlined in the *CARB Roseville Rail Yard Study (CARB 2004)* for GP-4X, GP-5X & GP-6X for Notch 1 & 2.

Table 5.28 Locomotive Time-In-Mode for Switchers When Fully Laden.

Switcher	% of full power	BHP	Duty Cycle (%)	BHP	Switcher	Switcher
Notch Position			**(based on Davis Yard Trim operations)**	**Weighted**	**PM_{10} (g/hr)**	**PM_{10} (g/sec)**
Idle	0.81%	17.01	44.20%	7.52	0.38	0.000104
1	4.76%	99.96	5.00%	5.00	0.25	0.000069
2	14.18%	297.78	25.00%	74.45	3.72	0.001034
3	27.80%	583.8	2.30%	13.43	0.67	0.000186
4	42.07%	883.47	21.50%	189.95	9.50	0.002638
5	57.30%	1203.3	1.50%	18.05	0.90	0.000251
6	72.51%	1522.71	1.60%	24.36	1.22	0.000338
7	89.76%	1884.96	0.00%	0.00	0.00	0.000000
8	105.31%	2211.51	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	0.86				14.31	0.00397
Locomotive HP	2100				PM_{10} (g/hr)	PM_{10} (g/sec)
Average Load (HP)				16%		

Table 5.29 Locomotive Time-In-Mode for Line Haul Locomotives.

Line Haul Notch Position	% of full power	BHP	Duty Cycle (%) (based on Davis Yard Trim operations)	BHP Weighted	Line Haul PM_{10} (g/hr)	Line Haul PM_{10} (g/sec)
Idle	0.4	8	47.03	3.76	0.08	0.000021
DB	2.1	42	15.47	6.50	0.13	0.000036
1	5	100	8.04	8.04	0.16	0.000045
2	11.4	228	8.04	18.34	0.37	0.000102
3	23.5	470	6.44	30.25	0.60	0.000168
4	34.3	686	5.45	37.36	0.75	0.000208
5	48.1	962	4.70	45.24	0.90	0.000251
6	64.3	1286	4.83	62.07	1.24	0.000345
7	86.6	1732	0.00	0.00	0.00	0.000000
8	102.5	2050	0.00	0.00	0.00	0.000000
Fuel Correction Factor	0.86				4.23	0.00101
Locomotive HP	2000				PM_{10} (g/hr)	PM_{10} (g/sec)
Average Load (HP)				11%		

Table 5.30 Locomotive Air Modelling Inputs For Both Switchers and Line-Haul.

Source	Point Source Parameters			
	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Temperature (K)
Locomotives (Idling)				
Line Haul (as point source)	4.6	0.625	3.1	364.15

Locomotives (Travelling)	Release Height (m)	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)
Switcher (as volume source)	6.61 (day), 15.04 (night)	4.65	3.07 (day), 7.00 (night)
Line Haul (as volume source)	6.61 (day), 15.04 (night)	4.65	3.07 (day), 7.00 (night)

5.3 VMT Activities

VMT is proposing to construct a multi-phased bulk aggregate import and distribution facility on the existing terminal footprint. The general transportation method is to unload dry bulk cargo from vessels, temporarily store, and reclaim from storage to cargo trucks and railcars for local and regional distribution. In addition, the terminal design allows re-loading cargo to barges to enable VMT to engage in short-sea shipping initiatives with other California ports and terminals. Figures 5.8 and 5.9 outlines the project footprint under Phase 1 and Phase 2 of the proposed project within the VMT Terminal Site. Phase 2 refers to the construction of an additional rock dike to allow transport by barge. As described above, the maximum environmental impact occurs in VMT Phase 1 operations.

Phase 1 & 2 VMT Terminal Cargo

As an operational deep draft facility, the VMT Terminal, including Phases 1 and 2, is anticipated to handle a wide range of commodities including, for example, the following:

- Feed Grains;
- Manufactured Steel;
- Timber/Lumber;
- Rock, Aggregate, Ores and Related Materials (including GBFS, clinker and related materials used as part of the Orcem Project);
- Project Based Break-Bulk Items (i.e. heavy lift transport, large construction assemblies);
- Marine Construction Materials

Another possible material which may at some future date be imported is pet coke. Pet coke generally has a higher moisture content than sand / aggregate (5-10%) but have a high silt content and thus would be imported via a sealed system to minimise fugitive dust. It is intended that should pet coke be imported it will be treated in a similar fashion as to what is currently envisaged for clinker imports. The sealed systems with any associated bag filters / release points will achieve an emission concentration of 2.5 mg/Nm^3 (0.0011 grains/dscf) in line with the appropriate BACT limit.

For the purposes of the current assessment, the materials with the greatest potential for fugitive dust release (sand and aggregates) were assumed to be the dominant material imported. Under these circumstances, sand and aggregates would be received from self-unloading, clam-shell crane equipped vessels and delivered to the storage area by covered conveyors where it will be stored in open stockpiles. The terminal will be designed to also discharge self-unloading, conveyor-equipped vessels using the same receiving hoppers and conveying equipment when throughput volumes increase.

During the initial project stages trucks will be loaded using front-end loaders to load cargo directly into the truck trailers. Railcars will ultimately be loaded via a loading station requiring railcar switching, but can be loaded in similar mobile manner as trucks initially. When the annual throughput increases at the Terminal, a railcar loading station and surge bin will be constructed on the site to improve operational efficiency and reduce the use of wheel loaders. Wheel loaders would then be used only in the stockyard to reclaim the cargo to receiving hoppers that feed conveyors leading to the rail loading stations and to maintain the stockpiles. Truck load-out is assumed to remain mobile during both Phase 1 and Phase 2 operations.

Cargoes which are not containerized, or do not otherwise release fugitive dust or airborne/soluble toxic materials when handled and stored in the open, will be unloaded using portable equipment onto the paved or aggregate surfaces within the 10.5-acre VMT Terminal shipping and receiving site area.

All other cargo received or shipped through the VMT Terminal will be handled through enclosed transport devices (such as, for example, the GBFS material received and transported directly to the Orcem Site). The existing surfaces at the site would be used as temporary lay-down areas for the cargo being prepared for loading onto ships, or unloaded for transfer to barge, rail, or trucks.

An estimate of the maximum day and annual emission rate of the criteria pollutants from the emission points / transfer points onsite is outlined in Tables 5.31a and 5.31b, respectively, and compared with the BAAQMD thresholds in Table 5.32. The estimates are based on detailed calculations, engineering data and based on 5,760 hours of operation at maximum load (Phase 2 Alternative). Example calculations are detailed are outlined in Appendix AQ-EMITS. Given that the estimated facility emission totals are significantly below the PSD threshold of 250 tons per year per pollutant, the project will not be subject to PSD review.

Table 5.31a Emissions of Criteria Pollutants from VMT, Vallejo under Phase 1 Alternative (lbs/day).

Source	ROG	CO	NOx	Exhaust PM_{10}	Fugitive PM_{10}	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	DPM	SO_2	CO_2	CH_4	N_2O
Shipping	5.40	11.81	100.37	2.33	-	2.22	-	1.99	6.69	7,570	0.74	0.42
Barge	0	0	0	0	0	0	0	0	0	0	0	0
Material Handling	-	-	-	-	0.80	-	0.12	-	-	-	-	-
Raw Material Storage Piles	-	-	-	-	0.01	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)	0.24	0.63	1.08	0.00	0.19	0.00	0.02	0.00	0.00	231	-	-
Unpaved Rd (Front Loader & Excavator)	0.61	5.78	1.81	0.05	0.25	0.05	0.02	0.05	0.03	3,310	-	-
Industrial Paved Rd (finished product)	0.11	0.27	1.02	0.00	0.18	0.00	0.04	0.00	0.00	206	-	-
Public Paved Rd	1.11	14.36	55.11	0.18	26.26	0.17	6.46	0.17	0.15	13,965	-	-
Rail	0.10	4.47	12.26	0.09	-	0.09	-	0.09	0.02	2,297	0.18	0.06
Total (lbs/day)	7.59	37.32	171.65	2.65	27.69	2.53	6.66	2.31	6.89	27,579	0.92	0.48
Total (tons/year)	1.38	6.81	31.33	0.48	5.05	0.46	1.22	0.42	1.26	5,033	0.17	0.09

1. As discussed above, Phase 1 Alternative does not include any traffic via barge

Table 5.31b Emissions of Criteria Pollutants From VMT, Vallejo under Phase 1 Alternative (tons/year)

				Exhaust	Fugitive	Exhaust	Fugitive			GHG Emissions (MT/year)		
Source	**ROG**	**CO**	**NOx**	**PM_{10}**	**PM_{10}**	**$PM_{2.5}$**	**$PM_{2.5}$**	**DPM**	**SO2**	**CO_2**	**CH_4**	**N_2O**
Shipping	0.99	2.16	18.32	0.42	-	0.40	-	0.36	1.22	1,253	0.13	0.07
Material Handling	-	-	-	-	0.15	-	0.02	-	-	-	-	-
Raw Material Storage Piles	-	-	-	-	0.00	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)	0.04	0.12	0.20	0.00	0.03	0.00	0.00	0.00	0.00	38	-	-
Unpaved Rd (Front Loader & Excavator)	0.11	1.05	0.33	0.01	0.05	0.01	0.00	0.01	0.01	548	-	-
Industrial Paved Rd (finished product)	0.02	0.05	0.19	0.00	0.03	0.00	0.01	0.00	0.00	34	-	-
Public Paved Rd	0.20	2.62	10.06	0.03	4.79	0.03	1.18	0.03	0.03	2,312	-	-
Stack and Bag Filters	-	-	-	-	-	-	-	-	-	-	-	-
Rail	0.02	0.81	2.24	0.02	-	0.02	-	0.02	0.00	380	0.03	0.01
Total (tons/year)	1.38	6.81	31.33	0.48	5.05	0.46	1.22	0.42	1.26	4,566	0.15	0.08
										0	0.00	0.00
Orcem	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03	26,524	0.64	0.21
VMT+Orcem	4.18	24.57	63.39	1.07	11.40	1.03	2.71	0.70	2.29	31,090	0.80	0.28

1. Stack and bag filter emissions are only associated with Orcem activity and are thus not included in the itemized VMT emissions

Table 5.32 Annual Emissions of Criteria Pollutants from VMT, Vallejo under Phase 1 Alternative (tons/yr).

VMT Facility Phase 2 Alternative Annual Emission (tons/yr)							
Facility	**NO_2**	**SO_2**	**PM_{10} Note 1**	**$PM_{2.5}$ Note 1**	**DPM**	**ROG**	**CO**
VMT (lbs/yr)	62,652	2,515	967	923	843	2,770	13,622
VMT (tons/yr)	31.33	1.26	0.48	0.46	0.42	1.38	6.81
BAAQMD CEQA Thresholds	10	N/A	15	10	10	10	N/A
Note 1	PM_{10} / $PM_{2.5}$ based on exhaust emissions only						

Figure 5.8

VMT Operations Phase 1

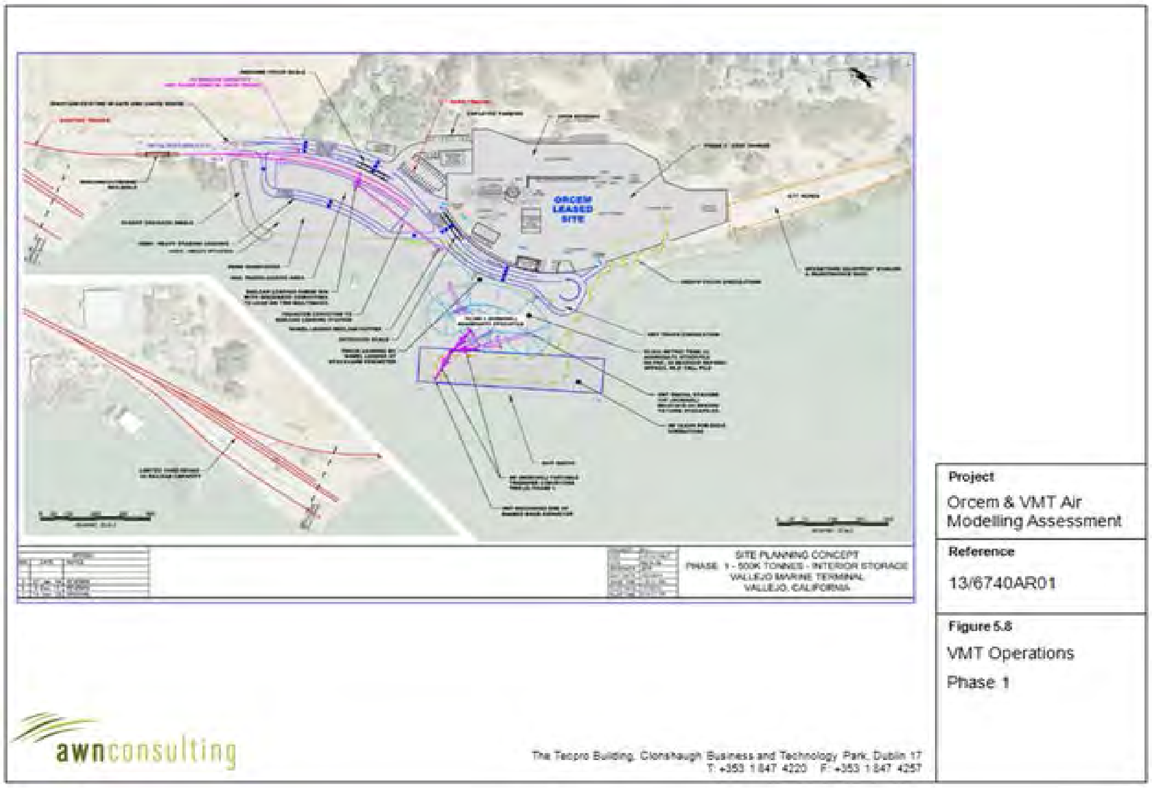
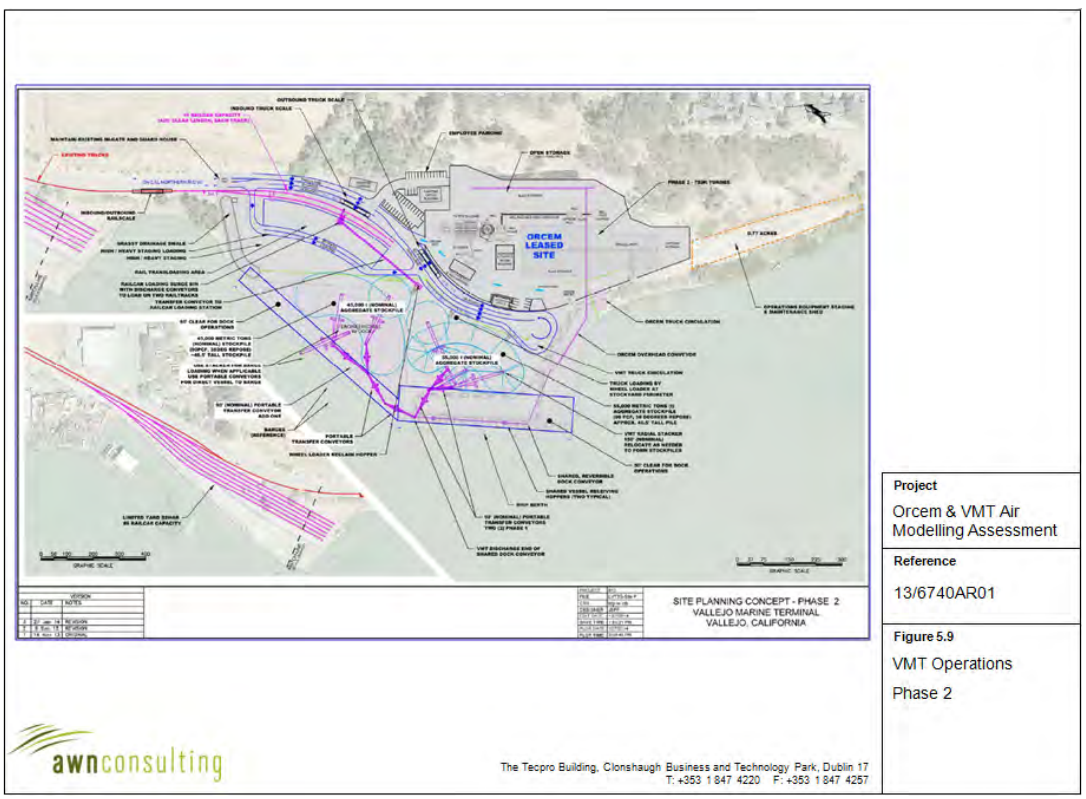


Figure 5.9

VMT Operations Phase 2



5.4 Derivation of Emission Rates for Each Emission Source in Use at the VMT Facility

Air and GHG emissions from the proposed VMT facility were derived using various sources including the CARB Off-Road Emission Inventory, EMFAC2014, AP-42 and vendor data. A discussion of each phase of development and associated emission source is outlined below.

5.4.1 Phases of Operation

The following information reflects potential maximum use estimates associated with full implementation of Phases 1 and 2 of the VMT Terminal and associated uses within the overall VMT Site. Actual operational volumes may be less.

Based on anticipated cargoes and the class of ship commonly used to transport such cargoes, at full capacity the Phase 1 wharf will accommodate an average of four berthings per month, handling one vessel at a time. This volume assumes a 5-6 day loading or unloading time per vessel. Vessels will be moored at the wharf on average from 5 to 7 days. During the time that vessels are moored at the facility, 24-hour operations will be conducted for off-loading or loading of cargo. Other VMT Terminal operations will be scheduled as two ten-hour shifts per day, six days per week.

<u>VMT Phase 1 Volumes</u>: The overall volume of cargo handled through the Phase 1 Terminal is expected to increase over the first several years of operation in response to market demand. Prior to completion of the rail access, Phase 1 VMT cargoes offloaded from ships will be loaded exclusively onto trucks. As shown in Tables 5.33 and 5.34 below, the maximum monthly volume of VMT cargo handled through the Phase 1 Terminal via the "Truck Only" export mode will be limited to 40,000 MTs (1 ship) per month. During this mode of operation, the Phase 1 Orcem Project is expected to transport an additional 40,000 MTs (1 additional ship) per month of raw materials via enclosed conveyor directly to the Orcem facility. The capacity of the Phase 1 Terminal to handle larger volumes of cargo will expand with completion of the rail access and Transloading Area improvements. Tables 5.33 and 5.34 shows that with rail improvements in place under the "Truck & Rail" mode, up to 60,000 MTs of VMT cargo can be processed through the Phase 1 Terminal (in addition to Orcem's Phase 1 40,000 monthly MTs of raw materials). Two-thirds of this 60,000 monthly MT volume is expected to be transported via railcar (up to 100 railcars per day with an average of 4.5 unit trains per month, as shown in Table 5.34); this mode of operation reduces truck volumes by 50% compared with the "Truck Only" mode. The "Alternate Truck & Rail" mode maximizes overall Phase 1 Terminal volumes at 112,500 MTs per month (in addition to the Orcem Phase 1 volume) by maximizing truck volumes at 40,000 MTs per month and concurrently increasing railcar volumes to 8 unit trains (of 100 cars each) per month.

<u>VMT Phase 2 Volumes</u>: Construction of the Phase 2 rock dike is designed to follow the Federal Short Sea Shipping Highway Initiative where possible by focusing on short-sea shipping opportunities that move more cargo by coastal and inland waterway barges, reducing both truck and rail emissions. There is the potential for 24-hour work periods during vessel loading and unloading, and other operations occurring within the same business hours as Phase 1. One of the primary functions of the Phase 2 rock dike will be "transloading" of cargo from ships to barges. Additional necessary lay-down area is provided in Phase 2 to support the transload process, whereby an inbound Phase 1 Wharf cargo will be moved to the Phase 2 lay-down area to be reclaimed and loaded onto barges. This allows the Phase 1 lay-down area to be open for the discharge of a new inbound cargo.

As shown in Table 5.33, completion of the Phase 2 terminal enables the "Truck, Rail & Barge" operational mode, in which total cargo volumes may be increased up to 120,000 MTs per month, while truck and trail transport are both substantially reduced (25% of total each) and barge transport is introduced to carry up to 50% of the volume leaving the terminal (60,000 monthly MTs). The combined Phase 1 and 2 VMT terminal volumes would be decreased to 96,400 total monthly MTs in order to accommodate concurrent Orcem Milestone 5 import of up to an additional 63,400 tonnes of raw materials monthly via enclosed conveyor into the Orcem Site (a combined 4 ships per month or 160,000 monthly MTs).

The final VMT Phase 2 operational mode identified in Table 5.34 is "Alternate Truck, Rail & Barge". This mode increases truck transport up to the maximized 40,000 tons per month, increases rail transport up to the maximized eight 100-car unit trains per month, and reduces barge transport to a maximum of 6,600 MTs per month (7,275 tons per month). Again, these volumes would be decreased to a combined 96,400 total monthly MTs in order to accommodate concurrent Orcem Phase 2 import of up to an additional 63,400 MTs of raw materials monthly. Both "Truck, Rail & Barge" modes represent maximized VMT cargo volumes of 1.44 million MTs per year, which when added to the Orcem Phase 2 import volume represents a maximum capacity of 1.92 million MTs per year.

The VMT Terminal will primarily service dry bulk and break-bulk cargoes. Liquid-bulk cargoes, or large-scale container operations are not envisioned to be handled through the VMT Terminal. While the primary focus of VMT operations may initially be sand / aggregates, the terminal will be designed to include both shipping and receiving of a wide range of products through the Phase 1 and Phase 2 wharves, including loading and unloading of a monthly average of 4 deep-draft (40,000 to 70,000 MTs[16]) ships through the Phase 1 wharf, along with a combination of barge and other smaller vessels through the Phase 2 wharf.

<u>Rail Operations</u>: Processing and movement of bulk cargo through the use of rail transportation serving the combined VMT Terminal Phases 1 and 2 will require up to 8 monthly unit trains, of up to 100 cars per episode (800 total monthly cars). The Rail Transloading area has a capacity to accommodate up to sixteen (16) railcars for loading at one time. Existing California Northern Railroad track spurs that adjoin the VMT Site's northerly entrance will be used to store railcars during the loading process. The VMT Project anticipates use of 2 switch-mobiles or a small locomotive to handle railcar movements on the VMT Site and to and from the California Northern Railroad track spurs adjacent to the Site. Additionally, there may be up to 2 Caterpillar 988 front end loaders and 2 diesel forklifts to handle cargo movements (depending on the cargo) in the lay-down areas of the VMT Terminal.

<u>VMT Terminal Operations with Orcem Volumes</u>: As summarized in Table 5.33, based on an average of four vessel movements per month at the Phase 1 VMT Terminal, and vessel capacities of approximately 40,000 MTs, an estimated maximum average of approximately 160,000 MTs of materials will be processed via all modes of transport through the Phase 1 Terminal monthly. This maximum capacity is made possible by the enhanced "transloading" and barge accommodation capabilities of the VMT Phase 2 improvements. The Orcem facility has been designed to install a covered conveyor system as part of its Phase 1 construction, to transport all raw materials from the VMT Phase 1 Wharf. Orcem's import of raw materials via this conveyor from the VMT Phase 1 Wharf will expand from under 500,000 annual MTs in Orcem Phase 1 to a maximum of 760,000 annual MTs in Orcem Phase 2 (Milestone 5). As noted above under VMT Phase 2 Volumes, the maximum volume of VMT cargoes for the "Truck, Rail and Barge" modes will scale back when the Orcem reaches Milestone 5 volumes.

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[16] 40,000 MT was assumed for this analysis, to conservatively maximize ship calls and activity.

Table 5.33 Source and Quantity of Materials under Phase 1 & 2 VMT (Truck / Rail / Barge Option)

VMT Shipping Phases			VMT Truck Phases				VMT Rail Phases			VMT Barge Phases		
Phase	Raw materials in (MT/yr)	Ship Movements Per Year	Truck Movement in (MT/yr)	Truck Movements Per Year[1]	Truck Movements Per Hr[2]	Truck Movements Per Day[2]	Rail Movements in (MT/yr)	Rail Movements Per Year	Rail Movements Per Week	Barge Movements in (MT/yr)	Barge Movements Per Year	Barge Movements Per Week
1 – Truck Only	480,000	12	480,000	26,455	4.2	84.6	0	0.0	0.0			
1 – Truck & Rail	720,000	18	240,000	13,228	2.1	42.3	480,000	52.9	1.0			
1 - Alternative	1,350,000	34	480,000	26,455	4.2	84.6	870,000	95.2	1.8			
2 – Truck / Rail / Barge	1,160,000	29	214,400	11,817	1.9	37.8	366,000	40.3	0.78	579,600	41.4	0.80

[1] Assumes 20 tons (18.14 MT) per truck
[2] 20 hours/day, 6 days/week

Table 5.34 Source and Quantity of Materials under Phase 1 & 2 VMT (Phase 2 Alternative Option)

VMT Shipping Phases			VMT Truck Phases				VMT Rail Phases			VMT Barge Phases		
Phase	Raw materials in (MT/yr)	Ship Movements Per Year	Truck Movement in (MT/yr)	Truck Movements Per Year	Truck Movements Per Hr	Truck Movements Per Day	Rail Movements in (MT/yr)	Rail Movements Per Year	Rail Movements Per Week	Barge Movements in (MT/yr)	Barge Movements Per Year	Barge Movements Per Week
1 – Truck Only	480,000	12	480,000	26,455	4.2	84.6	0	0.0	0.0			
1 – Truck & Rail	720,000	18	240,000	13,228	2.1	42.3	480,000	52.9	1.0			
1 - Alternative	1,350,000	34	480,000	26,455	4.2	84.6	870,000	95.2	1.8			
2 – Alternative	1,160,000	29	310,400	17,108	2.7	54.7	770,400	84.9	1.6	79,200	12	0.23

[1] Assumes 20 tons (18.14 MT) per truck
[2] 20 hours/day, 6 days/week

5.4.2 VMT Facility - Ship Unloading & Barge Loading

VMT is primarily expected to receive and discharge self-unloading, Handimax to Panamax class ships in loads of up to approximately 40,000 MTs of sand and gravel. During Phase 2 there is also the potential that material will be exported using barges.

The duration of the offloading process will vary with the type of vessel offloaded. There are several potential vessel offloading operations, and they are:

Geared Ships Nominally a 40,000MT bulk carrier with on board cranes (geared ship). This ship will berth at the dock and the raw material on board will be discharged from the ship using clamshell grabs fitted to the on board cranes. The clamshell grabs will lift the raw material from the ship holds and deposit it into mobile hoppers located on the dock.

Self-Discharge Ships Nominally a 70,000MT bulk carrier with on board reclaim conveyors and a discharge boom with an integral belt conveyor (self-discharge ship). This ship will berth at the dock and the raw material on board will be discharged from the ship via the self-discharge boom which will swing into the required position and transport the raw material from the ship and deposit it into receiving hopper located on the shore.

Shipping Emission Factor

The raw materials with the highest fugitive dust potential to be unloaded are sand and aggregates as shown in Table 5.35. These materials will be transported to the proposed upgraded dock by nominally 40,000 MTs Handymax vessels. The air emissions associated with the transportation of GBFS within the 24 nautical miles (nm) of the California coast (within the low-sulfur fuel zone (0.1% sulfur marine oil) are outlined below. The frequency of vessel calls per phase is outlined in Table 5.35 with Phases 4 and 5 assuming Orcem in operation at Milestone 5:

Table 5.35 Number of Vessel Calls per VMT Phase

VMT Phases	Tonnage	Vessel	Calls
1 – Truck Only	480,000	40,000 tonnes Handymax	12
1 – Truck & Rail	720,000	40,000 tonnes Handymax	18
1 - Alternative	1,360,000	40,000 tonnes Handymax	34
2 – Truck / Rail / Barge	1,160,000	40,000 tonnes Handymax	29
2 – Alternative	1,160,000	40,000 tonnes Handymax	29

The air emission factors associated with bulk carriers were derived from the CARB OGV Marine Emissions Model for the transit operating mode for each calendar year. For bulk carriers accessing the VMT berth, slow main engine speed and 0.1% S marine distillate were assumed as shown in Table 5.10 for main engines adjusted for maneuvering mode by the factors in Table 5.8 whilst for auxiliary engines a 0.1% S marine distillate was also assumed as shown in Table 5.11 because both the California and Emission Control Area requires that fuel sulfur level.

The emission methodology was based on the following formula:

$$Emissions_{t,\,om,\,e} = \Sigma\ Pop * EF_{e,\,om,\,f} * Hrs_{om,\,t} * VP_{om,\,t} * \%Load_{om,\,t} * Activity$$

Where:

Pop	=	Population
HP_{ave}	=	Maximum rated average horsepower (kW)
LF	=	load factor, unitless
Activity	=	Activity or annual operation (hr/yr)
EF	=	Emission factor (g/kW*hr)
om	=	operating mode (transit, maneuvering, hoteling)
t	=	vessel type
f	=	fuel
e	=	engine type.

The emission factors for tugs were estimated from the California Harbor Craft Emissions Inventory Database model as follows in Table 5.13 for the fleet average Bay Area harbor craft:

Tug boat emissions were calculated using the *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009) using the emission factors for tugs were estimated from the California Harbor Craft Emissions Inventory Database model for the fleet average Bay Area harbor craft. The emission methodology was based on the following formula:

$$Emissions = EF \times HP \times LF \times Hr$$

Where:

Emissions = amount of pollutant emitted during one period;

EF = fleet average that incorporates the model year, horsepower and engine use specific zero hour emission factor (new engine), deterioration, and fuel correction factors;

HP = rated horsepower of the engine;

LF = vessel type and engine use specific engine load factor;

Hr = number of annual operating hours of the engine.

It was assumed that two tug boats were required both inward and outward to escort the Handymax bulk carrier to the port using the methodology outlined in Section 5.2.2. Detailed emission calculations for each pollutant and phase are outlined in Appendix AQ-EMITS.

Ocean-going self-propelled barges are envisaged for phase 2 of the project of nominal capacity of 14,000 MTs. Barge emissions were calculated using the *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009) using the emission factors for tow boats were estimated from the California Harbor Craft Emissions Inventory Database model for the fleet average Bay Area harbor craft and information contained in the *Port of Oakland 2012 Seaport Air Emission Inventory* (ENVIRON, 2013). The emission methodology was based on the following

$$Emissions = EF \times HP \times LF \times Hr$$

Self-Propelled Barge - Main Engine

In relation to the main barge engine, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine(s). This is approximately the average size of self-propelled barges in the US.
- The emission actor for a 3000 hp barge is assumed to be as follows in Table 5.36:

Table 5.36 Main Engine (ME) & Auxiliary Engine (AE) Emission Factors – Barge (g/hp-hr)

Calendar Year	Area	Engine	NOx	PM	ROG	CO	SOx	CO_2
2016	Tow Boats	ME	5.48	0.18	0.57	3.76	0.0060	587.2
2016	Tow Boats	AE	5.74	0.27	0.88	4.18	0.0060	587.2
2017	Tow Boats	ME	5.12	0.15	0.57	3.93	0.0060	587.2
2017	Tow Boats	AE	5.48	0.23	0.88	4.19	0.0060	587.2
2018	Tow Boats	ME	5.11	0.15	0.57	3.97	0.0060	587.2
2018	Tow Boats	AE	5.49	0.23	0.88	4.21	0.0060	587.2
2019	Tow Boats	ME	5.09	0.15	0.57	4.01	0.0060	587.2
2019	Tow Boats	AE	5.50	0.23	0.89	4.23	0.0060	587.2
2020	Tow Boats	ME	4.66	0.12	0.57	4.22	0.0060	587.2
2020	Tow Boats	AE	5.45	0.22	0.89	4.23	0.0060	587.2

- The engine load of the barge is assumed to be 0.68 for the propulsion engine based on the ARB tow boat load.

Thus, for NOX emissions estimates:

Main Engine Emissions	=	EF x HP x LF x Hr
NOX Emissions	=	(5.11 g/hp-hr) x 3000hp x 0.68
Main Engine Emissions	=	2.90 g/sec

Self-Propelled Barge - Auxiliary Engine

In relation to the auxiliary engine likely to be used for the self-propelled barge, the following assumptions were made:

- 175 hp was assumed as the rated horsepower of the auxiliary engine.
- The emission factors for a 175 hp auxiliary engines on a tow boat is shown in Table 5.36.
- The engine load of the barge is assumed to be 0.43 for the auxiliary engine.

Thus, for NOX:

Auxiliary Engine Emissions	=	EF_0 x HP x LF x Hr
NO_X Emissions	=	(5.49 g/hp-hr) x 175hp x 0.43
Auxiliary Engine NO_X Emissions	=	0.115 g/sec

Detailed emission calculations for each pollutant are outlined in Appendix AQ-EMITS.

5.4.3 VMT Facility - Material Unloading and Handling

The proposed aggregate import system is comprised of two portable shared-use receiving hoppers to receive cargo from the vessel discharge systems and transfer it to the dock for truck load-out and/or a shared-use reversible dock conveyor for material repositioning to the storage stacks.

For aggregates destined for the VMT Terminal area, the aggregate would be transported from the receiving conveyor at the dock by portable link conveyors. The link conveyors will carry the cargo to a yard stacking conveyor, which will create open storage stockpiles. The function of the storage area would be to receive and store finished product for outbound load-out by rail, truck and/or barge. No crushing or screening would take place at the Terminal.

Where necessary, a stockpile water spray system will be in place to prevent fugitive dust emissions. Fugitive dust emissions will occur at each storage area, upload point, transfer point and drop point as the raw material is moved from the ship to the raw material storage area and thereafter transferred to the rail, barge or truck for export off-site. A range of mitigation measures will be put in place to minimize these emissions including frequent watering and aspirated hoppers as outlined in Table 5.37. Detailed emission calculations based on AP-42 and similar emission calculations associated with material handling is outlined in Appendix AQ-EMITS.

Table 5.37 Proposed Operational Mitigation Measures At VMT

Potential Source of Emissions to Air	Operational Measure to Ensure Impacts are Minimised	Basis
Handymax Ship	0.1% Sulphur Marine Fuel Within 24nm of California coast for the main, auxiliary and boiler engines	Regulatory requirement
Grab Crane on ship transfers GBFS to Mobile Hopper	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD (2007))	Mitigation
Hopper drop to conveyor	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD (2007))	Mitigation
Conveyor drop to conveyor	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD (2007))	Mitigation
Front loader excavation of stockpile	Watering of material transfer point to ensure adequate moisture content giving a control effectiveness of 95% (SCAQMD (2007))	Mitigation
Loading of hopper by front loader	Watering of material transfer point to ensure adequate moisture content and aspirated hopper discharging through filter giving a control effectiveness of 95% (SCAQMD (2007))	Mitigation
Raw Material Storage Piles	Frequent watering of storage pile areas giving a control effectiveness of 90% (SCAQMD (2007), AP42)	Mitigation
Unpaved Rd (Front Loader & Fork Lift)	Dust suppression using $MgCl_2$ (magnesium chloride), frequent watering (3-times daily) & 15 mph speed limit giving a combined control effectiveness of 96.8%[Note 1] Forklift diesel engines on-site will have post 2013 engines whilst front loaders will operate on CNG/ propane	Mitigation
Industrial Paved Rd	Watering 3 times daily giving a control effectiveness of 80% (SCAQMD (2007))	Mitigation
Railcar Filling	Railcar loading station and surge bin	Project design feature
Railcar movement	Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) will be used for both switching and line haul. Reduction of 80-90% in PM_{10} compared to Tier II EPA emission rates.	Regulatory requirement

[Note 1] Western Governors' Association (WRAP, 2006) Fugitive Dust Handbook indicates 84% control efficiency for $MgCl_2$. The Alaska Cooperative Transportation and Public Facilities Research Program (Control of Dust Emissions from Unpaved Roads, 1992) reports up to 80% control for 15mph speed limitation. This results in a cumulative control of 96.8%.

5.4.4 VMT Facility - Front Loader & Fork Lift Offroad Diesel Engines

Up to two biodiesel (B20) powered front wheeled loader with a bucket capacity of approximately 16yd^3 and up to two diesel powered forklifts will be in operation under Phase 1 & 2 of the development. The loader will transfer sand / aggregate from the raw material storage areas to rail, truck or barge loading hoppers. The exhaust and fugitive emissions associated with their operations is outlined below.

The methodology for estimating PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2 and NO_X emissions from each type of off-road equipment (front loader, fork lift) is based on the following equation:

$$\text{Emissions} = \text{Pop} * HP_{ave} * LF * \text{Activity} * (EF_{zh} + dr * CHrs) \times FCF \times B20$$

Where:

Pop	=	Population
HP_{ave}	=	Maximum rated average horsepower (hp)
LF	=	load factor, unitless
Activity	=	Activity or annual operation (hr/yr)
EF_{zh}	=	Zero-hour Emission factor (g/hp*hr)
dr	=	deterioration rate as equipment is used (gr/bhp-hr^2)
CHrs	=	cumulative hours accumulated on the equipment
FCF	=	fuel control factor (% reduction) to allow for use of California diesel fuel
B20	=	Biodiesel B20 emission reduction factor

The Off-Road Emission Factors for Off-road Sources is based on CHE and OFFROAD2011 model based on an equipment model year of 2015 for forklifts front loaders. All front loaders and forklifts used on-site by VMT will be no older than model year 2015. Appendix AQ-EMITS details the emission calculations associated with both the exhaust and fugitive emissions associated with both the front loaders and forklifts.

5.4.5 VMT Facility - Truck Movements on Local Road Network

During the operational phase of the VMT facility there will be additional heavy duty truck movements to and from the site using the local road network. The truck movements will entail a range of materials although principally sand and aggregate initially. The number of truck movements accessing the facility will be dependent on the phasing of the development and the tonnage of material imported as outlined in Tables 5.33 and 5.34. Table 5.38 outlines the diurnal pattern of truck movements during operational days.

Table 5.38 Details of peak hourly and daily one-way truck movements on public roads accessing the VMT site.

Time Of Day	VMT Phases	
	Phase 2 – Truck / Train / Barge	Phase 2 - Alternative
	One – Way Truck Movements On Public Road	
0:00 to 1:00	0	0
1:00 to 2:00	0	0
2:00 to 3:00	0	0
3:00 to 4:00	3	3
4:00 to 5:00	4	4
5:00 to 6:00	4	4
6:00 to 7:00	4	4
7:00 to 8:00	6	6
8:00 to 9:00	4	4
9:00 to 10:00	4	4
10:00 to 11:00	4	4
11:00 to 12:00	4	4
12:00 to 13:00	4	4
13:00 to14:00	6	6
14:00 to 15:00	4	4
15:00 to 16:00	4	4
16:00 to 17:00	4	4
17:00 to 18:00	4	4
18:00 to 19:00	4	4
19:00 to 20:00	4	4
20:00 to 21:00	4	4
21:00 to 22:00	4	4
22:00 to 23:00	4	4
23:00 to 00:00	4	4
Total	87	87
Note [1] Includes two third-party deliveries at 10:00 and two third-party deliveries at 14:00		

The haul route to and from the site will be via Lemon Street to the junction with Sonoma Boulevard at which point the traffic will either:

- Route 1 – Turn south onto Sonoma Boulevard and continue towards the I-80;
- Route 2 – Turn north onto Sonoma Boulevard, or;
- Route 3 – Continue onto Lemon Street east of Sonoma Boulevard to the Curtola Parkway.

It is assumed that the distribution of traffic to each of these routes will be equivalent to the Orcem truck distribution pattern:

- Route 1 – 39%;
- Route 2 – 5%; and

- Route 3 – 56%.

Thus, for the maximum day, the breakdown of traffic along each of the three routes is presented in Table 5.39 based on these distributions.

Table 5.39 Details of hourly and daily one-way truck movements on public roads accessing the VMT site.

Time Of Day	VMT Phases		
	Phase 2 – Truck / Train / Barge & Phase 2 - Alternative		
	One – Way South onto Sonoma Boulevard Road	One – Way North onto Sonoma Boulevard Road	One – Way Lemon Street east of Sonoma Boulevard Road
0:00 to 1:00	0.0	0.0	0.0
1:00 to 2:00	0.0	0.0	0.0
2:00 to 3:00	0.0	0.0	0.0
3:00 to 4:00	1.2	0.2	1.7
4:00 to 5:00	1.6	0.2	2.2
5:00 to 6:00	1.6	0.2	2.2
6:00 to 7:00	1.6	0.2	2.2
7:00 to 8:00	2.3	0.3	3.4
8:00 to 9:00	1.6	0.2	2.2
9:00 to 10:00	1.6	0.2	2.2
10:00 to 11:00	1.6	0.2	2.2
11:00 to 12:00	1.6	0.2	2.2
12:00 to 13:00	1.6	0.2	2.2
13:00 to14:00	2.3	0.3	3.4
14:00 to 15:00	1.6	0.2	2.2
15:00 to 16:00	1.6	0.2	2.2
16:00 to 17:00	1.6	0.2	2.2
17:00 to 18:00	1.6	0.2	2.2
18:00 to 19:00	1.6	0.2	2.2
19:00 to 20:00	1.6	0.2	2.2
20:00 to 21:00	1.6	0.2	2.2
21:00 to 22:00	1.6	0.2	2.2
22:00 to 23:00	1.6	0.2	2.2
23:00 to 00:00	1.6	0.2	2.2
Total	33.9	4.4	48.7
Note 1 Includes two third-party deliveries at 10:00 and two third-party deliveries at 14:00			

The air emissions associated with the movement of road haulage trucks both on-site and on public roads was calculated using the EMFAC2014 emission model (*CARB, 2014)*[17]. The model includes the latest data on California's car and truck fleet and travel activity. The model also reflects the emission benefits of CARB's recent rulemaking including on-road diesel fleet rules, Pavley Clean Car Standards and the Low Carbon Fuel Standard. The haul truck fleet was assumed to meet the drayage truck rule

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[17] http://www.arb.ca.gov/msei/categories.htm

where all trucks must use engines meeting or exceeding the 2007 emission standards, which includes trucks with model year 2008 or later. The average emissions for trucks with 2008 to the calendar year model years were used to estimate the haul truck emission rates.

Emissions of PM_{10}, $PM_{2.5}$, NO_X, CO, SO_2 and CO_2 were calculated based on the number of vehicle trips per hour, the distance travelled on each specific link (each link is classified as a trip segment with a uniform traffic speed) of the trip and the link-specific emission factor. The emission factor for each link was a function of the average vehicle speed and the % of time in idling mode. Details of the modeled trip segments are outlined in Table 5.25.

Detailed emission calculations based on EMFAC2014 both on-site and on the nearby public roads is presented in Appendix AQ-EMITS.

5.4.6 VMT Facility - Rail Movements

As outlined in Section 5.2.7, it is proposed that as part of this development the line will be upgraded with capacity for the storage of railcars and loading/unloading of materials.

An area for transferring goods and materials between railcars and trucks ("Rail Transloading" area) will be established. This common mobile system makes it possible for both VMT and Orcem to load and unload railcars, while maximizing the efficiency of lay-down areas for VMT ship and barge cargoes.

Processing and movement of bulk cargo through the use of rail transportation serving the combined VMT Terminal Phases 1 and 2 will require up to 8 monthly unit trains of up to 100 cars per episode (800 total monthly cars). The Rail Transloading area has a capacity to accommodate up to sixteen (16) railcars for loading at any one time. The existing California Northern Railroad track spurs that adjoin the VMT Site's northerly entrance will be used to store railcars during the loading process. The VMT Project anticipates the use of 2 switch-mobiles or a small locomotive to handle railcar movements on the VMT Site and to and from the California Northern Railroad track spurs adjacent to the Site.

The project rail movements for VMT are outlined in Table 5.40 for the truck / rail / barge option and in Table 5.41 for the alternative option.

Table 5.40 Annual Train Movements from the VMT Site – Truck / Rail / Barge Option

	Rail Movements in (MT/yr)	**Rail Movements Per Year**	**Rail Movements Per Week**
VMT Phase	**Sand / Aggregate**		
1 – Truck Only	0	0.0	0.0
1 – Truck & Rail	480,000	52.9	1.0
1 - Alternative	870,000	95.2	1.8
2 – Truck / Rail / Barge	366,000	40.3	0.78

Table 5.41 Annual Train Movements from the VMT Site – Alternative Option

	Rail Movements in (MT/yr)	Rail Movements Per Year	Rail Movements Per Week
VMT Phase	**Sand / Aggregate**		
1 – Truck Only	0	0.0	0.0
1 – Truck & Rail	480,000	52.9	1.0
1 - Alternative	870,000	95.2	1.8
2 – Alternative	770,400	84.9	1.6

The following narrative outlines the export methodology by rail for the VMT site:

- Sand / aggregate is likely the main raw material to be exported by rail from the site;
- Arriving unladen trains will be parked in the existing rail yard area outside the site boundary. This area has capacity for 89 railcars;
- The railcars will then be shunted from this yard area to the rail transloading area on the VMT site where there is capacity for 16 railcars;
- Material for export will be transloaded to the railcars using a railcar loading station and surge bin, and;
- Loaded railcars will be shunted back to the rail yard area outside the site boundary to await collection by the locomotive.

The locomotives used at the facility will be both line-haul (long-haul trains to transport material to market and import raw material for processing) and switching locomotives which will be used to move the rail wagons to assemble the train prior to departure.

The National Railway Equipment Company will supply ultra-low emissions road-switcher locomotives for both switching and line-haul. The emission factors associated with both modes of operation are outlined in Table 5.27 for PM_{10}, HC, NO_X and CO. Emission rates for GHGs and SO_2 were taken from the *Port of Los Angeles Emission Inventory 2012* (POLA, 2013).

The switching time in mode for each notch setting was taken from the *Commercial Rail Yard (Davis Yard) Emission Inventory*, *Los Angeles* (Sierra Research, 2007) based on “trim” operations. The switching notch settings and associated emission rates for PM_{10} is outlined in Table -28 whilst the line haul notch settings and associated emission rates are outlined in Table 5.29. Table 5.30 outlines the air model input parameters for both switching and line haul (idling and traveling).\

5.5 Combined Emissions from VMT and Orcem

Table 5.42 below presents the unmitigated combined emissions from VMT and Orcem calculated as described earlier in this section. Again, in relation to non-fugitive (exhaust) PM_{10} and $PM_{2.5}$ emissions, levels are below the BAAQMD CEQA significance levels. However, NO_x exceeds the BAAQMD CEQA annual and average day operational emission thresholds. A discussion of the mitigation controls is outlined in Section 5.6.

Table 5.42 Annual Unmitigated Emissions of Criteria Pollutants from the Project (tons/yr)

Facility	NO_x	SO_2	PM_{10} Note 1	$PM_{2.5}$ Note 1	DPM	ROG	CO
Orcem Total (tons/yr)	31.5	1.0	0.6	0.6	0.3	2.8	17.8
VMT Total (tons/yr)	31.3	1.3	0.5	0.5	0.4	1.4	6.8
Combined Total (tons/yr)	62.8	2.3	1.1	1.0	0.7	4.2	24.6
BAAQMD CEQA Thresholds Note 2	10	N/A	15	10	10	10	N/A
Significant Under CEQA	Yes	No	No	No	No	No	No

Note 1 PM_{10} / $PM_{2.5}$ based on exhaust emissions only

Note 2 BAAQMD annual thresholds are equivalent to average daily thresholds, assuming 365 days/year operation.

5.6 Offset Combined Emissions

The combined umitigated emissions are greater than the BAAQMD significance threshold for NOx. Therefore, all feasible mitigation measures are required for NOx emitted from Project operation. The BAAQMD requires that emissions from the combination of stationary sources, ocean going vessels and rail be offset if those emissions from any facility are greater than 10 tons per year. Only NOx emissions are greater than 10 tons per year from stationary sources, ocean going vessels and rail activities at both Orcem and VMT. Subject to the ROA, VMT would be permitted by the BAAQMD, and such permitting would result in emissions offsets.

Emissions of those pollutants that are greater than 10 tons per year, but less than 35 tons per year are provided offsets by the BAAQMD small facility bank for offsets. Emissions from ocean going vessels from Orcem are 12 tons per year, rail emissions are 0.7 tons per year, and stationary sources from Orcem are 5.6 tons per year. Emissions from ocean going vessels from VMT are 18.3 tons per year and emissions from rail from VMT are 2.2 tons per year. Therefore, the BAAQMD will provide Orcem with 18.29 tons of emissions offsets and VMT with 20.56 tons of offsets for a total of 38.85 tons of offsets per year. Accordingly, these emissions are shown as offset emissions in Table 5.43. These emission offsets are estimates of the total emission offsets that will be provided by the BAAQMD upon permitting. However, the permitting will not be completed until after this EIR is certified.

These offsets, along with the pollutant reduced and the estimated reduction is contained in Table 5.43, below. The BAAQMD would be permitting Orcem and VMT shipping, and would individually provide a permit for the facility. In permitting each Orcem and VMT, the BAAQMD would provide NOx offsets from its small facility offset bank, as each Orcem and VMT are below 35 tons per year.

Table 5.43 outlines the combined annual mean emission totals (tons/yr) for the Orcem and VMT operations for each aspect of the operations, individually, and combined.

Table 5.43 Annual Emissions of Criteria Pollutants from the Combined Operations of VMT and Orcem (tons/yr).

Emissions (tons/year)	ROG	CO	NOx	Exhaust PM_{10}	Fugitive PM_{10}	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	DPM	SO_2
VMT	1.38	6.81	31.33	0.48	5.05	0.46	1.22	0.42	1.26
VMT Emissions Offsets	--	--	20.56	--	--	--	--	--	--
VMT Offset	1.38	6.81	10.77	0.48	5.05	0.46	1.22	0.42	1.26
Orcem	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03
Orcem Emissions Offsets	--	--	18.29	--	--	--	--	--	--
Orcem Offset	2.80	17.76	13.77	0.59	6.35	0.57	1.50	0.28	1.03
Orcem Plus VMT Unmitigated	4.18	24.57	63.39	1.07	11.40	1.03	2.71	0.70	2.29
BAAQMD Thresholds	10	--	10	15		10		--	--
Unmitigated Emissions Significant?	No	--	Yes	No		No		--	--
Orcem Plus VMT Offset	4.18	24.57	24.54	1.07	11.40	1.03	2.71	0.70	2.29
BAAQMD Thresholds	10	--	10	15		10		--	--
Offset Emissions Significant?	No	--	Yes	No		No		--	--

Note 1 In line with the BAAQMD CEQA threshold, the exhaust portion of PM_{10} and $PM_{2.5}$ only are outlined (Table 2.1 of the edition dated Updated May 2012). There is no operational-related significance threshold for fugitive PM_{10} / $PM_{2.5}$

A robust series of project design features described in Table ES-4 reduce air emissions from the Project. The emissions reductions from these measures are already incorporated into the emissions estimates for the Project.

6. GHG EMISSION INVENTORY

The operational phase of the development will see both Orcem and VMT operating their respective areas of the site simultaneously. The following sections have quantified the GHG emissions associated with their operations as a result of the following GHG emission generating activities:

- Port activity, e.g. ship exhaust emissions, ship unloading;
- Offroad vehicle movements on site;
- GHG emissions from emission point P-1 (Main Stack);
- Truck movements both onsite and on the local road network;
- Rail activity;
- Barge activity;
- Onsite electricity consumption.

GHG emission calculations for ship activities are included with the criteria emissions, in sections 5.2.2 and 5.4.2 for Orcem and VMT, respectively. GHG emission calculation details for the Orcem main stack are also included in section 6.2.5. GHG emissions for Orcem trucks are also included with criteria emissions, in section 5.2.6.

Consistent with the description in Section 5, the material throughput for both the Orcem and VMT projects would ramp up over time, as shown in Table 1.1. As noted earlier, the greatest air quality impact would result from the activities described in #3 in Table 1.1, where the maximum material is moved through the facilities via trucks and rail. The maximum mode will not occur until at least 2020. Accordingly, the emissions are analyzed for 2020 fleet year for the shipping scenario where 160,000 metric tonnes of material is shipped to the facility monthly via four vessels, and of that, 91,900 metric tonnes is shipped by truck, and 68,100 metric tons is shipped by rail. This is equivalent to two 100-car trans per week, or eight per month. While there may be up to 12 100-car trains per month, such a scenario would result in lower emissions, as there would be fewer truck trips. Note that the ROA would have the same number of cars, but it would be delivered in 50-car trains rather than 100-car trains.

6.1 Orcem Operational Phase

As outlined in Section 5.1, the primary raw material utilized at the Orcem Plant is granulated blast furnace slag or GBFS, a recycled beneficiated by-product from the first stage in the production of steel. It is a by-product of converting iron ore to metallic iron in a blast furnace. The resultant vitrified material (granulate), is GBFS. GBFS has the appearance and handling characteristics of a coarse beach sand. This GBFS is the primary raw material to be delivered to the Orcem site in Vallejo. At the Orcem facility this GBFS will then be further processed by drying and grinding to a very fine powder called Ground Granulated Blast Furnace Slag (GGBFS). Full details on the phasing of the project have been outlined in Section 5.1.

Emissions of CO_2, CH_4 and N_2O to the atmosphere from the Hot Air Generator will be released via a 50m stack. The emission rates were calculated based on vendor data and default USEPA AP-42 emission rates and additional conservative assumptions related to emission variability.

An estimate of the annual emission rate of the GHGs from the process emission points / transfer points onsite is outlined in Tables 6.1. The estimates are based on detailed calculations, engineering data and based on 7,600 hours of operation at maximum load (Milestone 5). Full details are outlined in Appendix AQ-EMITS. GHG emissions are estimated based on the same operational parameters that were used to estimate criteria air pollutants as described earlier.

Table 6.1 GHG Summary for Orcem, Mode 1 Milestone 5

Scenarios	Operations	CO_2 (lbs/yr)	CH_4 (lbs/yr)	N_2O (lbs/yr)
Orcem Milestone 5	Shipping (From the Sea Buoy)	1,784,870	178	103
	Hopper/Conveyor	285,099	0	0
	Unpaved Rd (Front Loader & Excavator)	1,923,733	0	0
	Industrial Paved Rd (finished product)	115,774	0.0	0.0
	Public Paved Rd	6,410,007	0	0
	Stack (Natural Gas)	30,642,803	1224	341
	Electricity (Production)	16,219,622	0.0	0.0
	Rail	258,341	21	7
	Onsite GHG Emissions (CalEEMod®)	834,598	0.0	0.0
	Total (lbs/year)	58,474,848	1,423	450
	Total CO_2e	26,601 MTs CO_2e per year		

6.2 Derivation of GHG Emission Rates for Each Emission Source in Use at the Orcem Facility

GHG emissions from the proposed Orcem facility were derived using various sources including the CARB Off-Road Emission Inventory, EMFAC2014, AP-42 and vendor data. A discussion of each mode of operation and associated emission source is outlined below.

6.2.1 Milestones & Modes of Operation

While the Orcem facility primarily will produce GGBFS, this manufacturing plant will operate in a number of finished product operational modes within any given timeframe based upon market demand for GGBFS and various cement products. These modes include:

- Mode 1 - GGBFS production only.
- Mode 2 - Cementing products production only.
- Mode 3 - GGBFS production & cement.

The material production associated with these modes, transportation options and the associated phases are summarized in Tables 5.3 – 5.5 and in Figures 5.1 – 5.6.

6.2.2 Orcem Facility - Ship Unloading

The principal raw materials to be processed at the Orcem facility will be GBFS and Clinker. These materials will arrive by ship at the proposed upgraded dock to be owned and operated by VMT. Unloading options and raw material transport options have been discussed in Section 5.2.2.

The GHG emissions associated with the transportation of GBFS from the Sea Buoy are outlined below. The frequency of vessel calls per phase has previously been outlined in Table 5.6.

The emission estimation calculation has followed the California Air Resources Board (CARB) "*Emission Estimation Methodology For Ocean-Going Vessels (OGVs)*" (*CARB, 2011)* for bulk carriers and *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009) in relation to assist tugs.

The air emission factors associated with bulk carriers were derived from the CARB OGV Marine Emissions Model for the transit operating mode for each calendar year. For bulk carriers accessing the VMT berth, slow main engine speed and 0.1% S marine distillate were assumed as shown in Tables 5.10 for main engines adjusted for maneuvering mode by the factors in Table 5.8 whilst for auxiliary engines a 0.1% S marine distillate was also assumed as shown in Table 5.11 because both the California and Emission Control Area requires that fuel sulfur level. Shown in Table 5.12 is the emission factor for boilers.

GHG emissions have been quantified for the three distinct operating modes of ocean-going vessels, namely: transit (emissions from vessels operations between ports), maneuvering (slow speed vessel operations while in port areas) and hoteling while moored to a dock.

GHG emissions have also been quantified for the two types of engines found on OGVs. The main engine is used for propulsion and is used during both transit and maneuvering modes. Auxiliary engines are used for on-board electrical power whilst smaller boilers are present to provide steam heat for fuel heating and hot water. Auxiliary engines are used in all three modes of operations (transit, maneuvering and hoteling) whilst boilers tend to be used only during maneuvering and hoteling (*CARB, 2011*).

The time in mode and load for propulsion engines was calculated based on the vessel speed and the distance traveled in each mode. The time in mode for the transit mode of the vessel was determined from the Sea Buoy to within 1.3 km of the facility.

The maneuvering mode was determined from 1.3 km from the berth to berthing. The maneuvering time was based on the distance traveled divided by speed plus 15 minutes for docking or undocking. Maneuvering inbound was assumed to occur at 5 knots whilst outbound ships were assumed to maneuver at 7 knots (*CARB, 2011).*

Hoteling was determined by the time spent at berth. Hoteling time was estimated based on the number of hours required for ship unloading to take place plus one hour before and after ship unloading. During hoteling it is assumed the ships auxiliary engine and boiler engines are in operation.

Engine power ratings and load factors for both OGVs and associated assist tugs have been outlined in Tables 5.7 – 5.16.

6.2.3 Orcem Facility - Material Unloading and Handling

The raw material transport system for unloading material from the dockside to storing in the raw material storage area has been outlined in Section 5.2.3.

A range of mitigation measures will be put in place to minimize GHG emissions as outlined in Table 6.2. Detailed emission calculations based on AP-42 and similar emission calculations associated with material handling are outlined in Appendix AQ-EMITS.

Table 6.2 Proposed Operational GHG Mitigation Measures At Orcem

Potential Source of Emissions to Air At Orcem	Operational Measure to Ensure Impacts are Minimised
Handymax Ship	0.1% Sulphur Marine Fuel Within 24nm of California coast for the main, auxiliary and boiler engines
Unpaved Rd (Front Loader & Excavator)	Machines on-site will have Tier 4 engines
Railcar movement	Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) will be used for both switching and line haul.

6.2.4 Front Loader & Excavator Offroad Engines

Up to two biodiesel (20% biodiesel - B20) powered front wheeled loader with a bucket capacity of approximately 16yd^3 and one biodiesel powered excavator will be in operation. The excavator will manage and transfer raw material from the external and internal (depending on Mode) raw material storage areas to the front wheeled loader. The exhaust and emissions associated with their operations is outlined below.

The methodology for estimating CO_2 emissions from each type of off-road equipment (front loader, excavator) is based on the following equation:

$$\text{Emissions} = \text{Pop} * \text{HP}_{ave} * \text{LF} * \text{Activity} * (\text{EF}_{zh} + \text{dr} * \text{CHrs}) \times \text{FCF} \times \text{B20}$$

Where:

Pop	=	Population
HPave	=	Maximum rated average horsepower (hp)
LF	=	load factor, unitless
Activity	=	Activity or annual operation (hr/yr)
EFzh	=	Zero-hour Emission factor (g/hp*hr)
dr	=	deterioration rate as equipment is used (gr/bhp-hr2)
CHrs	=	cumulative hours accumulated on the equipment
FCF	=	fuel control factor (% reduction) to allow for use of California diesel fuel
B20	=	biodiesel B20 emission reduction factor[18]

All front loaders and excavators used on-site by Orcem will have Tier 4 engines and likely be no older than model year 2015. Appendix AQ-EMITS details the emission calculations associated with the exhaust emissions associated with both the front loaders and excavators.

6.2.5 Process Building Emissions

The Orcem main processing plant will have the following principal components which are of significance with respect to GHG emissions:

A 36 MMBTU/hr (10.8MW) natural gas fired drier (called the Hot Gas Generator), which will produce hot air for drying incoming GBFS, this hot air stream is then directed to:

A Main Bag Filtration System, through which natural gas combustion emissions and hot air from the Vertical Roller Mill discharge.

[18] Although CARB allows for GHG reduction credits from renewable fuel sources such as biodiesel, GHG emissions for the Project were conservatively estimated without this reduction factor.

The emissions from the Hot Gas Generator and Main Bag Filter will exit the facility via emission point P-1 (Main Stack). The exit point of the stack will be at a height of 50m above ground level.

Detailed GHG emission calculations associated with the Main Emission Point (P-1) is outlined in Appendix AQ-EMITS with summary information outlined in Table 5.19.

6.2.6 Truck Movements on Local Road Network

During the operational phase of the Orcem facility there will be additional heavy truck movements to and from the site using the local road network. The truck movements will be a combination of bulk material import (as previously outlined in Table 5.20) and also the export of finished product from the facility (as previously outlined in Table 5.21). The number of truck movements serving the site therefore depends on the mode and phase of operation.

The GHG emissions associated with the movement of road haulage trucks both on-site and on public roads were calculated using the EMFAC2014 emission model (*CARB, 2014)*. The model includes the latest data on California's car and truck fleet and travel activity. The model also reflects the emission benefits of CARB's recent rulemaking including on-road diesel fleet rules, Pavley Clean Car Standards and the Low Carbon Fuel Standard. The haul truck fleet was assumed to meet the drayage truck regulations that all trucks meet 2007 or newer engines.

Emissions of CO_2 were calculated based on the number of vehicle trips per hour, the distance travelled on each specific link (each link is classified as a trip segment with a uniform traffic speed) of the trip and the link-specific emission factor. The emission factor for each link was a function of the average vehicle speed and the % of time in idling mode. Details of the modelled trip segments are outlined in Table 5.25.

Detailed emission calculations based on EMFAC2014 both on-site and on the nearby public roads is presented in Appendix AQ-EMITS.

6.2.7 Rail Movements Accessing the Orcem Facility

It is proposed that as part of this development the existing California Northern Railroad short line be upgraded with capacity for the storage of railcars and loading/unloading of materials. Rail tanker cars will be loaded at a location immediately north of the Orcem Site, along the westerly side of the main access road. Trucks will transfer materials to the railcars from the Loading Silos and Outload Building; materials arriving via rail will be transferred by enclosed pipeline to the material storage areas.

The project rail movements for Orcem are outlined in Table 3.22 broken down into raw material imports (cement only under Mode 3) and finished product exports (GGBFS under both Mode 1 and 3). Also shown in Table 3.22 is the equivalent reduction in truck movements associated with the use of rail to export GGBFS finished product.

Emission Factor Methodology for Locomotive Movements

The locomotives used at the facility will be both line-haul (long-haul trains to transport material to market and import raw material for processing) and switching locomotives which will be used to move the rail wagons to assemble the train prior to departure. During switching the engines will be in operation when moving the shuttle cars from the siding to the loading area and will be turned off outside of this time. In the case of Orcem, where 16 empty cars will be loaded over a 10 hour period, the switchers will only operate for approximately 20 minutes when empty (requiring one 700hp engine) and again when fully loaded (when three 700 hp engines will be required).

The National Railway Equipment Company will supply ultra-low emissions road-switcher locomotives for both switching and line-haul. Emission rates for GHGs were taken from the *Port of Los Angeles Emission Inventory 2012* (*POLA, 201*3).

The switching time in mode for each notch setting was taken from the *Commercial Rail Yard (Davis Yard) Emission Inventory, Los Angeles* (*Sierra Research, 2007)* based on “trim” operations. The switching notch settings and associated emission rates for CO_2 are outlined in Appendix AQ-EMITS. The line haul time in mode was based on the EPA duty cycle with the exception that Notch setting 7 & 8 are assumed not to occur within the modelling domain (rail traffic is modelled for a distance of 1.0 mile from the facility). The line haul notch settings and associated emission rates for CO_2 are also outlined in Appendix AQ-EMITS.

6.3 VMT Activities

VMT is proposing to construct a multi-phased bulk aggregate import and distribution facility on the existing terminal footprint. The general transportation method is to unload dry bulk cargo from vessels, temporarily store, and reclaim from storage to cargo trucks and railcars for local and regional distribution. A detail project description is outlined in Section 5.3.

An estimate of the annual emission rate of GHGs from the emission points / transfer points onsite is outlined in Table 6.3. The estimates are based on detailed calculations, engineering data and based on 5,760 hours of operation at maximum load (Phase 1 Alternative). Full details are outlined in Appendix AQ-EMITS.

Table 6.3GHG Summary for VMT, Phase 1 Alternative

Scenarios	Operations	CO_2 (lbs/yr)	CH_4 (lbs/yr)	N_2O (lbs/yr)
	Shipping (Sea Buoy to Dock)	2,762,910	270.3	154.5
	Barge	0	0	0
	Unpaved Rd (Forklift)	84,223	0	0
	Unpaved Rd (Front Loader & Excavator)	1,208,321	0	0
	Industrial Paved Rd (finished product)	75,260	0	0
	Public Paved Rd	5,097,129	0	0
	Rail	838,567	66.8	21.9
	Onsite GHG Emissions (CalEEMod®)	592,399	0	0
	Total ()	10,658,808	337	176
	Total Metric Tonnes	4,863 MTs CO_2e / year		

6.4 Derivation of GHG Emission Rates for Each Emission Source in Use at the VMT Facility

GHG emissions from the proposed VMT facility were derived using various sources including the CARB Off-Road Emission Inventory, EMFAC2014, AP-42 and vendor data. A discussion of each phase of development and associated emission source is outlined below.

6.4.1 Phases of Operation

Based on anticipated cargoes and the class of ship commonly used to transport such cargoes, at full capacity the Phase 1 wharf will accommodate an average of four berthings per month, handling one vessel at a time. This volume assumes a 5-6 day loading or unloading time per vessel. Vessels will be moored at the wharf on average from 5 to 7 days. During the time that vessels are moored at the facility, 24-hour operations will be conducted for off-loading or loading of cargo. Other VMT Terminal operations will be scheduled as two ten-hour shifts per day, six days per week. Full details of the phases of operation is outlined in Section 5.4.1.

6.4.2 VMT Facility - Ship Unloading & Barge Loading

VMT is primarily expected to receive and discharge self-unloading, Handimax to Panamax class ships in loads of up to approximately 40,000 MTs of sand and gravel.

The GHG emissions associated with the transportation of GBFS from the Sea Buoy was calculated based on the methodology outlined in the CARB *Emission Estimation Methodology For Ocean-Going*

Vessels (OGVs) (CARB, 2011). Full details are outlined in Section 5.2.2 and in Tables 5.7 – 5.13. The frequency of vessel calls per phase is outlined in Table 5.25.

Tug boat emissions were calculated using the Appendix B - *Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009).

It was assumed that two tug boats were required both inward and outward to escort the Handymax bulk carrier to the port using the methodology outlined in Section 5.2.2. Detailed emission calculations for each pollutant are outlined in Appendix AQ-EMITS.

Ocean-going self-propelled barges are envisaged for phase 2 of the project of nominal capacity of 14,000 tons. Barge emissions were calculated using the *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California* (CARB, 2009) and information contained in the *Port of Oakland 2012 Seaport Air Emission Inventory* (ENVIRON, 2013). Detailed emission calculations for each pollutant are outlined in Appendix AQ-EMITS.

6.4.3 VMT Facility - Material Unloading and Handling

A range of mitigation measures will be put in place to minimize GHG emissions as outlined in Table 6.4. Detailed emission calculations based on AP-42 and similar emission calculations associated with material handling is outlined in Appendix AQ-EMITS.

Table 6.4 Proposed Operational GHG Mitigation Measures At VMT

Potential Source of Emissions to Air At VMT	Operational Measure to Ensure Impacts are Minimised
Handymax Ship	0.1% Sulphur Marine Fuel Within 24nm of California coast for the main, auxiliary and boiler engines
Unpaved Rd (Front Loader & Fork Lift)	Machines on-site will have Tier 4 engines
Railcar movement	Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) will be used for both switching and line haul. Reduction of 80-90% in PM_{10} compared to Tier II EPA emission rates.
Note 1: These mitigation measures reduce emissions of black carbon, which is recognized as a Short-Lived Climate Pollutant (SCLP) by CARB. See: http://www.arb.ca.gov/cc/shortlived/shortlived.htm	

6.4.4 VMT Facility - Front Loader & Fork Lift Offroad Engines

Up to two biodiesel (B-20) powered front wheeled loader with a bucket capacity of approximately 16yd^3 and up to two biodiesel (B-20) powered forklifts will be in operation under Phase 1 & 2 of the development. The loader will transfer sand / aggregate from the raw material storage areas to rail, truck or barge loading hoppers.

The methodology for estimating CO_2 emissions from each type of off-road equipment (front loader, fork lift) is based on the formula outlined in Section 7.2.4.

The Off-Road Emission Factors for Off-road Sources, based on OFFROAD2011 is based on an equipment model year of 2015. All front loaders and forklifts used on-site by VMT will use Tier 4 engines and likely be no older than model year 2015. Appendix AQ-EMITS details the emission calculations associated with exhaust emissions associated with both the front loaders and forklifts.

6.4.5 VMT Facility - Truck Movements on Local Road Network

During the operational phase of the VMT facility there will be additional heavy duty truck movements to and from the site using the local road network. The truck movements will entail a range of materials although principally sand and aggregate initially. The number of truck movements accessing the facility will be dependent on the phasing of the development and the tonnage of material imported as outlined in Tables 5.33 and 5.34. Tables 5.41 and 5.42 outline the diurnal pattern of truck movements during operational days along the local haul routes.

The GHG emissions associated with the movement of road haulage trucks both on-site and on public roads was calculated using the EMFAC2014 emission model. The model includes the latest data on California's car and truck fleet and travel activity. The model also reflects the emission benefits of CARB's recent rulemaking including on-road diesel fleet rules, Pavley Clean Car Standards and the Low Carbon Fuel Standard. And the haul trucks were assumed to comply with the drayage truck regulations.

Emissions of CO_2 were calculated based on the number of vehicle trips per hour, the distance travelled on each specific link (each link is classified as a trip segment with a uniform traffic speed) of the trip and the link-specific emission factor. The emission factor for each link was a function of the average vehicle speed and the % of time in idling mode. Details of the modelled trip segments are outlined in Table 3-21.

Detailed emission calculations based on EMFAC2014 both on-site and on the nearby public roads is presented in Appendix AQ-EMITS.

6.4.6 VMT Facility - Rail Movements Accessing

As outlined in Section 5.2.7, it is proposed that as part of this development the line will be upgraded with capacity for the storage of railcars and loading/unloading of materials.

An area for transferring goods and materials between railcars and trucks ("Rail Transloading" area) will be established. This common mobile system makes it possible for both VMT and Orcem to load and unload railcars, while maximizing the efficiency of lay-down areas for VMT ship and barge cargoes.

Processing and movement of bulk cargo through the use of rail transportation serving the combined VMT Terminal Phases 1 and 2 will require up to 8 monthly unit trains of up to 100 cars per episode (800 total monthly cars). The Rail Transloading area has a capacity to accommodate up to sixteen (16) railcars for loading at any one time. The existing California Northern Railroad track spurs that adjoin the VMT Site's northerly entrance will be used to store railcars during the loading process. The VMT Project anticipates the use of 2 switch-mobiles or a small locomotive to handle railcar movements on the VMT Site and to and from the California Northern Railroad track spurs adjacent to the Site.

The locomotives used at the facility will be both line-haul (long-haul trains to transport material to market and import raw material for processing) and switching locomotives which will be used to move the rail wagons to assemble the train prior to departure. During switching the engines will be in operation when moving the shuttle cars from the siding to the loading area and will be turned off outside of this time. In the case of VMT, where 100 empty cars will be loaded over a 20 hour period in batches of 16 cars (6.25 switches in total), the switchers will only operate for approximately 90 minutes when empty (requiring one 700hp engine) and again when fully loaded (when three 700 hp engines will be required).

The National Railway Equipment Company will supply ultra-low emissions road-switcher locomotives for both switching and line-haul. Emission rates for GHGs were taken from the *Port of Los Angeles Emission Inventory 2012* (*POLA, 201*3).

The switching time in mode for each notch setting was taken from the *Commercial Rail Yard (Davis Yard) Emission Inventory, Los Angeles* (*Sierra Research, 2007)* based on "trim" operations. The switching notch settings and associated emission rates for CO_2 are outlined in Appendix AQ-EMITS. The line haul time in mode was based on the EPA duty cycle with the exception that Notch setting 7

& 8 are assumed not to occur within the modelling domain (rail traffic is modelled for a distance of 1.0 mile from the facility). The line haul notch settings and associated emission rates for CO_2 are also outlined in Appendix AQ-EMITS.

6.5 Summary of GHG Emissions

A summary of GHG emissions associated with Orcem and VMT, broken down in to their respective sources, is outlined in Table 6.5. Table 6.5 also includes indirect GHG emissions associated with on-site electricity consumption.

Table 6.5 GHG Summary for Combined Orcem / VMT Emissions

Scenarios	Operations	CO_2 (lbs/yr)	CH_4 (lbs/yr)	N_2O (lbs/yr)
Orcem Mode 1 Milestone 5 & VMT Phase 2 Alternative	Shipping	4,547,780	448.05	257.5
	Hopper Conveyor	285,099	0	0
	Unpaved Rd (Forklift)	84,223	0	0
	Unpaved Rd (Front Loader & Excavator)	3,132,054	0	0
	Industrial Paved Rd (finished product)	191,034	0	0
	Public Paved Rd	11,507,136	0	0
	Stack (Natural Gas)	30,642,803	1,224	341
	Electricity (Production)	16,219,622	0	0
	Rail	1,096,908	88	29
	Onsite GHG Emissions (CalEEMod®)	1,426,997	0	0
	Total (lbs/year)	69,133,656	1,760	627
	Total Metric Tonnes	31,463 MTs CO_2e / year		

6.6 Comparison with Cement GHG Emissions

There is a growing worldwide awareness of the need to limit global warming by reducing greenhouse gas emissions. California is a world leader in this initiative. In 2006 the Global Warming Solutions Act (AB 32) established by law the goal to reduce GHG emissions by 2020 to the level they were at in 1990 and tasked the CARB to produce a scoping plan as to how this should be achieved.

ARB identified the cement industry as a significant source of greenhouse gas emissions and placed the industry on its list of areas for development of early action measures to reduce such emissions. The major opportunities for GHG emission reductions involved replacing some of the ordinary portland cement with other materials including GGBFS.

Overall the production of GGBFS has only a small fraction of the impact on the environment compared with the production of ordinary portland cement. A report by The Loreti Group entitled "*Greenhouse Gas Emission Reductions from Blended Cement Production*" (Loreti Group, 2008) prepared for the California Climate Action Registry found that the GHG emission intensity varied across the USA from a high of 1.4 MTs of CO_2 / MT of cement for Kansas to a low of around 0.75

tonnes of CO_2 / MT of cement for Maryland with a mean value of 0.904 tonnes of CO_2 / MT of cement. The cement industry has also published figures suggesting a similar figure. The presentation "*Industry Background and Overview*" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 indicated that currently the emission factor for calcinations and fuel usage in cement production amounted to 0.86 tonnes of CO_2 / MT of cement. Shipping was not taken into account in this estimation.

Outlined in Table 6.6 is the equivalent CO_2 emissions associated with cement production based on the proposed GGBFS tonnages in Mode 1, Milestones 1 – 5 and using the figure of 0.86 tonnes of CO_2 / MT of cement.

Table 6.6 Annual CO_2e Emissions Associated With the Production of Cement Based on the Tonnages for Orcem Mode 1 Milestone 5 (MTs)

Orcem Mode	Milestone	Equivalent CO_2 emissions associated with Cement Production (MTs)
		GGBFS
1	1	94,000
	2	178,100
	3	252,310
	4	316,620
	5	501,320

Table 6.7 represents the anticipated savings that can typically be obtained from the production of GGBFS based on the throughput of the proposed Orcem Project in Mode 1 Milestones 1 – 5.

Table 6.7 Annual CO_2 Savings Associated With the Production of GGBFS by Orcem (MTs)

Orcem Mode	Milestone	GGBFS Tonnage Produced (MTs)	Equivalent CO_2 emissions associated with Cement Production (MTs)[Note 1]	CO_2 emissions associated with GGBFS (MTs)	Savings in terms of CO_2e (MTs)
1	1	109,299	94,000	8,010	85,987 (91% reduction)
	2	207,093	178,100	15,687	162,413 (91% reduction)
	3	293,381	252,310	23,309	228,999 (91% reduction)
	4	368,165	316,620	31,047	285,575 (90% reduction)
	5	582,928	501,320	48,581	452,737 (90% reduction)

[Note 1] 0.86 tonnes of CO_2 / MT of cement based on the presentation "*Industry Background and Overview*" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport) .Note that GHG emissions associated with GGBFS also includes GHG emissions resulting from shipment of materials from Japan, to ensure a conservative comparison.

In relation to the production of GGBFS by Orcem, the GHG emission savings when compared to greenhouse gas emissions from cement production are substantial. As shown in Table 6.7, the average percentage saving compared to portland cement production is greater than 90% and amounts to approximately 450,000 MTs of CO_2e for Mode 1 Milestone 5.

In relation to Mode 2, the production of cement from clinker by Orcem will lead to a more modest GHG emission savings when compared to greenhouse gas emissions from cement production. As shown in Table 6.8, the average percentage saving compared to portland cement production is greater than 3% and amounts to approximately 27,000 MTs of CO_2e for Mode 2 Milestone 5.

Table 6.8 Annual CO_2 Savings Associated With the Production of Cement from Clinker by Orcem (Mode 2) (MTs)

Orcem Mode	Milestone	Cement Tonnage Produced (Metric tonnes)	Equivalent CO_2 emissions associated with Cement Production (MTs)Note 1	Orcem CO_2 emissions associated with Clinker Production (MTs)	Savings in terms of CO_2e (MTs)
2	1	133,333	114,666	110,815	3,852 (3.4% reduction)
	2	266,667	229,334	221,636	7,698 (3.4% reduction)
	3	400,000	344,000	332,441	11,559 (3.4% reduction)
	4	533,333	458,666	441,607	17,060 (3.7% reduction)
	5	844,444	726,222	699,149	27,073 (3.7% reduction)

Note 1 0.86 tonnes of CO_2 / MT of cement based on the presentation "*Industry Background and Overview*" presented by Tom Pyle (CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport) Note that GHG emissions associated with GGBFS also includes GHG emissions resulting from shipment of materials from Japan, to ensure a conservative comparison.

Mode 3 operations will involve the production of mainly GGBFS from GBFS with some additional cement imported / exported from the facility. Under this mode of operation, GHG emission savings when compared to greenhouse gas emissions from purely portland cement production will be significant. As shown in Table 6.9, the average percentage saving compared to portland cement production is greater than 70% and amounts to approximately 450,000 MTs of CO_2e for Mode 3 Milestone 5.

Table 6.9 Annual CO_2 Savings Associated With the Production of GGBFS / Cement by Orcem (Mode 3) (MTs)

Orcem Mode	Milestone	Cement Tonnage Produced (Metric tonnes)	Equivalent CO_2 emissions associated with Cement Production (MTs)Note 1	Orcem CO_2 emissions associated with GGBFS / Cement Production (MTs)	Savings in terms of CO_2e (MTs)
3	1	175,052	150,545	58,922	91,623 (61% reduction)
	2	310,103	266,689	83,214	183,475 (69% reduction)
	3	445,155	382,833	107,491	275,343 (72% reduction)
	4	488,165	419,822	131,907	287,915 (69% reduction)
	5	702,928	604,518	148,240	456,278 (75% reduction)

Note 1 0.86 tonnes of CO_2 / MT of cement based on the presentation "*Industry Background and Overview*" presented by Tom Pyle

(CAT Cement Sub-Group Leader) at the CARB AB32 meeting in 2008 (emission factors for calcination and fuel usage in cement production combined with no allowance for transport)

In summary, all proposed modes of operation will lead to GHG savings when compared to portland cement manufacturing. Although the savings in regards to Mode 2 are quite modest, it is the intention of Orcem to primarily operate in either Mode 1 or Mode 3 with Mode 2 available under circumstances that the principle raw material, GBFS, is not available.

7. LOCAL CO CONCENTRATIONS

The BAAQMD Thresholds of Significance for local CO emissions is the 1- and 8-hour California Ambient Air Quality Standards (CAAQS) of 20.0 ppm and 9.0 ppm, respectively. By definition, these represent levels that are protective of public health. If a project would cause local emissions of CO to exceed any of the thresholds listed below, the proposed project would result in a significant impact to air quality.

Because CO impacts have been historically related to automobile idling at intersections, the BAAQMD CEQA Guidelines contain a preliminary screening methodology that provides a conservative indication of whether the implementation of the proposed project would result in CO emissions that exceed the Thresholds of Significance based on automobile traffic at intersections. However, these screening criteria do not apply to proposed stationary source projects.

For this project, there would be CO emissions from Orcem's stationary source, rail traffic, truck traffic, onsite mobile equipment, and ship traffic. The CO impacts from truck and rail traffic are expected to be very low because both truck and rail traffic emissions are stringently controlled. BAAQMD screening thresholds for on-road CO concentrations are based on traffic volume at intersections; no intersections near the Project exceed the threshold as a result of the Project. The impact from vessels hotelling at the VMT dock, and the stationary source equipment have the greatest potential to result in offsite impacts of CO.

Accordingly, the CO impact evaluation was conducted assuming that a single ocean going vessel is docked, and, for the one-hour standard, the main and auxiliary engine are operating. For the eight-hour standard, it is assumed that the auxiliary engine is operating for the entire 8 hour period. Otherwise, long term emissions estimates are used to estimate the potential for short term CO exceedances. The result of that evaluation are shown below in Table 7.1 below, and show that the maximum offsite concentration of CO is well below the BAAQMD significance thresholds. Appendix AQ-MODEL contains the evaluation conducted to estimate the maximum CO concentrations.

Table 7.1: Results of Evaluation of Thresholds of Significance for Local Carbon Monoxide Emissions

CAAQS Averaging Time	Threshold Concentration (ppm)	Estimated Concentration (ppm)
1-Hour	20	7
8-Hour	9.0	4

8. RISKS AND HAZARDS

The BAAQMD has adopted project and cumulative thresholds for three risk-related air quality indicators: cancer risks, non-cancer hazards, and increases in ambient air concentrations of $PM_{2.5}$. The BAAQMD adopted significance thresholds and the evaluations undertaken to evaluate the Project's and ROA consistency with these air quality indicators are described in this section.

8.1 Project Cancer Risks and Hazards

To assist the lead agency in evaluating air quality impacts at the community scale, thresholds of significance have been adopted by the BAAQMD for local community risks and hazards associated with TACs and $PM_{2.5}$ with respect to siting a new source and/or receptor, as well as for assessing both individual source and cumulative multiple source impacts. These thresholds of significance focus on $PM_{2.5}$ and TACs because these more so than other emission types may pose significant adverse health impacts at the local level as discussed separately below.

The emissions of TACs and $PM_{2.5}$ are evaluated based on the health impacts that may result from the emissions of TACs and $PM_{2.5}$. The health impacts associated with TACs are quite diverse and generally are assessed locally, rather than regionally. TACs (and $PM_{2.5}$) can cause long-term health impacts such as cancer, birth defects, neurological damage, asthma, bronchitis, or genetic damage; or short-term acute affects such as eye watering, respiratory irritation (a cough), running nose, throat pain, and headaches.

For evaluation purposes, TACs are separated into carcinogens and noncarcinogens based on the nature of the physiological impacts associated with exposure to the pollutant. Carcinogens are assumed to have no safe threshold below which health impacts would not occur, and cancer risk is expressed as excess cancer cases per one million exposed individuals, typically over a lifetime of exposure. Non-carcinogenic substances differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis. Acute and chronic exposure to non-carcinogens is expressed as a hazard index (HI), which is the ratio of expected exposure levels to an acceptable reference exposure levels.

The BAAQMD's adopted thresholds of significance for local community risk and hazard impacts are identified below. Local community risk and hazard impacts are associated with TACs and $PM_{2.5}$ because emissions of these pollutants can have significant adverse health impacts at the local level. Impacts were assessed at all nearby residences, as well as BAAQMD-designated sensitive receptors, such as schools, hospitals, and day care centers. The sensitive receptors included in this analysis can be found in Appendix AQ-HRA. If project-related emissions of TACs or $PM_{2.5}$ exceed any of the thresholds in Table 8.1, it would exceed the BAAQMD Thresholds and may result in a significant impact.

The evaluation of project and cumulative cancer risks and hazards was conducted by Ramboll Environ and AWN, and is contained in Appendix HRA. The health risk assessment was conducted incorporating dispersion modeling consistent with BAAQMD Guidelines and health risk assessment methods consistent with Office of Environmental Health Hazard Assessment (OEHHA) methods as adopted by the BAAQMD[19]. The results of that assessment are contained in Table 8.1. The largest contributing sources to health risks include ship auxiliary engines, on-site equipment such as front end loaders, and trucks.

[19] In March 2015, OEHHA promulgated new guidance for Health Risk Assessments. The BAAQMD has not yet fully adopted the new guidance. This analysis was conducted in accordance with the current BAAQMD recommendations.

Table 8.1 Project Health Risks and BAAQMD Adopted Significance Thresholds

BAAQMD Threshold	Threshold	Units	Estimated Value (unmitigated)	Significant?
Project Cancer Risk	10.0	In a million	13.3	Yes (unmitigated)
Project Non-Cancer Acute HI	1.0	Unitless	0.01	No
Project Non-Cancer Chronic HI	1.0	Unitless	0.1	No
Project $PM_{2.5}$ Concentration	0.3	$\mu g/m^3$	0.13	No

The above risks were calculated at maximum operation (as determined by the number of ship calls) with no additional mitigation beyond the use of a 20% biodiesel blend for all diesel operated equipment. As presented in Table 8.2, the Project and ROA cancer risk is less than significant based on the BAAQMD Thresholds at this level of mitigation until the average number of ship calls exceeds 28 ships per year (assuming 19 Orcem ship calls and the remainder VMT). In order to not exceed this annual average and maintain consistency with BAAQMD adopted thresholds, additional mitigation measures are required. Potential mitigation measures include:

Increased fraction of biodiesel in diesel-powered equipment

Replacing diesel-powered front-end loaders with natural gas Compressed Natural Gas (CNG) units

Replacing diesel-powered mobile conveyors and hoppers with electric-powered units

Replacing a diesel-powered forklift with an electric unit

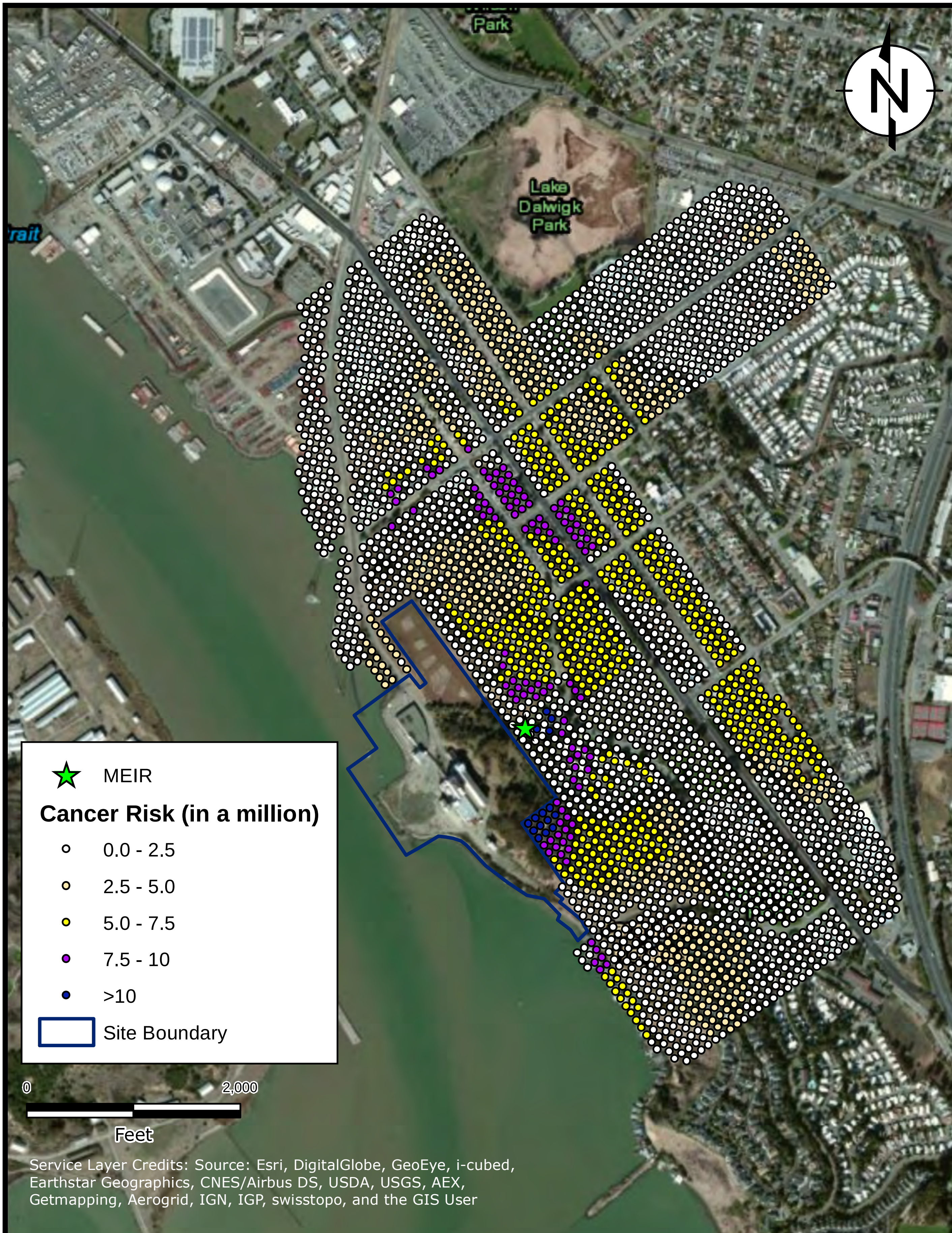
As described in Appendix HRA, emissions associated with mitigated equipment scale with the number of ship calls, depending on whether Orcem or VMT operate the equipment. For example, in the mitigation scenarios evaluated in this report, only the number of VMT ship calls is adjusted, thus only diesel emissions from VMT equipment are affected. Mitigated cancer risk for various scenarios are presented in Table 8.2, along with the maximum average ship calls per year allowable under each scenario before additional mitigation is required. These scenarios apply equally to both the Project and the ROA. Mitigation measures in Table 8.2 are intended to allow a choice of technologies based on the most cost-effective measures available at the time of implementation.

Table 8.2 Mitigation Measure Summary

Mitigation Measures	Maximum Residential Cancer Risk at Full Capacity of 48 Ships (in a million)[1]	Maximum Number of Ship Calls for Less than Significant Impact	Mitigated Residential Cancer Risk at Maximum Ship Calls (in a million)[1]
20% Biodiesel in all on-site equipment (Base Case)	13.34	28	9.92
100% Biodiesel in conveyors and hoppers, 20% Biodiesel in all other on-site equipment	11.96	36	9.91
20% Biodiesel in all equipment, with Orcem natural gas-fueled (CNG) front end loaders (FELs)	10.17	47	9.995
20% Biodiesel in all equipment, with Orcem and VMT CNG FELs	9.39	48 (full capacity)	9.39
100% Biodiesel in conveyors and hoppers, 20% Biodiesel in forklift and VMT FEL, Orcem CNG FELs	9.74	48 (full capacity)	9.74

[1] Due to relative contributions from different sources (onsite equipment, ship hotelling, trucks, etc), the location of the MEIR may vary with the number of ship calls and mitigation measures. The values presented here represent the maximum residential risk for each scenario.

The full risk results for the base case and mitigated case (with Orcem and VMT CNG FELs) are presented in Figures 8.1 and 8.2, respectively. Both maps represent risk results at the full complement of 48 ship calls per year. As noted in the table above, the location of the MEIR changes between the two scenarios. This is due to the large contribution of the front end loaders in the base case, which is completely mitigated by the use of CNG fuel. As a result, the MEIR for the mitigated scenario is mostly impacted by ship hoteling emissions.



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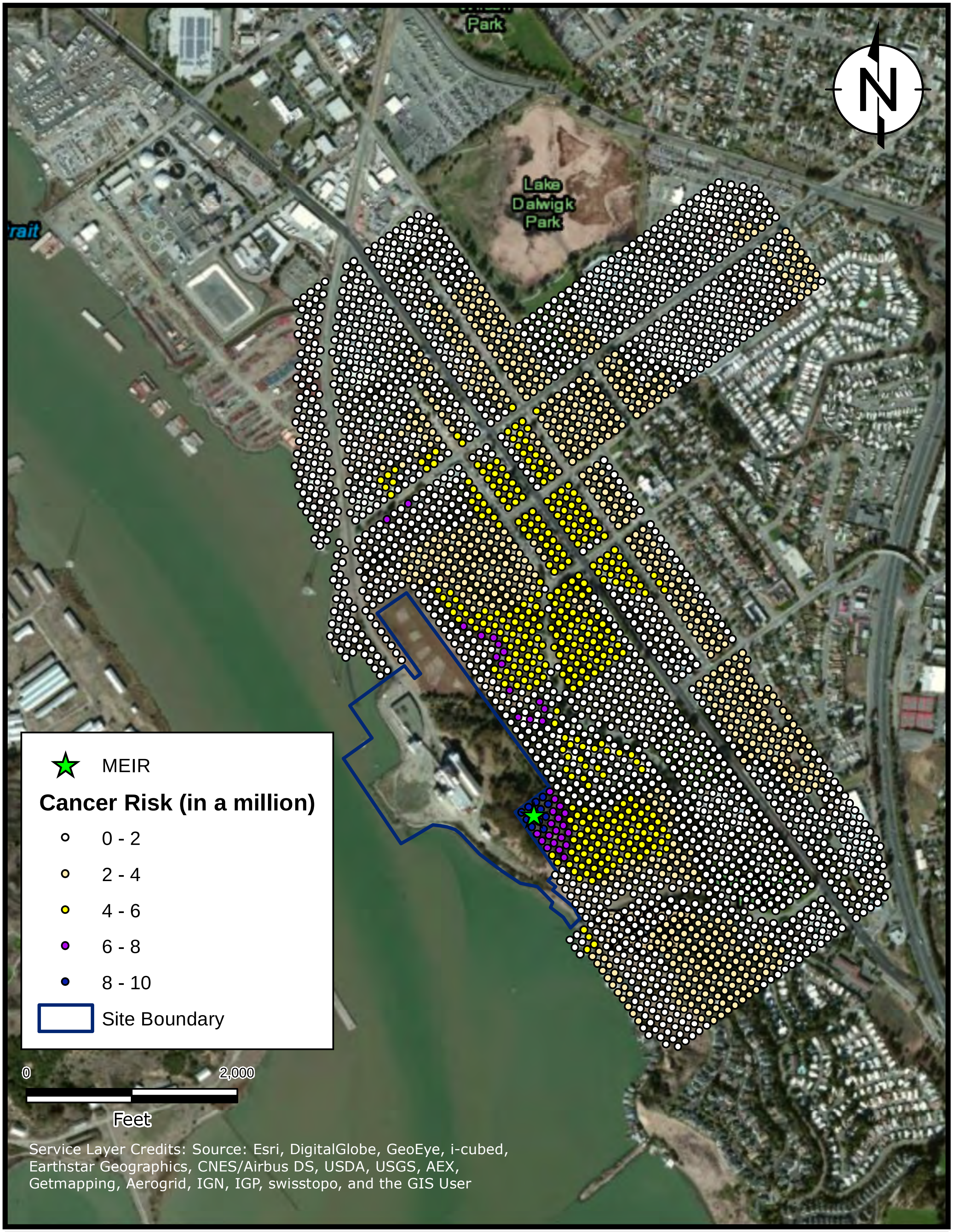
RAMBOLL ENVIRON

DRAFTED BY: MJH | DATE: 7/1/2015

Unmitigated Full Operations (48 Ships) Risks
Orcem-VMT
Vallejo, California

FIGURE

0336906A



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RAMBOLL ENVIRON

DRAFTED BY: MJH | DATE: 7/1/2015

Mitigated Full Operations (48 Ships) Risks
Orcem-VMT
Vallejo, California

FIGURE

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8.2 Cumulative Risks and Hazards

The maximum mitigated excess cancer risk from the Project and ROA (Orcem and VMT operation) was calculated to be 9.74 in a million, which is below the BAAQMD significance threshold of an increased cancer risk of greater than 10.0 in one million. Additionally, acute and chronic non-cancer health effects would be below the BAAQMD significance threshold of a hazard index greater than 1.0.

According to the BAAQMD's adopted Guidelines (BAAQMD, 2012), for evaluating cumulative risks, permitted stationary sources of TACs near the project site were identified using BAAQMD's *Stationary Source Risk and Hazard Analysis Tool* for sources in Napa-Solano counties. This mapping tool uses Google Earth to identify the location of stationary sources and their estimated screening level cancer risk and hazard impacts. Three stationary sources within a 0.5 mile radius of the Project site were identified:

> Plant G10729 is the Discount Gas Grocery & Liquor located at 605 Magazine Street, approximately 1,300 feet northeast of the Project boundary. This gas station has a cancer risk value of 4.02, a hazard value of 0.004, and no $PM_{2.5}$ value associated with it.
>
> Plant 16677 is Original Display Fixtures located at 206 Lemon Street, about 600 feet northwest of the Project boundary. There are no cancer risk, hazard or $PM_{2.5}$ values associated with this source.
>
> Plant 17907 is the Sousa Solano Auto Body & Paint shop located at 407 Lemon Street, about 970 feet north of the Project boundary. There are no cancer risk, hazard or $PM_{2.5}$ values associated with this source.

It is assumed that both Plants 16677 and 17907 would not contribute to cumulative risks or hazards. For Plant G10729 it is highly unlikely that the gas station will significantly contribute to any significant cumulative cancer risk or hazard when combined with either the Project's or the ROA's cancer risks and hazards since the BAAQMD Thresholds for significant cumulative risk, shown in Table 8.3, are a cancer risk of greater than 100 in a million and a hazard index of greater than 10.0 for all local sources combined.

Table 8.3 Cumulative Health Risks and Significance Thresholds

BAAQMD Threshold	Threshold	Units	Estimated Value (unmitigated)	Significant?
Cumulative Cancer Risk	100	In a million	17	No
Cumulative Non-Cancer Chronic HI	10.0	Unitless	0.1	No
Cumulative $PM_{2.5}$ Concentration	0.8	$\mu g/m^3$	0.13	No

Based on the above, the Project and the ROA would both be in compliance with the BAAQMD's adopted Thresholds for Single Source and Cumulative community risks, as well as hazard index risks. We therefore conclude that the Project and ROA would have a less-than-significant health risk impact.

9. ODORS

The BAAQMD does not have an adopted odor threshold for operational activities, but does recommend screening criteria based on distance between types of sources known to generate odor and the receptor. For projects outside the screening distance, and with no known potential odor sources, no additional analysis is required. For projects within the screening distances, the BAAQMD uses the following threshold for project operations:

An odor source with five (5) or more confirmed complaints per year averaged over three years is considered to have a significant impact on receptors within the screening distance shown in the Bay Area Air Quality Management District's guidance, Table 3.3.

The project is not considered a receptor for odors. During construction, the various diesel powered vehicles and equipment in use on-site would not be a typical source of objectionable odors. However, the application of architectural coatings and the paving of parts of the site with asphalt have the potential to cause odors. However, these odors would be temporary and not likely to be noticeable for extended periods of time much beyond the project's site boundaries.

The BAAQMD 2010 Guidelines identify wastewater treatment plants, oil refineries, or other types of asphalt plants, chemical manufacturing, painting/coating operations, coffee roasters, food processing facilities, recycling operations and metal smelters as odor sources that could potentially be located in heavy industrial land uses. The project would not include any of these operations. Consequently, the Project is not considered to have a potential significant odor impact and additional evaluation of the potential for odor impacts was not conducted.

10. REFERENCES

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/24/ USEPA (2009) AERMOD Implementation Guide Last Revision March 19, 2009.
/25/ Western Governors' Association (WRAP,2006) WRAP Fugitive Dust Handbook

APPENDIX CONST

ORCEM VALLEJO GGBFS PLANT CONSTRUCTION AIR QUALITY ANLYSIS VALLEJO, CALIFORNIA

August 10, 2014

♦ ♦ ♦

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Introduction

The purpose of this report is to address air quality and greenhouse gas emission impacts associated with the construction of the proposed Orcem Vallejo GGBFS Plant. The Orcem facility will include approximately 75,000 square feet of buildings and equipment, together with outdoor storage areas. The project will be located on approximately 4.83 acres of the former General Mills plant site at 800 Derr Avenue. The Orcem facilty would produce "green" cement that is technically known as ground granulated blast furnace slag (GGBFS).

The proposed Vallejo Marine Terminal (VMT) project would accommodate the Orcem project, since the GGBFS material is planned to be provided to the plant by ship through the terminal. Therefore, emissions from construction of the VMT project are also included in this analysis. The VMT project would reestablish the use of the marine industrial portion of the former General Mills facility at 790 Derr Avenue. The vacant facility includes deteriorated wharfs. The VMT project would remove the deteriorated timber wharf and construct a modern deep water terminal that includes wharf improvements, laydown areas, trucking access, and rail connections. The project proposes reuse of several existing buildings.

Air quality impacts due to temporary construction emissions from these projects were predicted. On-site construction emissions were computed using the California Emissions Estimator Model (CalEEMod) version 2013.2.2. Tug boat emissions associated with dredging were computed using emission factors developed by the California Air Resources Board (CARB). Resulting community risk and hazard impacts associated with these emissions were evaluated as part of a health risk assessment (HRA). Impacts from this activity were evaluated using significance thresholds adopted by the Bay Area Air Quality Management District (BAAQMD) in 2010 and published in their 2011 CEQA Air Quality Guidelines[1].

Results of this assessment are meant to supplement the air quality analysis for these projects that is being prepared by AWN Consulting for Orcem California, Inc. That report provides a more detailed description of the projects and provides a report on the air quality impacts associated with the projects. This report provides focuses on the calculation of air pollutant and GHG emissions and their associated community risk and hazard impacts.

Project Description

Orcem California

The Proposed Orcem Project would consist of the following primary construction components: (1) Preparation of the Site, including demolition of the 7 remaining structures formerly utilized by General Mills situated within the Orcem Site; (2) Development of the enclosed milling plant, including major buildings, storage facilities, conveyance systems and processing equipment; (3) Construction of ancillary buildings such as the "Outload" and "Storage Silo" Buildings; and (4) Improvement of site infrastructure and supporting facilities, including fire hydrants, storm water management improvements, and equipment for loading and unloading of rail cars. The project will be constructed in phases to coincide with the growth in demand for Orcem's products. Construction of the new project facilities will include separate buildings and major pieces of equipment. These improvements provide for a total building area of approximately 72,500 square feet.

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[1] Bay Area Air Quality Management District. 2011. *BAAQMD CEQA Air Quality Guidelines*. May.

Vallejo Marine Terminal

The VMT Terminal involves two separate phases of construction based on projected growth of cargo over the first several years of operations:

Phase 1

Replacement of the severely deteriorated timber wharf with a concrete pile supported wharf with structural concrete deck, associated mooring and fender systems, and related improvements for deep-water marine transportation operations. This would include approximately 22,000 cubic yards of solid fill, most of which is which is within the footprint of the existing wharf. It is anticipated that the engineered fill will come exclusively from recycled material made available on-site through the demolition and processing of several existing structures. Minimal dredging of approximately 20,000 cubic yards will be required, subject to a permit from the U.S. Army Corps of Engineers (the Corps), for the initial establishment of the design depth of -38 feet Mean Lower Low Water (MLLW) in accordance with the Pile Supported Pier Layout. In addition to the wharf construction, Phase 1 improvements will include the installation of a steel maintenance shed, upgrading and realignment of the existing rail service on the site, completion of various site improvements within the 10.5-acre deep water terminal project area. The existing Warehouse Building will be demolished in order to accommodate rail access and an area for transferring goods and materials to or from rail cars, and to establish efficient terminal logistics. As shown in Appendix A-6, a mobile wheel loader reclaim hopper will be positioned opposite the Orcem Plant (between VMT Phase 1 and 2 boundaries), and connected to a rail car loading station via an enclosed transfer conveyor. This common mobile system makes it possible for both VMT and Orcem to load and unload rail cars, while maximizing the efficiency of lay-down areas for VMT ship and barge cargoes. Trucks will be loaded via front end loader.

Phase 2

A second concrete pile supported wharf with structural concrete deck, and associated mooring and fender systems, for shallower draft barge operations is planned under Phase 2. A rip-rap dike will be constructed along the shoreward alignment of the wharf, and fill will be placed from the existing shoreline out to the dike. Phase 2 will include approximately 115,000 cubic yards of solid fill. Dredging of approximately 65,000 cubic yards will also be required, pursuant to a Corps permit, as part of Phase 2 to establish a berthing depth of -25 feet to -38 feet MLLW.

Setting

The Bay Area Air Quality Management District (BAAQMD) is the regional agency tasked with managing air quality in the region. At the State level, the California Air Resources Board (a part of the California Environmental Protection Agency) oversees regional air district activities and regulates air quality at the State level. The BAAQMD has published CEQA Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.[2]

The project is located in the western portion of Solano County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the State and federal level. The Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$).

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROG) and nitrogen oxides (NOx). These precursor pollutants react under certain meteorological conditions to form high

[2] Bay Area Air Quality Management District. 2011. BAAQMD CEQA Air Quality Guidelines. May.

ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant of the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic air contaminants (TAC) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants listed above. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, state, and Federal level.

Diesel exhaust is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the CARB, diesel exhaust is a complex mixture of gases, vapors and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB, and are listed as carcinogens either under the state's Proposition 65 or under the Federal Hazardous Air Pollutants programs.

CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of DPM. Several of these regulatory programs affect medium and heavy duty diesel trucks that represent the bulk of DPM emissions from California highways. These regulations include the solid waste collection vehicle (SWCV) rule, in-use public and utility fleets, and the heavy-duty diesel truck and bus regulations. In 2008, CARB approved a new regulation to reduce emissions of DPM and nitrogen oxides from existing on-road heavy-duty diesel fueled vehicles.[3] The regulation requires affected vehicles to meet specific performance requirements between 2014 and 2023, with all affected diesel vehicles required to have 2010 model-year engines or equivalent by 2023. These requirements are phased in over the compliance period and depend on the model year of the vehicle.

Significance Thresholds

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These Thresholds were designed to establish the level at which BAAQMD identified air pollution emissions would cause significant environmental impacts under CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The significance thresholds identified by BAAQMD and used in this analysis are summarized in Table 1.

[3] Available online: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm. Accessed: April 30, 2014.

As stated in the 2011 BAAQMD CEQA Air Quality Guidelines, air pollution by it's nature is largely a cumulative impact. No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. If a project's contribution to the cumulative impact is considerable, then the project's impact on air quality is considered significant. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions.

BAAQMD's adoption of significance thresholds contained in the 2011 CEQA Air Quality Guidelines was called into question by an order issued March 5, 2012, in California Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds. However, this litigation remains pending as the California Supreme Court recently accepted a portion of CBIA's petition to review the appellate court's decision to uphold BAAQMD's adoption of the thresholds. The specific portion of the argument to be considered is in regard to whether CEQA requires consideration of the effects of the environment on a project (as contrasted to the effects of a proposed project on the environment). Therefore, the significance thresholds contained in the 2011 CEQA Air Quality Guidelines are applied to this project.

Table 1 Air Quality Significance Thresholds – Construction

Pollutant	**Construction-Related Threshold**
Criteria Air Pollutants	
ROG	54 average daily pounds
NO_x	54 average daily pounds
PM_{10} Exhaust	82 average daily pounds
$PM_{2.5}$ Exhaust	54 average daily pounds
CO	Not Applicable
Fugitive Dust (PM10 and PM2.5)	Construction Dust Ordinance or other Best Management Practices
Health Risks and Hazards for New Sources	
Excess Cancer Risk	10 per one million
Chronic or Acute Hazard Index	1.0
Incremental annual average $PM_{2.5}$	0.3 $\mu g/m^3$
Cumulative Health Risks and Hazards Thresholds for New Sources	
Excess Cancer Risk	100 per one million
Chronic Hazard Index	10.0
Annual Average $PM_{2.5}$	0.8 $\mu g/m^3$
Greenhouse Gas Emissions	
GHG Annual Emissions	None
Note: ROG = reactive organic gases, NOx = nitrogen oxides, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less; and GHG = greenhouse gas.	

Construction Period Emissions

The California Emissions Estimator Model (CalEEMod) Version 2013.2.2 was used to predict emissions from construction and operation of the site assuming full build out of the project. CalEEMod is a statewide computer model developed in cooperation with air districts throughout the state, to quantify criteria pollutant and greenhouse gas (GHG) emissions associated with the construction and operational activities from a variety of land use projects, such as residential, commercial and industrial facilities. The model analyzes at the air district, county, air basin or statewide level. The project land use types and size, construction schedule and anticipated construction equipment usage were input to CalEEMod. Since portions of the construction activity would uses tugboats, emissions of that activity were computed separately using emission factors published by CARB.

CalEEMod produced annual emissions for both on- and off-site construction activities. On-site activities are primarily made up of construction equipment emissions, while off-site activity includes worker and vendor traffic. A construction build-out scenario, including equipment list and phasing schedule was provided by the project applicant.

The CalEEMod construction module is used to calculate these emissions. Construction emissions have several different types of emission sources that include off-road equipment usage, on-road vehicle travel, fugitive dust, architectural coating, and paving off-gassing. These emission sources are associated with various types of construction that typically include demolition, site preparation, grading, trenching, building construction, paving, and architectural coating. The extent to which these phases occur depends on the specific project.

The project applicants provided construction schedules along with equipment lists and usage rates. The schedule for each phase of each project was entered into CalEEMod's Construction Phase subscreen and the number of construction days was computed. The average hours per day were based on the average hours per day and number of days per phase that the applicant estimated for each piece of equipment. These data were input to CalEEMod's Off-Road Equipment subscreen. Unless provided, the CalEEMod default horsepower and load factor were assigned to each piece of equipment. The default average equipment horsepower is based on CARB's OFFROAD2011. The load factor is the ratio of the actual output to the maximum output of a piece of equipment. The program uses the OFFROAD2011 load factor as default, which is equipment type-specific. CalEEMod assumes that all of the equipment operates on diesel fuel. Emissions factors are based on CARB's OFFROAD2011 emissions model, using the horsepower and load factor for each type of equipment.

The number of worker, vendor, and hauling trips and associated vehicle miles traveled (VMT) are used to determine both the exhaust emissions and fugitive dust emissions associated with on-road vehicle use. Worker and vendor trips are computed using default settings in CalEEMod. Haul truck trips are based on estimates of truck trips or material hauling provided by the applicants. Cement and asphalt import truck trips are included, but using vendor trip lengths. Demolition truck trips are based on the amount of demolition material to be hauled.

Construction generates on-road vehicle exhaust, evaporative, and dust emissions from personal vehicles for worker and vendor commuting, and trucks for soil and material hauling. These emissions are based on the number of trips and VMT along with on-road vehicle emission factors from CARB's EMFAC2011. The CalEEMod default trip lengths were used to compute trip lengths with the following exceptions:

- Demolition trip lengths for Orcem set to 0.2 miles, since material would be processed and used to construct VMT facilities;

- Other trip length emissions used for the health risk assessment were set to 0.65 miles to represent on-site and near-site travel since most off-site travel would not contribute to local health risk impacts; and
- Asphalt and cement truck trips were set to vendor trip lengths.

CalEEMod Inputs – Orcem

The CalEEMod construction inputs for the Orcem site are found in Attachment 1 along with the CalEEMod output. The land uses input include 72,500 square feet of "General Heavy Industry" on 4.83 acres. Construction phases include demolition, site preparation, grading, trenching, building construction (Exterior and Interior), and paving. Construction would begin in January 2015 and be completed in June 2016 for 392 total work days.

Average daily emissions were computed by dividing the total construction emissions by the number of construction days. Table 2 shows average daily construction emissions of ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust during construction of the project.

Table 2 Orcem Construction Period Emissions

Scenario	ROG	NOx	PM_{10} Exhaust	$PM_{2.5}$ Exhaust	GHG Emissions
2015 Construction emissions (tons)	0.70 tons	3.34 tons	0.16 tons	0.15 tons	369 metric tons
2016 Construction emissions (tons)	0.23 tons	0.43 tons	0.02 tons	0.02 tons	62 metric tons
Average daily emissions (pounds)[1]	4.7 lbs.	19.2 lbs.	0.9 lbs.	0.9 lbs.	--
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.	--
Exceed Threshold?	**No**	**No**	**No**	**No**	**--**

[1] Assumes 392 workdays.

CalEEMod Inputs – VMT Phase 1 and 2

The CalEEMod construction inputs for both phases of the VMT are found in Attachment 2 along with the CalEEMod output. The land uses input include 6,000 square feet of "General Heavy Industry" on approximately 11 acres for Phase 1 and 1,000 square feet of "General Heavy Industry" use on 2 acres. Construction phases include demolition of the wharf, building construction, and placing of the concrete deck form. In addition, Phase 2 was assumed to include the import of up to 77,500 cubic yards of materials from demolished materials that would be stockpiled at the Orcem site.
Tuck trips to import concrete to the site were included in the modeling.

In addition to emissions from construction equipment and traffic that are predicted using CalEEMod, there would be emissions associated with the movement of barges as part of construction dredging operations. Information from CARB was used to develop emissions from tug and barge usage to import fill material. Tug boat emissions were calculated using the *Appendix B - Emission Estimation Methodology For Commercial Harbor Craft Operating In California*[4]. It was assumed that a tug would

[4] Emission factors from CARB's September 2007 Initial Statement of Reasons for Proposed Rulemaking, Proposed Regulation for Commercial Harbor Craft, Appendix B, Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, and Appendix D - Statewide Commercial Harbor Craft Survey, Final Report. This report was revised in 2012.

operate under propulsion for 4 hours of each dredging day, as the tug port and location for depositing spoils is within 3 miles of the site. The tug was assumed to include two 1,200-horsepower diesel engines, an auxiliary engine of 150 horsepower and would be 15 years old. Dredging operations for Phase are anticipated to last 4 days and up to 7 days for Phase 2. These emission calculations are also included in *Attachment 2*.

Construction for Phase 1 would begin in March 2015 and be completed in May 2015 for 62 total work days. Phase 2 would be constructed from late February 2016 through June 2016 for a total of 80 workdays.

Average daily emissions were computed by dividing the total construction emissions by the number of construction days. Table 3 shows total and average daily construction emissions of air pollutants (i.e., ROG, NO_X, PM_{10} exhaust, and $PM_{2.5}$ exhaust) and GHG during construction of the project.

Table 3 VMT Phase 1 and Phase 2 Construction Period Emissions

Scenario	**ROG**	**NOx**	**PM_{10} Exhaust**	**$PM_{2.5}$ Exhaust**	**GHG Emissions**
VMT Phase 1					
2015 Construction emissions From CalEEMod	0.08 tons	0.85 tons	0.04 tons	0.04 tons	68 metric tons
2015 Construction emissions For Tug operations	0.03 tons	0.22 tons	0.01 tons	0.01 tons	26 metric tons
Average daily emissions (pounds)[1]	3.5 lbs/day	34.5 lbs/day	1.6 lbs/day	1.6 lbs/day	94 metric tons
VMT Phase 2					
2016 Construction emissions From CalEEMod	0.21 tons	1.70 tons	0.07 tons	0.07 tons	68 metric tons
2016 Construction emissions For Tug operations	0.04 tons	0.31 tons	0.02 tons	0.02 tons	37 metric tons
Average daily emissions (pounds)[2]	6.3 lbs/day	50.3 lbs/day	2.3 lbs/day	2.3 lbs/day	105 metric tons/year
BAAQMD Thresholds (pounds per day)	*54* lbs.	*54* lbs.	*82* lbs.	*54* lbs.	--
Exceed Threshold?	**No**	**No**	**No**	**No**	**--**

[1] Assumes 62 workdays, [2] 80 workdays and [3] total of 142 workdays

Fugitive Dust Impacts

Construction activities, particularly during site preparation and grading would temporarily generate fugitive dust in the form of PM_{10} and $PM_{2.5}$. Sources of fugitive dust would include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site would deposit mud on local streets, which could be an additional source of airborne dust after it dries. Fugitive dust emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. Fugitive dust emissions would also depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances

from the construction site. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are employed to reduce these emissions.
BAAQMD-Recommended Best Management Practices for Controlling Fugitive Particulate Matter

Implementation of the measures recommended by BAAQMD and listed below would reduce the air quality and fugitive dust-related impacts associated with grading and new construction to a less than significant. The contractor shall implement the following Best Management Practices that are required of all projects:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.

2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

4. All vehicle speeds on unpaved roads shall be limited to 15 mph.

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.

6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Construction Period Community Risk Assessment

Construction activity is anticipated to involve demolition of the existing on-site buildings and building construction. As above, the project would have less-than-significant construction period emissions. While those thresholds primarily address the potential for emissions to adversely affect regional air quality, localized emissions of dust or equipment exhaust could affect nearby sensitive land uses. During demolition and construction activities, dust would be generated. Most of the dust would result during grading activities. The amount of dust generated would be highly variable and is dependent on the size of the area disturbed at any given time, amount of activity, soil conditions and meteorological conditions. Typical winds during late spring through summer are from the southwest. Nearby land uses could be adversely affected by dust generated during construction activities. The BAAQMD CEQA Air Quality Guidelines consider these impacts to be less than significant if best management practices are employed to reduce these emissions.

Construction equipment and associated heavy-duty truck traffic along with dredging activities generate diesel exhaust, which is a known Toxic Air Contaminant (TAC). As indicated above, these emissions would not be considered to contribute substantially to existing or projected air quality violations. Diesel exhaust poses both a health and nuisance impact to nearby receptors.

A community risk assessment of the project construction activities was conducted that evaluated potential health effects of sensitive receptors at these nearby residences from construction emissions of diesel particulate matter (DPM).[5] A dispersion model was used to predict the off-site DPM and PM2.5 concentrations resulting from project construction so that lifetime cancer risks could be predicted. The closest residences to the project site are located less than 80 feet north of the site. Figure 1 shows the project site and sensitive receptor locations (residences) used in the air quality dispersion modeling analysis where potential health impacts were evaluated.

Construction Emissions

The community risk assessment focused on modeling on-site construction activity using construction fleet information included in the project design features. For these reasons, construction period emissions were modeled using the California Emissions Estimator Model, Version 2013.2.2 (CalEEMod) along with projected construction activity. The number and types of construction equipment and diesel vehicles, along with the anticipated length of their use for different phases of construction were based on site-specific construction activity schedules provided. Construction of the projects is expected to occur over a 2-year period, beginning in January 2015 and going through June 2016. The CalEEMod model provided total annual $PM_{2.5}$ exhaust emissions (assumed to be diesel particulate matter) for the off-road construction equipment and for exhaust emissions from on-road vehicles (haul trucks, vendor trucks, and worker vehicles). The on-road emissions are a result of haul truck travel, worker travel, and vendor deliveries during building demolition, grading and construction activities. A trip length of 0.65 miles was used to represent vehicle travel while at or near the construction site. It was assumed that these emissions from on-road vehicles traveling at or near the site would occur at the construction site or along Lemon Street. Fugitive $PM_{2.5}$ dust emissions were also calculated by CalEEMod. Table 4 provides the emissions of exhaust and fugitive PM2.5.

Table 4 On- and Near-Site Construction DPM and PM2.5 Emissions

Scenario	PM2.5 Exhaust (DPM)	PM2.5 Fugitive
Orcem		
2015 Construction emissions from CalEEMod	0.1431 tons	0.0800 tons
2016 Construction emissions from CalEEMod	0.0209 tons	0.0004 tons
VMT Phase 1		
2015 Construction emissions from CalEEMod	0.0403 tons	0.0024 tons
2015 Construction emissions from Tug operations	0.01 tons	0.00 tons
VMT Phase 2		
2016 Construction emissions from CalEEMod	0.0668 tons	0.0013 tons
2016 Construction emissions from Tug operations	0.02 tons	0.00 tons

[5] DPM is identified by California as a toxic air contaminant due to the potential to cause cancer.

Dispersion Modeling

Air quality modeling of annual average DPM and fugitive PM2.5 concentrations was conducted using the EPA's AERMOD dispersion model. The AERMOD model is a steady-state, multiple-source, dispersion model designed to calculate pollutant concentrations from single or multiple sources. The model is recommended by BAAQMD for predicting air pollutant/contaminant concentrations associated with various emissions sources. The AERMOD model predicts pollutant concentrations at receptors located in areas of flat or complex terrain from a variety of emission source types including point, area, volume and line sources.

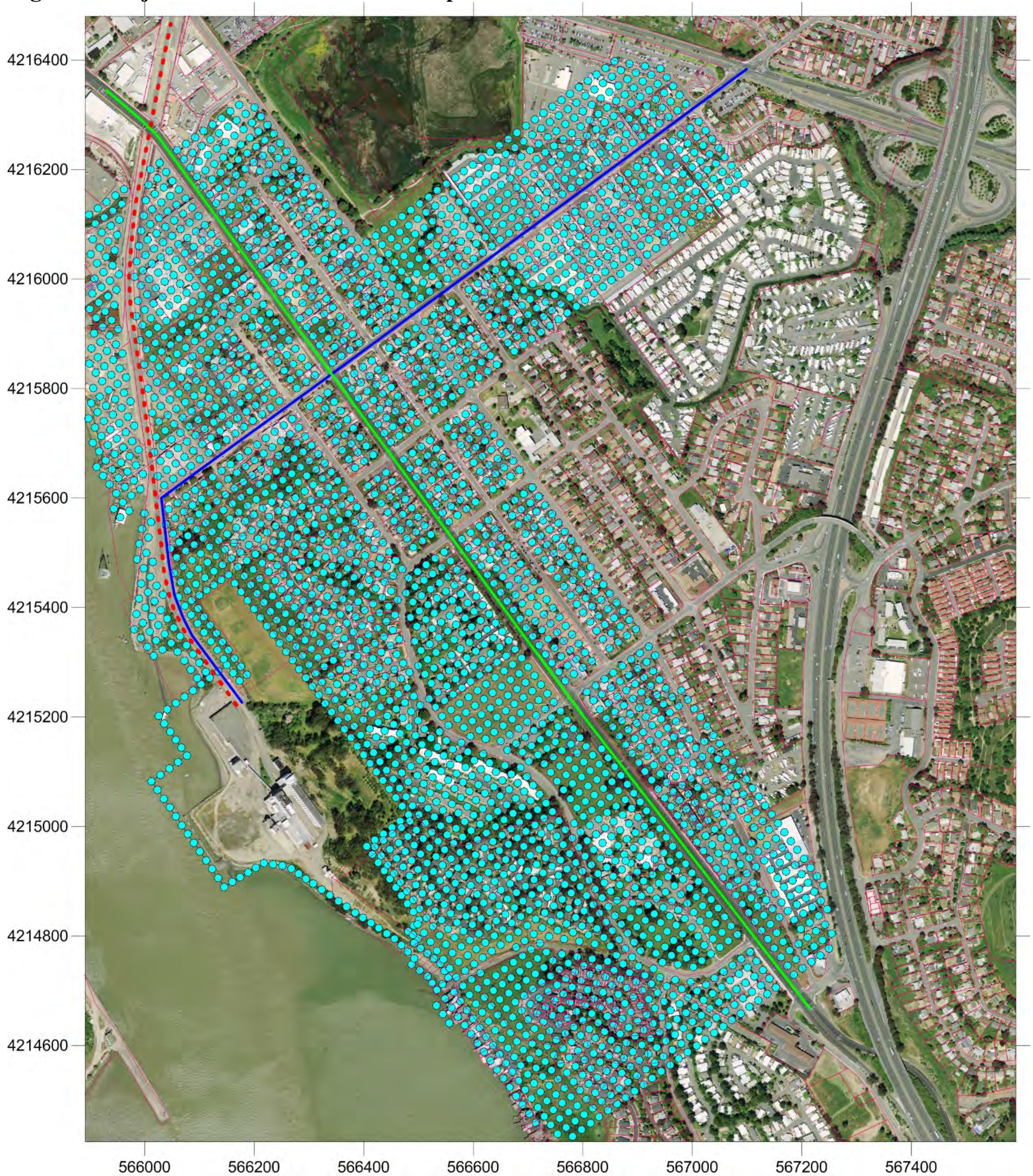
The AERMOD modeling utilized point sources and a single area source to represent the on-site construction emissions, with the point sources representing the DPM exhaust emissions from construction equipment and the use of a single area source for fugitive $PM_{2.5}$ dust emissions. To represent the construction equipment exhaust emissions, 82 equally spaced point sources were placed within the area of land based construction activity. For the dredging activities overwater, the tug emissions were modeled as 29 equally spaced point sources. Each land based point source had an emission release height of 3.048 meters with the tug release height set to six (6) meters. The exit temperature and stack velocity were based on an average sized construction engine source. For the tug exit temperature and stack velocity, the stack parameters were based on those identified in the Air Quality Analysis. For modeling fugitive $PM_{2.5}$ emissions, a near ground level release height of 2.5 meters was used for the area source. Emissions were modeled as occurring daily between 7 am - 9 pm. The model used a 5-year data set (2007-2010, 2012) of hourly meteorological data from the Conoco-Phillips Rodeo monitoring program with supplemental data from the Napa County Airport used for the 2010 year. This data was developed based on inputs provided by the BAAQMD. Annual DPM concentrations from construction activities were predicted for 2015 and 2016 with the annual average concentrations based on the 5-year average concentrations from modeling 5 years of meteorological data. DPM concentrations were calculated at nearby sensitive receptors at heights of 1.5 meters (4.9 feet) representative of the ground level exposures for the nearby residential structures.

A nested USGS NAD83 Cartesian coordinate receptor gird system was used to provide sufficient spatial coverage of the surrounding project area to ensure that the extent of the significant impacts and the maximum impact locations are identified. The following nested grid system was used to identify all maximum impact locations:

- Fence line receptors were spaced at 10-meter intervals,
- 30-meter spacing from the property boundary to 600m from the fence line,
- 30-meter spacing along Lemon Avenue and Sonoma Road
- Concentrations within the facility fence line were not calculated.

No receptors were placed on directly on roadways, overwater, or at other locations where long-term exposure would not occur. Figure 2 displays the locations of the receptors used in the construction HRA. Those receptors representative of sensitive receptors were used to evaluate construction period impacts.

Figure 1 Project Construction HRA Receptor Grids



Predicted Cancer Risk and Hazards

The maximum modeled DPM and $PM_{2.5}$ concentrations occurred at 566410.04 meters easting, 4215153.47 meters northing. The location of this receptor is also identified on Figure 1. Increased cancer risks were calculated using the modeled concentrations and BAAQMD recommended risk assessment methods for both a child exposure (3rd trimester through 2 years of age) and adult exposure.[6] Since the modeling was conducted under the conservative assumption that emissions occurred daily for a full year during each construction year, the default BAAQMD exposure period of 350 days per year was used.[7]

Results of this assessment indicate that for project construction the incremental child cancer risk at the maximally exposed individual (MEI) receptor would be 5.7 in one million and the adult incremental cancer risk would be 0.3 in one million.

The maximum annual $PM_{2.5}$ concentration was 0.08 micrograms per cubic meter ($\mu g/m^3$) occurring at the same location where maximum cancer risk would occur. This $PM_{2.5}$ concentration is below the BAAQMD threshold of 0.3 $\mu g/m^3$ used to judge the significance of health impacts from $PM_{2.5}$.

Potential non-cancer health effects due to chronic exposure to DPM were also evaluated. The chronic inhalation reference exposure level (REL) for DPM is 5 $\mu g/m^3$. The maximum predicted annual DPM concentration was 0.043 $\mu g/m^3$, which is much lower than the REL. The Hazard Index (HI), which is the ratio of the annual DPM concentration to the REL, is 0.009. This HI is much lower than the BAAQMD significance criterion of a HI greater than 1.0.

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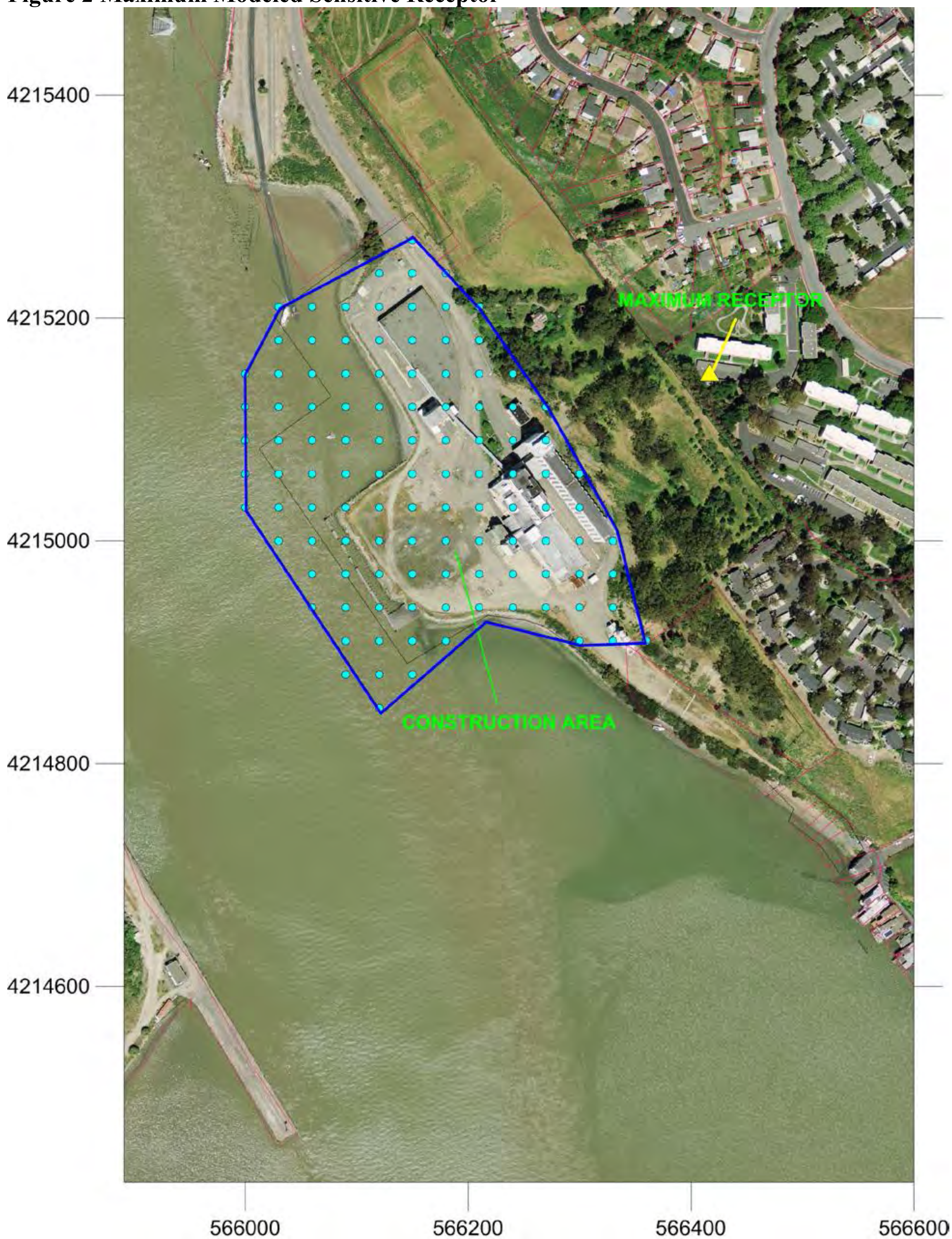
6 Bay Area Air Quality Management District (BAAQMD), 2012, *Recommended Methods for Screening and Modeling Local Risks and Hazards*, May.

7 Bay Area Air Quality Management District (BAAQMD), 2010, *Air Toxics NSR Program Health Risk Screening Analysis Guidelines*, January.

Figure 2 Maximum Modeled Sensitive Receptor



Attachment 1: Orcem Emissions Calculations

Project Name: **Orcem California GGBFS Plant**

Complete ALL Portions in Yellow

See Equipment Type TAB for type, horsepower and load factor

Project Size 72,500 square feet bldngs 4.83 acres

Hours of Construction: 7am - 9pm

Qty	Description	HP	Load Factor	Hours/day	Total Work Days	Average hrs/day	Annual Hours	Comments	I&R Comments
	Demolition	**Start Date:**	**1/1/2015**		63 days				Total days = 3 months * 22 days/month = 66 days
		End Date:	03/30/2015						
							0	**Demolition Volume**	
1	Excavators	162	0.3819	10	25	4.0	250	Square footage of buildings to be demolished	
1	Rubber-Tired Dozers	255	0.3953	10	25	4.0	250	(*or* total tons to be hauled)	
1	*Gipo Truck Crusher*	350	0.78	10	25	4.0	250	156,000 square feet *or*	Caterpillar specs indicate 350 HP, if available, load factor.
1	Off-road Crane	226	0.2881	10	25	4.0	250	_?_ Hauling volume (tons)	Model default HP and load factor
	Site Preperation	**Start Date:**	**1/1/2015**		63 days			Any pavement demolished and hauled? _NO_	
		End Date:	03/30/2015						
1	Rubber Tired Dozers	255	0.3953	8	10	1.3	80		
1	Tractors/Loaders/Backhoes	97	0.3685	8	10	1.3	80		
	Other Equipment?								
	Grading / Excavation	**Start Date:**	**1/4/2015**		127 days				
		End Date:	06/30/2015					**Soil Hauling Volume**	
2	Excavators	162	0.3819	8	60	7.6	960	Export volume = _2,509_ cubic yards?	Will use model to compute hauling emissions
1	Graders	174	0.4087	8	60	3.8	480	Import volume = _6,290_ cubic yards?	Will use model to compute hauling emissions
1	Rubber Tired Dozers	255	0.3953	4	60	1.9	240		
2	Trucks			8	40	5.0	640		Yes
1	*Piling Drill Rig*	205	0.5	8	20	1.3	160		
	Trenching	**Start Date:**	**1/4/2015**		127 days				
		End Date:	06/30/2015						
1	Tractor/Loader/Backhoe	97	0.3685	8	40	2.5	320		
	Other Equipment?								
	Building - Exterior	**Start Date:**	**1/7/2015**		321 days			Cement Trucks? 100 Total Round-Trips	
		End Date:	03/30/2016						
1	Cranes	226	0.2881	8	120	3.0	960	Electric? (Y/N) N Otherwise assumed diesel	
1	Forklifts	89	0.201	8	160	4.0	1280	Liquid Propane (LPG)? (Y/N) N Otherwise Assumed diesel	
							0	Or temporary line power? (Y/N) Y	
							0		
1	Welders	46	0.45	8	100	2.5	800		
4	*MEWPs (Elevated work platforms)*	ELECTRIC	ELECTRIC	8	150	15.0	4800	ELECTRIC No diesel exhaust	ELECTRIC
	Building - Interior/Architectural Coating	**Start Date:**	**1/9/2015**		385 days				
		End Date:	06/30/2016						
1	Air Compressors	78	0.32	8	120	2.5	960		
1	Aerial Lift	62	0.3	8	60	1.2	480		
	Other Equipment?								
	Paving	**Start Date:**	**1/2/2016**		106 days				
		Start Date:	05/30/2016						
1	Cement and Mortar Mixers	9	0.56	8	20	1.5	160		
1	Pavers	125	0.4154	8	20	1.5	160	Asphalt? 1,657 cubic yards or ____ round trips?	Will use model to compute hauling emissions
1	Paving Equipment	130	0.3551	8	20	1.5	160		
1	Rollers	80	0.3752	6	20	1.1	120		
1	Tractors/Loaders/Backhoes	97	0.3685	6	20	1.1	120		
	Other Equipment?								

Orcem, California Vallejo Plant

Solano-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	72.50	1000sqft	4.83	72,500.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 56

Climate Zone 4 **Operational Year** 2017

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Model Input for Construction only

Land Use - Based on construction data provided

Construction Phase - Based on provided schedule and equipment list

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Grading - Based on provided equipment list and schedule

Demolition - Based on provided equipment list and schedule

Trips and VMT - Set demolition hauling trip length to 0.2 miles, since material to be crushed on site. Added cement and asphalt trips at vendor trip length

Architectural Coating - Assume architectual coatings meet BAAQMD Regs

Vehicle Trips - Construction Model Run

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	150.00
tblArchitecturalCoating	EF_Residential_Interior	100.00	150.00
tblConstructionPhase	NumDays	18.00	385.00
tblConstructionPhase	NumDays	230.00	321.00
tblConstructionPhase	NumDays	20.00	63.00
tblConstructionPhase	NumDays	8.00	127.00
tblConstructionPhase	NumDays	18.00	106.00
tblConstructionPhase	NumDays	5.00	63.00
tblConstructionPhase	PhaseEndDate	9/20/2017	6/30/2016
tblConstructionPhase	PhaseEndDate	9/21/2016	3/30/2016
tblConstructionPhase	PhaseEndDate	9/23/2015	6/30/2015
tblConstructionPhase	PhaseEndDate	11/25/2016	5/30/2016
tblConstructionPhase	PhaseEndDate	6/25/2015	3/30/2015
tblConstructionPhase	PhaseEndDate	12/24/2015	6/30/2015
tblConstructionPhase	PhaseStartDate	3/31/2016	1/9/2015

tblConstructionPhase	PhaseStartDate	7/1/2015	1/7/2015
tblConstructionPhase	PhaseStartDate	3/31/2015	1/4/2015
tblConstructionPhase	PhaseStartDate	7/1/2016	1/2/2016
tblConstructionPhase	PhaseStartDate	3/31/2015	1/1/2015
tblConstructionPhase	PhaseStartDate	7/1/2015	1/4/2015
tblGrading	AcresOfGrading	30.16	4.00
tblGrading	MaterialExported	0.00	2,509.00
tblGrading	MaterialImported	0.00	6,290.00
tblLandUse	LotAcreage	1.66	4.83
tblOffRoadEquipment	HorsePower	85.00	350.00
tblOffRoadEquipment	HorsePower	226.00	205.00
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.29	0.50
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.31	0.31
tblOffRoadEquipment	OffRoadEquipmentType		Crushing/Proc. Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Aerial Lifts
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	UsageHours	6.00	2.50
tblOffRoadEquipment	UsageHours	6.00	1.50
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	7.00	3.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	7.60
tblOffRoadEquipment	UsageHours	8.00	1.50
tblOffRoadEquipment	UsageHours	6.00	1.10
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	1.90
tblOffRoadEquipment	UsageHours	8.00	1.10
tblOffRoadEquipment	UsageHours	8.00	1.30
tblOffRoadEquipment	UsageHours	8.00	3.80
tblOffRoadEquipment	UsageHours	6.00	1.50
tblOffRoadEquipment	UsageHours	8.00	1.30
tblOffRoadEquipment	UsageHours	8.00	2.50
tblProjectCharacteristics	OperationalYear	2014	2017
tblTripsAndVMT	HaulingTripLength	20.00	0.20

tblTripsAndVMT	HaulingTripLength	20.00	7.30
tblTripsAndVMT	HaulingTripLength	20.00	7.30
tblTripsAndVMT	HaulingTripNumber	0.00	200.00
tblTripsAndVMT	HaulingTripNumber	0.00	368.00
tblVehicleTrips	ST_TR	1.50	0.10
tblVehicleTrips	SU_TR	1.50	0.10
tblVehicleTrips	WD_TR	1.50	0.10

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.6982	3.3421	2.5257	4.0100e-003	0.2766	0.1589	0.4356	0.0992	0.1483	0.2475	0.0000	367.2452	367.2452	0.0633	0.0000	368.5739
2016	0.2276	0.4301	0.4308	7.2000e-004	0.0227	0.0230	0.0457	6.0900e-003	0.0217	0.0278	0.0000	61.8046	61.8046	8.9800e-003	0.0000	61.9931
Total	**0.9258**	**3.7722**	**2.9565**	**4.7300e-003**	**0.2993**	**0.1819**	**0.4813**	**0.1053**	**0.1700**	**0.2753**	**0.0000**	**429.0497**	**429.0497**	**0.0723**	**0.0000**	**430.5670**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.6982	3.3421	2.5257	4.0100e-003	0.2766	0.1589	0.4356	0.0992	0.1483	0.2475	0.0000	367.2449	367.2449	0.0633	0.0000	368.5736
2016	0.2276	0.4301	0.4308	7.2000e-004	0.0227	0.0230	0.0457	6.0900e-003	0.0217	0.0278	0.0000	61.8045	61.8045	8.9800e-003	0.0000	61.9931
Total	**0.9258**	**3.7722**	**2.9565**	**4.7300e-003**	**0.2993**	**0.1819**	**0.4813**	**0.1053**	**0.1700**	**0.2753**	**0.0000**	**429.0494**	**429.0494**	**0.0723**	**0.0000**	**430.5667**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2015	3/30/2015	5	63	
2	Site Preparation	Site Preparation	1/1/2015	3/30/2015	5	63	
3	Grading	Grading	1/4/2015	6/30/2015	5	127	
4	Trenching	Trenching	1/4/2015	6/30/2015	5	127	
5	Building Construction	Building Construction	1/7/2015	3/30/2016	5	321	
6	Interior Construciton	Architectural Coating	1/9/2015	6/30/2016	5	385	
7	Paving	Paving	1/2/2016	5/30/2016	5	106	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 4

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 108,750; Non-Residential Outdoor: 36,250 (Architectural Coating –

<u>OffRoad Equipment</u>

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Interior Construciton	Air Compressors	1	2.50	78	0.48
Paving	Cement and Mortar Mixers	1	1.50	9	0.56
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Demolition	Excavators	1	4.00	162	0.38
Building Construction	Cranes	1	3.00	226	0.29
Building Construction	Forklifts	1	4.00	89	0.20
Grading	Excavators	2	7.60	162	0.38
Paving	Pavers	1	1.50	125	0.42
Paving	Rollers	1	1.10	80	0.38
Demolition	Rubber Tired Dozers	1	4.00	255	0.40
Grading	Rubber Tired Dozers	1	1.90	255	0.40
Building Construction	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Building Construction	Generator Sets	0	8.00	84	0.74
Grading	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	1.10	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	1.30	97	0.37
Grading	Graders	1	3.80	174	0.41
Paving	Paving Equipment	1	1.50	130	0.36
Site Preparation	Rubber Tired Dozers	1	1.30	255	0.40
Building Construction	Welders	1	2.50	46	0.45
Demolition	Crushing/Proc. Equipment	1	4.00	350	0.78
Demolition	Cranes	1	4.00	226	0.29
Grading	Cranes	1	1.30	205	0.50
Trenching	Tractors/Loaders/Backhoes	1	2.50	97	0.37
Interior Construciton	Aerial Lifts	1	1.20	62	0.31

<u>Trips and VMT</u>

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	710.00	12.40	7.30	0.20	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	5	13.00	0.00	1,100.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	3	30.00	12.00	200.00	12.40	7.30	7.30	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	368.00	12.40	7.30	7.30	LD_Mix	HDT_Mix	HHDT
Interior Construciton	2	6.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Trenching	1	3.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2015

<u>Unmitigated Construction On-Site</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0768	0.0000	0.0768	0.0116	0.0000	0.0116	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0654	0.6916	0.3648	6.9000e-004		0.0289	0.0289		0.0273	0.0273	0.0000	68.7869	68.7869	0.0111	0.0000	69.0193
Total	**0.0654**	**0.6916**	**0.3648**	**6.9000e-004**	**0.0768**	**0.0289**	**0.1057**	**0.0116**	**0.0273**	**0.0389**	**0.0000**	**68.7869**	**68.7869**	**0.0111**	**0.0000**	**69.0193**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.4200e-003	0.0103	0.0732	1.0000e-005	7.0000e-005	5.0000e-005	1.2000e-004	2.0000e-005	5.0000e-005	7.0000e-005	0.0000	0.8190	0.8190	2.0000e-005	0.0000	0.8195
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3000e-003	1.8700e-003	0.0177	3.0000e-005	2.8700e-003	2.0000e-005	2.8900e-003	7.6000e-004	2.0000e-005	7.8000e-004	0.0000	2.6922	2.6922	1.5000e-004	0.0000	2.6954
Total	**6.7200e-003**	**0.0122**	**0.0909**	**4.0000e-005**	**2.9400e-003**	**7.0000e-005**	**3.0100e-003**	**7.8000e-004**	**7.0000e-005**	**8.5000e-004**	**0.0000**	**3.5113**	**3.5113**	**1.7000e-004**	**0.0000**	**3.5148**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0768	0.0000	0.0768	0.0116	0.0000	0.0116	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0654	0.6916	0.3648	6.9000e-004		0.0289	0.0289		0.0273	0.0273	0.0000	68.7868	68.7868	0.0111	0.0000	69.0192
Total	**0.0654**	**0.6916**	**0.3648**	**6.9000e-004**	**0.0768**	**0.0289**	**0.1057**	**0.0116**	**0.0273**	**0.0389**	**0.0000**	**68.7868**	**68.7868**	**0.0111**	**0.0000**	**69.0192**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.4200e-003	0.0103	0.0732	1.0000e-005	7.0000e-005	5.0000e-005	1.2000e-004	2.0000e-005	5.0000e-005	7.0000e-005	0.0000	0.8190	0.8190	2.0000e-005	0.0000	0.8195
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.3000e-003	1.8700e-003	0.0177	3.0000e-005	2.8700e-003	2.0000e-005	2.8900e-003	7.6000e-004	2.0000e-005	7.8000e-004	0.0000	2.6922	2.6922	1.5000e-004	0.0000	2.6954
Total	**6.7200e-003**	**0.0122**	**0.0909**	**4.0000e-005**	**2.9400e-003**	**7.0000e-005**	**3.0100e-003**	**7.8000e-004**	**7.0000e-005**	**8.5000e-004**	**0.0000**	**3.5113**	**3.5113**	**1.7000e-004**	**0.0000**	**3.5148**

3.3 Site Preparation - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0308	0.0000	0.0308	0.0169	0.0000	0.0169	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3600e-003	0.0912	0.0686	6.0000e-005		4.8100e-003	4.8100e-003		4.4300e-003	4.4300e-003	0.0000	5.8576	5.8576	1.7500e-003	0.0000	5.8943
Total	**8.3600e-003**	**0.0912**	**0.0686**	**6.0000e-005**	**0.0308**	**4.8100e-003**	**0.0356**	**0.0169**	**4.4300e-003**	**0.0214**	**0.0000**	**5.8576**	**5.8576**	**1.7500e-003**	**0.0000**	**5.8943**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.5000e-004	9.4000e-004	8.8400e-003	2.0000e-005	1.4400e-003	1.0000e-005	1.4500e-003	3.8000e-004	1.0000e-005	3.9000e-004	0.0000	1.3461	1.3461	7.0000e-005	0.0000	1.3477
Total	**6.5000e-004**	**9.4000e-004**	**8.8400e-003**	**2.0000e-005**	**1.4400e-003**	**1.0000e-005**	**1.4500e-003**	**3.8000e-004**	**1.0000e-005**	**3.9000e-004**	**0.0000**	**1.3461**	**1.3461**	**7.0000e-005**	**0.0000**	**1.3477**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0308	0.0000	0.0308	0.0169	0.0000	0.0169	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3600e-003	0.0912	0.0686	6.0000e-005		4.8100e-003	4.8100e-003		4.4300e-003	4.4300e-003	0.0000	5.8576	5.8576	1.7500e-003	0.0000	5.8943
Total	**8.3600e-003**	**0.0912**	**0.0686**	**6.0000e-005**	**0.0308**	**4.8100e-003**	**0.0356**	**0.0169**	**4.4300e-003**	**0.0214**	**0.0000**	**5.8576**	**5.8576**	**1.7500e-003**	**0.0000**	**5.8943**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.5000e-004	9.4000e-004	8.8400e-003	2.0000e-005	1.4400e-003	1.0000e-005	1.4500e-003	3.8000e-004	1.0000e-005	3.9000e-004	0.0000	1.3461	1.3461	7.0000e-005	0.0000	1.3477
Total	**6.5000e-004**	**9.4000e-004**	**8.8400e-003**	**2.0000e-005**	**1.4400e-003**	**1.0000e-005**	**1.4500e-003**	**3.8000e-004**	**1.0000e-005**	**3.9000e-004**	**0.0000**	**1.3461**	**1.3461**	**7.0000e-005**	**0.0000**	**1.3477**

3.4 Grading - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0934	0.0000	0.0934	0.0502	0.0000	0.0502	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1135	1.2739	0.7802	1.0500e-003		0.0640	0.0640		0.0589	0.0589	0.0000	100.2354	100.2354	0.0299	0.0000	100.8638
Total	**0.1135**	**1.2739**	**0.7802**	**1.0500e-003**	**0.0934**	**0.0640**	**0.1575**	**0.0502**	**0.0589**	**0.1091**	**0.0000**	**100.2354**	**100.2354**	**0.0299**	**0.0000**	**100.8638**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0156	0.1924	0.1511	4.2000e-004	9.3100e-003	2.8600e-003	0.0122	2.5600e-003	2.6300e-003	5.1900e-003	0.0000	38.3336	38.3336	3.2000e-004	0.0000	38.3404
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3900e-003	4.9000e-003	0.0464	9.0000e-005	7.5300e-003	6.0000e-005	7.5800e-003	2.0000e-003	5.0000e-005	2.0500e-003	0.0000	7.0554	7.0554	3.9000e-004	0.0000	7.0636
Total	**0.0189**	**0.1973**	**0.1974**	**5.1000e-004**	**0.0168**	**2.9200e-003**	**0.0198**	**4.5600e-003**	**2.6800e-003**	**7.2400e-003**	**0.0000**	**45.3889**	**45.3889**	**7.1000e-004**	**0.0000**	**45.4039**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0934	0.0000	0.0934	0.0502	0.0000	0.0502	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1135	1.2739	0.7802	1.0500e-003		0.0640	0.0640		0.0589	0.0589	0.0000	100.2353	100.2353	0.0299	0.0000	100.8637
Total	**0.1135**	**1.2739**	**0.7802**	**1.0500e-003**	**0.0934**	**0.0640**	**0.1575**	**0.0502**	**0.0589**	**0.1091**	**0.0000**	**100.2353**	**100.2353**	**0.0299**	**0.0000**	**100.8637**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0156	0.1924	0.1511	4.2000e-004	9.3100e-003	2.8600e-003	0.0122	2.5600e-003	2.6300e-003	5.1900e-003	0.0000	38.3336	38.3336	3.2000e-004	0.0000	38.3404
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3900e-003	4.9000e-003	0.0464	9.0000e-005	7.5300e-003	6.0000e-005	7.5800e-003	2.0000e-003	5.0000e-005	2.0500e-003	0.0000	7.0554	7.0554	3.9000e-004	0.0000	7.0636
Total	**0.0189**	**0.1973**	**0.1974**	**5.1000e-004**	**0.0168**	**2.9200e-003**	**0.0198**	**4.5600e-003**	**2.6800e-003**	**7.2400e-003**	**0.0000**	**45.3889**	**45.3889**	**7.1000e-004**	**0.0000**	**45.4039**

3.5 Trenching - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.1200e-003	0.0678	0.0479	6.0000e-005		5.3100e-003	5.3100e-003		4.8800e-003	4.8800e-003	0.0000	5.8715	5.8715	1.7500e-003	0.0000	5.9083
Total	**7.1200e-003**	**0.0678**	**0.0479**	**6.0000e-005**		**5.3100e-003**	**5.3100e-003**		**4.8800e-003**	**4.8800e-003**	**0.0000**	**5.8715**	**5.8715**	**1.7500e-003**	**0.0000**	**5.9083**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8000e-004	1.1300e-003	0.0107	2.0000e-005	1.7400e-003	1.0000e-005	1.7500e-003	4.6000e-004	1.0000e-005	4.7000e-004	0.0000	1.6282	1.6282	9.0000e-005	0.0000	1.6301
Total	**7.8000e-004**	**1.1300e-003**	**0.0107**	**2.0000e-005**	**1.7400e-003**	**1.0000e-005**	**1.7500e-003**	**4.6000e-004**	**1.0000e-005**	**4.7000e-004**	**0.0000**	**1.6282**	**1.6282**	**9.0000e-005**	**0.0000**	**1.6301**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.1200e-003	0.0678	0.0479	6.0000e-005		5.3100e-003	5.3100e-003		4.8800e-003	4.8800e-003	0.0000	5.8715	5.8715	1.7500e-003	0.0000	5.9083
Total	**7.1200e-003**	**0.0678**	**0.0479**	**6.0000e-005**		**5.3100e-003**	**5.3100e-003**		**4.8800e-003**	**4.8800e-003**	**0.0000**	**5.8715**	**5.8715**	**1.7500e-003**	**0.0000**	**5.9083**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.8000e-004	1.1300e-003	0.0107	2.0000e-005	1.7400e-003	1.0000e-005	1.7500e-003	4.6000e-004	1.0000e-005	4.7000e-004	0.0000	1.6282	1.6282	9.0000e-005	0.0000	1.6301
Total	**7.8000e-004**	**1.1300e-003**	**0.0107**	**2.0000e-005**	**1.7400e-003**	**1.0000e-005**	**1.7500e-003**	**4.6000e-004**	**1.0000e-005**	**4.7000e-004**	**0.0000**	**1.6282**	**1.6282**	**9.0000e-005**	**0.0000**	**1.6301**

3.6 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0764	0.6326	0.3113	4.7000e-004		0.0369	0.0369		0.0344	0.0344	0.0000	42.8002	42.8002	0.0126	0.0000	43.0642
Total	**0.0764**	**0.6326**	**0.3113**	**4.7000e-004**		**0.0369**	**0.0369**		**0.0344**	**0.0344**	**0.0000**	**42.8002**	**42.8002**	**0.0126**	**0.0000**	**43.0642**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.6000e-003	0.0115	0.0185	2.0000e-005	5.9000e-004	1.6000e-004	7.5000e-004	1.6000e-004	1.4000e-004	3.0000e-004	0.0000	2.1194	2.1194	2.0000e-005	0.0000	2.1199
Vendor	0.0231	0.1777	0.2454	3.7000e-004	9.9300e-003	2.8500e-003	0.0128	2.8400e-003	2.6200e-003	5.4600e-003	0.0000	33.6589	33.6589	3.0000e-004	0.0000	33.6652
Worker	0.0159	0.0229	0.2165	4.2000e-004	0.0351	2.7000e-004	0.0354	9.3400e-003	2.5000e-004	9.5900e-003	0.0000	32.9478	32.9478	1.8200e-003	0.0000	32.9861
Total	**0.0405**	**0.2122**	**0.4803**	**8.1000e-004**	**0.0457**	**3.2800e-003**	**0.0489**	**0.0123**	**3.0100e-003**	**0.0154**	**0.0000**	**68.7261**	**68.7261**	**2.1400e-003**	**0.0000**	**68.7711**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0764	0.6326	0.3113	4.7000e-004		0.0369	0.0369		0.0344	0.0344	0.0000	42.8001	42.8001	0.0126	0.0000	43.0641
Total	**0.0764**	**0.6326**	**0.3113**	**4.7000e-004**		**0.0369**	**0.0369**		**0.0344**	**0.0344**	**0.0000**	**42.8001**	**42.8001**	**0.0126**	**0.0000**	**43.0641**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.6000e-003	0.0115	0.0185	2.0000e-005	5.9000e-004	1.6000e-004	7.5000e-004	1.6000e-004	1.4000e-004	3.0000e-004	0.0000	2.1194	2.1194	2.0000e-005	0.0000	2.1199
Vendor	0.0231	0.1777	0.2454	3.7000e-004	9.9300e-003	2.8500e-003	0.0128	2.8400e-003	2.6200e-003	5.4600e-003	0.0000	33.6589	33.6589	3.0000e-004	0.0000	33.6652
Worker	0.0159	0.0229	0.2165	4.2000e-004	0.0351	2.7000e-004	0.0354	9.3400e-003	2.5000e-004	9.5900e-003	0.0000	32.9478	32.9478	1.8200e-003	0.0000	32.9861
Total	**0.0405**	**0.2122**	**0.4803**	**8.1000e-004**	**0.0457**	**3.2800e-003**	**0.0489**	**0.0123**	**3.0100e-003**	**0.0154**	**0.0000**	**68.7261**	**68.7261**	**2.1400e-003**	**0.0000**	**68.7711**

3.6 Building Construction - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0179	0.1517	0.0757	1.2000e-004		8.6800e-003	8.6800e-003		8.1000e-003	8.1000e-003	0.0000	10.5679	10.5679	3.0800e-003	0.0000	10.6325
Total	**0.0179**	**0.1517**	**0.0757**	**1.2000e-004**		**8.6800e-003**	**8.6800e-003**		**8.1000e-003**	**8.1000e-003**	**0.0000**	**10.5679**	**10.5679**	**3.0800e-003**	**0.0000**	**10.6325**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.6000e-004	2.5000e-003	4.4100e-003	1.0000e-005	5.0000e-004	3.0000e-005	5.2000e-004	1.3000e-004	3.0000e-005	1.5000e-004	0.0000	0.5216	0.5216	0.0000	0.0000	0.5217
Vendor	5.2200e-003	0.0385	0.0578	9.0000e-005	2.4700e-003	5.7000e-004	3.0400e-003	7.1000e-004	5.2000e-004	1.2300e-003	0.0000	8.2864	8.2864	7.0000e-005	0.0000	8.2878
Worker	3.5200e-003	5.1000e-003	0.0479	1.0000e-004	8.7500e-003	6.0000e-005	8.8200e-003	2.3300e-003	6.0000e-005	2.3900e-003	0.0000	7.9141	7.9141	4.1000e-004	0.0000	7.9228
Total	**9.1000e-003**	**0.0461**	**0.1101**	**2.0000e-004**	**0.0117**	**6.6000e-004**	**0.0124**	**3.1700e-003**	**6.1000e-004**	**3.7700e-003**	**0.0000**	**16.7221**	**16.7221**	**4.8000e-004**	**0.0000**	**16.7323**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0179	0.1517	0.0757	1.2000e-004		8.6800e-003	8.6800e-003		8.1000e-003	8.1000e-003	0.0000	10.5679	10.5679	3.0800e-003	0.0000	10.6325
Total	**0.0179**	**0.1517**	**0.0757**	**1.2000e-004**		**8.6800e-003**	**8.6800e-003**		**8.1000e-003**	**8.1000e-003**	**0.0000**	**10.5679**	**10.5679**	**3.0800e-003**	**0.0000**	**10.6325**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.6000e-004	2.5000e-003	4.4100e-003	1.0000e-005	5.0000e-004	3.0000e-005	5.2000e-004	1.3000e-004	3.0000e-005	1.5000e-004	0.0000	0.5216	0.5216	0.0000	0.0000	0.5217
Vendor	5.2200e-003	0.0385	0.0578	9.0000e-005	2.4700e-003	5.7000e-004	3.0400e-003	7.1000e-004	5.2000e-004	1.2300e-003	0.0000	8.2864	8.2864	7.0000e-005	0.0000	8.2878
Worker	3.5200e-003	5.1000e-003	0.0479	1.0000e-004	8.7500e-003	6.0000e-005	8.8200e-003	2.3300e-003	6.0000e-005	2.3900e-003	0.0000	7.9141	7.9141	4.1000e-004	0.0000	7.9228
Total	**9.1000e-003**	**0.0461**	**0.1101**	**2.0000e-004**	**0.0117**	**6.6000e-004**	**0.0124**	**3.1700e-003**	**6.1000e-004**	**3.7700e-003**	**0.0000**	**16.7221**	**16.7221**	**4.8000e-004**	**0.0000**	**16.7323**

3.7 Interior Construciton - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3339					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0228	0.1566	0.1218	1.9000e-004		0.0127	0.0127		0.0126	0.0126	0.0000	16.5547	16.5547	2.6600e-003	0.0000	16.6106
Total	**0.3567**	**0.1566**	**0.1218**	**1.9000e-004**		**0.0127**	**0.0127**		**0.0126**	**0.0126**	**0.0000**	**16.5547**	**16.5547**	**2.6600e-003**	**0.0000**	**16.6106**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.1500e-003	4.5400e-003	0.0430	8.0000e-005	6.9700e-003	5.0000e-005	7.0300e-003	1.8500e-003	5.0000e-005	1.9000e-003	0.0000	6.5383	6.5383	3.6000e-004	0.0000	6.5459
Total	**3.1500e-003**	**4.5400e-003**	**0.0430**	**8.0000e-005**	**6.9700e-003**	**5.0000e-005**	**7.0300e-003**	**1.8500e-003**	**5.0000e-005**	**1.9000e-003**	**0.0000**	**6.5383**	**6.5383**	**3.6000e-004**	**0.0000**	**6.5459**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3339					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0228	0.1566	0.1218	1.9000e-004		0.0127	0.0127		0.0126	0.0126	0.0000	16.5547	16.5547	2.6600e-003	0.0000	16.6106
Total	**0.3567**	**0.1566**	**0.1218**	**1.9000e-004**		**0.0127**	**0.0127**		**0.0126**	**0.0126**	**0.0000**	**16.5547**	**16.5547**	**2.6600e-003**	**0.0000**	**16.6106**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.1500e-003	4.5400e-003	0.0430	8.0000e-005	6.9700e-003	5.0000e-005	7.0300e-003	1.8500e-003	5.0000e-005	1.9000e-003	0.0000	6.5383	6.5383	3.6000e-004	0.0000	6.5459
Total	**3.1500e-003**	**4.5400e-003**	**0.0430**	**8.0000e-005**	**6.9700e-003**	**5.0000e-005**	**7.0300e-003**	**1.8500e-003**	**5.0000e-005**	**1.9000e-003**	**0.0000**	**6.5383**	**6.5383**	**3.6000e-004**	**0.0000**	**6.5459**

3.7 Interior Construciton - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.1702					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0105	0.0732	0.0615	1.0000e-004		5.6900e-003	5.6900e-003		5.6600e-003	5.6600e-003	0.0000	8.4240	8.4240	1.2700e-003	0.0000	8.4507
Total	**0.1807**	**0.0732**	**0.0615**	**1.0000e-004**		**5.6900e-003**	**5.6900e-003**		**5.6600e-003**	**5.6600e-003**	**0.0000**	**8.4240**	**8.4240**	**1.2700e-003**	**0.0000**	**8.4507**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4300e-003	2.0700e-003	0.0195	4.0000e-005	3.5600e-003	3.0000e-005	3.5800e-003	9.5000e-004	2.0000e-005	9.7000e-004	0.0000	3.2151	3.2151	1.7000e-004	0.0000	3.2186
Total	**1.4300e-003**	**2.0700e-003**	**0.0195**	**4.0000e-005**	**3.5600e-003**	**3.0000e-005**	**3.5800e-003**	**9.5000e-004**	**2.0000e-005**	**9.7000e-004**	**0.0000**	**3.2151**	**3.2151**	**1.7000e-004**	**0.0000**	**3.2186**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.1702					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0105	0.0732	0.0615	1.0000e-004		5.6900e-003	5.6900e-003		5.6600e-003	5.6600e-003	0.0000	8.4240	8.4240	1.2700e-003	0.0000	8.4507
Total	**0.1807**	**0.0732**	**0.0615**	**1.0000e-004**		**5.6900e-003**	**5.6900e-003**		**5.6600e-003**	**5.6600e-003**	**0.0000**	**8.4240**	**8.4240**	**1.2700e-003**	**0.0000**	**8.4507**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4300e-003	2.0700e-003	0.0195	4.0000e-005	3.5600e-003	3.0000e-005	3.5800e-003	9.5000e-004	2.0000e-005	9.7000e-004	0.0000	3.2151	3.2151	1.7000e-004	0.0000	3.2186
Total	**1.4300e-003**	**2.0700e-003**	**0.0195**	**4.0000e-005**	**3.5600e-003**	**3.0000e-005**	**3.5800e-003**	**9.5000e-004**	**2.0000e-005**	**9.7000e-004**	**0.0000**	**3.2151**	**3.2151**	**1.7000e-004**	**0.0000**	**3.2186**

3.8 Paving - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1304	0.0889	1.3000e-004		7.6300e-003	7.6300e-003		7.0300e-003	7.0300e-003	0.0000	12.3815	12.3815	3.6400e-003	0.0000	12.4580
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1304**	**0.0889**	**1.3000e-004**		**7.6300e-003**	**7.6300e-003**		**7.0300e-003**	**7.0300e-003**	**0.0000**	**12.3815**	**12.3815**	**3.6400e-003**	**0.0000**	**12.4580**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.3500e-003	0.0230	0.0407	5.0000e-005	1.1400e-003	2.7000e-004	1.4100e-003	3.1000e-004	2.5000e-004	5.6000e-004	0.0000	4.8139	4.8139	4.0000e-005	0.0000	4.8148
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.5300e-003	3.6600e-003	0.0344	8.0000e-005	6.2800e-003	5.0000e-005	6.3300e-003	1.6700e-003	4.0000e-005	1.7100e-003	0.0000	5.6800	5.6800	3.0000e-004	0.0000	5.6862
Total	**5.8800e-003**	**0.0267**	**0.0751**	**1.3000e-004**	**7.4200e-003**	**3.2000e-004**	**7.7400e-003**	**1.9800e-003**	**2.9000e-004**	**2.2700e-003**	**0.0000**	**10.4939**	**10.4939**	**3.4000e-004**	**0.0000**	**10.5010**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1304	0.0889	1.3000e-004		7.6300e-003	7.6300e-003		7.0300e-003	7.0300e-003	0.0000	12.3815	12.3815	3.6400e-003	0.0000	12.4580
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1304**	**0.0889**	**1.3000e-004**		**7.6300e-003**	**7.6300e-003**		**7.0300e-003**	**7.0300e-003**	**0.0000**	**12.3815**	**12.3815**	**3.6400e-003**	**0.0000**	**12.4580**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.3500e-003	0.0230	0.0407	5.0000e-005	1.1400e-003	2.7000e-004	1.4100e-003	3.1000e-004	2.5000e-004	5.6000e-004	0.0000	4.8139	4.8139	4.0000e-005	0.0000	4.8148
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.5300e-003	3.6600e-003	0.0344	8.0000e-005	6.2800e-003	5.0000e-005	6.3300e-003	1.6700e-003	4.0000e-005	1.7100e-003	0.0000	5.6800	5.6800	3.0000e-004	0.0000	5.6862
Total	**5.8800e-003**	**0.0267**	**0.0751**	**1.3000e-004**	**7.4200e-003**	**3.2000e-004**	**7.7400e-003**	**1.9800e-003**	**2.9000e-004**	**2.2700e-003**	**0.0000**	**10.4939**	**10.4939**	**3.4000e-004**	**0.0000**	**10.5010**

Attachment 2: VMT Phase 1 and Phase 2 Emission Calculations

Project Name: **VMT - PHASE 1 Wharf Contstruction - Old Wharf Removal**

Complete ALL Portions in Yellow

See Equipment Type TAB for type, horsepower and load factor

Project Size 6,000 square feet bldngs 11 acres

Qty	Description	HP	Load Factor	Hours/day	Total Work Days	Avg hours per day	Annual Hours	Comments
	Demolition of Wharf	**Start Date:**	**3/16/2015**		5 days			
		End Date:	3/20/2015					
	Concrete/Industrial Saws	81	0.73				0	**Demolition Volume**
2	Excavators	162	0.3819	8	5	8	80	Existing remains of timber wharf to be removed
1	skif to deploy containment boom			2	2		4	All materianl will leave site by deck barge
	Dredging	**Start Date:**	**5/10/2015**					
		End Date:	5/15/2015					**Demolition Volume**
1	Dredge	850		24	4	24	96	Dredge volume for Phase 2 is estimated at 20,000 cubic yards
1	Tug	1200		4	4	4	16	
1	Generator	150	0.34	24	4	24	96	
	Building - Exterior	**Start Date:**	**3/2/2015**		62 days			Cement Trucks? _?_ Total Round-Trips
		End Date:	5/15/2015					
1	Cranes - Manitowoc 4100	226	0.2881	8	62	8	496	Electric? (Y/N) *N* Otherwise assumed diesel
1	Cranes - 60 ton hydraulic	226	0.2881	8	2	0.3		Electric? (Y/N) *N* Otherwise assumed diesel
1	Forklifts	89	0.201	8	62	8	496	Liquid Propane (LPG)? (Y/N) _Y_ Otherwise Assumed diesel
2	Diesel Impact Hammer (D46 or equiv)	226	0.2881	8	10		160	Or temporary line power? (Y/N) ___
1	Derrick Barge (750 hp diesel)	750	0.31	8	62	8	496	
	deck barge (40' x 100')						0	Barge is not self-powered. It will use on-board winches to maneuver
	Concrete Placement (Form & Falsewo	**Start Date:**	**3/23/2015**		40 days			834 cubic yards of concrete placed for new wharf; assume 9 cy/truck = 93 trucks cycled through project. Approx 18 trucks per day for 5 pour days to place the concrete. Each truck will pour for approx 15 minutes. Pour days will be on day 10 of each 10-day work cycle.
		Start Date:	5/15/2015					
84	Cement Truck	9	0.56	8	5	8	3360	
1	Concrete Pump (150 hp diesel)	84	0.74				0	

Project Name: **VMT - PHASE 2 Wharf Contstructio**

Complete ALL Portions in Yellow

See Equipment Type TAB for type, horsepower and load factor

	Project Size	0	square feet bldngs	2	acres			

Qty	Description	HP	Load Factor	Hours/day	Total Work Days	Avg. Hours per Day	Annual Hours	Comments
	Dredging	**Start Date:**	**6/6/2015**					
		End Date:	6/15/2016		8	days		**Demolition Volume**
1	Dredge	850	0.29	24	7.25	21.8	174	Dredge volume for Phase 2 is estiamted at 50,000 cubic yards
1	Tug	1200	0.31	4	7.25	3.6	29	Production will be approximately 7,000 cubic yards/day
1	Generator	150	0.34	24	7.25	21.8	174	
	Move Orcem Demo Material as fill	**Start Date:**	**2/29/2015**					
		End Date:	6/15/2016					
1	Rubber Tired Loaders	199	0.36	8	80	8		Import 77,500 cy from Orcem (0.2 miles)
								assume this occurs throughput construction period
	Building - wharf structure	**Start Date:**	**2/29/2016**					Cement Trucks? _?_ Total Round-Trips
		End Date:	5/31/2016		72	days		
1	Cranes - Manitowoc 4100	226	0.29	8	72	8.0	576	Electric? (Y/N) *N* Otherwise assumed diesel
1	Cranes - 60 ton hydraulic	226	0.29	8	2	0.2	16	Electric? (Y/N) *N* Otherwise assumed diesel
1	Forklifts	89	0.201	8	72	8.0	576	Liquid Propane (LPG)? (Y/N)_Y_ Otherwise Assumed diesel
2	Diesel Impact Hammer (D46 or equiv)			8	13	1.4	208	Or temporary line power? (Y/N) ___
1	Derrick Barge (750 hp diesel)	750	0.29	8	72	8.0	576	Derrick Barge is not self-powered. It will use on-board winches to maneuve
1	deck barge (40' x 100')			8	72	8.0	576	using anchors
	Concrete Placement (Form & Falsewo	**Start Date:**	**3/11/2016**					
		Start Date:	5/13/2016		70	days		1,000 cubic yards of concrete placed for new wharf; assume 9 cy/truck = 112 trucks cycled through project. Approx 18 trucks per day for 6.25 pour days to place the concrete. Each truck will pour for approx 15 minutes. Pour days will be on day 10 of each 10-day work cycle.
18	Cement Truck	9	0.56	0.25	6.25		28.125	
1	Concrete Pump (150 hp diesel)	84	0.74	4.5	6.25		28.125	
							0	
							0	

VMT - Phase 1 Wharf Construction - Old Wharf Removal

Solano-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	6.00	1000sqft	11.00	6,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	56
Climate Zone	4			**Operational Year**	2017
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Construction Modeling only

Land Use - Based on building size and estimated acreage for distrubed areas

Construction Phase - Based on provided equipment list and schedule

Off-road Equipment - Used "Other Construction Equipment" to represent Derricvk Barge. Both crane usage combined to one crane

Off-road Equipment - Based on provided equipment list and schedule

Off-road Equipment - Based on provided equipment list and schedule

Trips and VMT - Entered 186 cement truck trips at vendor trip lengths

Demolition - Estimated as place holder

Grading - Using default

Architectural Coating -

Vehicle Trips - Only modeling construction

Off-road Equipment - Does NOT include tug emissions, which were computed outside of CalEEMod. Crane used to represent dredge. 24-hr/day operation

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	300.00	62.00
tblConstructionPhase	NumDays	20.00	5.00
tblConstructionPhase	NumDays	20.00	40.00
tblConstructionPhase	NumDays	30.00	5.00
tblConstructionPhase	PhaseEndDate	6/2/2015	3/20/2015
tblConstructionPhase	PhaseEndDate	5/22/2015	5/15/2015
tblConstructionPhase	PhaseStartDate	5/27/2015	3/16/2015
tblConstructionPhase	PhaseStartDate	3/21/2015	3/23/2015
tblConstructionPhase	PhaseStartDate	5/16/2015	5/10/2015
tblGrading	AcresOfGrading	0.00	12.50
tblLandUse	LotAcreage	0.14	11.00
tblOffRoadEquipment	HorsePower	171.00	750.00
tblOffRoadEquipment	HorsePower	226.00	850.00
tblOffRoadEquipment	HorsePower	84.00	150.00
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.42	0.31
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Other Construction Equipment

tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOffRoadEquipment	UsageHours	7.00	0.30
tblProjectCharacteristics	OperationalYear	2014	2017
tblTripsAndVMT	HaulingTripLength	20.00	7.30
tblTripsAndVMT	HaulingTripNumber	0.00	186.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0822	0.8472	0.4215	7.4000e-004	0.0206	0.0433	0.0639	3.2100e-003	0.0407	0.0439	0.0000	67.9516	67.9516	0.0141	0.0000	68.2478
Total	**0.0822**	**0.8472**	**0.4215**	**7.4000e-004**	**0.0206**	**0.0433**	**0.0639**	**3.2100e-003**	**0.0407**	**0.0439**	**0.0000**	**67.9516**	**67.9516**	**0.0141**	**0.0000**	**68.2478**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2015	0.0822	0.8472	0.4215	7.4000e-004	0.0206	0.0433	0.0639	3.2100e-003	0.0407	0.0439	0.0000	67.9515	67.9515	0.0141	0.0000	68.2477
Total	**0.0822**	**0.8472**	**0.4215**	**7.4000e-004**	**0.0206**	**0.0433**	**0.0639**	**3.2100e-003**	**0.0407**	**0.0439**	**0.0000**	**67.9515**	**67.9515**	**0.0141**	**0.0000**	**68.2477**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Building Construction	Building Construction	3/2/2015	5/26/2015	5	62	
2	Demolition	Demolition	3/16/2015	3/20/2015	5	5	
3	Concrete Placement	Paving	3/23/2015	5/15/2015	5	40	
4	Dredging	Grading	5/10/2015	5/15/2015	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Building Construction	Cranes	2	8.00	226	0.29
Building Construction	Forklifts	1	8.00	89	0.20
Building Construction	Generator Sets	0	8.00	84	0.74
Dredging	Excavators	0	8.00	162	0.38
Building Construction	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Building Construction	Welders	0	8.00	46	0.45
Demolition	Concrete/Industrial Saws	0	8.00	81	0.73
Demolition	Excavators	2	8.00	162	0.38
Demolition	Rubber Tired Dozers	0	8.00	255	0.40
Concrete Placement	Pavers	0	8.00	125	0.42
Concrete Placement	Paving Equipment	0	8.00	130	0.36
Dredging	Graders	0	8.00	174	0.41
Concrete Placement	Rollers	0	8.00	80	0.38
Dredging	Rubber Tired Dozers	0	8.00	255	0.40
Dredging	Scrapers	0	8.00	361	0.48
Dredging	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Building Construction	Cranes	1	0.30	226	0.29
Building Construction	Other Construction Equipment	1	8.00	750	0.31
Concrete Placement	Pumps	1	8.00	84	0.74
Dredging	Cranes	1	24.00	850	0.29
Dredging	Generator Sets	1	24.00	150	0.74

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Building Construction	5	3.00	1.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	2	5.00	0.00	99.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Concrete Placement	1	3.00	0.00	186.00	12.40	7.30	7.30	LD_Mix	HDT_Mix	HHDT
Dredging	2	5.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Building Construction - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0544	0.6206	0.2333	4.0000e-004		0.0308	0.0308		0.0283	0.0283	0.0000	38.4477	38.4477	0.0115	0.0000	38.6888
Total	**0.0544**	**0.6206**	**0.2333**	**4.0000e-004**		**0.0308**	**0.0308**		**0.0283**	**0.0283**	**0.0000**	**38.4477**	**38.4477**	**0.0115**	**0.0000**	**38.6888**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.6000e-004	3.5700e-003	4.9300e-003	1.0000e-005	2.0000e-004	6.0000e-005	2.6000e-004	6.0000e-005	5.0000e-005	1.1000e-004	0.0000	0.6767	0.6767	1.0000e-005	0.0000	0.6768
Worker	3.8000e-004	5.5000e-004	5.2200e-003	1.0000e-005	8.5000e-004	1.0000e-005	8.5000e-004	2.3000e-004	1.0000e-005	2.3000e-004	0.0000	0.7949	0.7949	4.0000e-005	0.0000	0.7958
Total	**8.4000e-004**	**4.1200e-003**	**0.0102**	**2.0000e-005**	**1.0500e-003**	**7.0000e-005**	**1.1100e-003**	**2.9000e-004**	**6.0000e-005**	**3.4000e-004**	**0.0000**	**1.4715**	**1.4715**	**5.0000e-005**	**0.0000**	**1.4726**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0544	0.6206	0.2333	4.0000e-004		0.0308	0.0308		0.0283	0.0283	0.0000	38.4477	38.4477	0.0115	0.0000	38.6887
Total	**0.0544**	**0.6206**	**0.2333**	**4.0000e-004**		**0.0308**	**0.0308**		**0.0283**	**0.0283**	**0.0000**	**38.4477**	**38.4477**	**0.0115**	**0.0000**	**38.6887**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.6000e-004	3.5700e-003	4.9300e-003	1.0000e-005	2.0000e-004	6.0000e-005	2.6000e-004	6.0000e-005	5.0000e-005	1.1000e-004	0.0000	0.6767	0.6767	1.0000e-005	0.0000	0.6768
Worker	3.8000e-004	5.5000e-004	5.2200e-003	1.0000e-005	8.5000e-004	1.0000e-005	8.5000e-004	2.3000e-004	1.0000e-005	2.3000e-004	0.0000	0.7949	0.7949	4.0000e-005	0.0000	0.7958

Total	8.4000e-004	4.1200e-003	0.0102	2.0000e-005	1.0500e-003	7.0000e-005	1.1100e-003	2.9000e-004	6.0000e-005	3.4000e-004	0.0000	1.4715	1.4715	5.0000e-005	0.0000	1.4726

3.3 Demolition - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0107	0.0000	0.0107	1.6200e-003	0.0000	1.6200e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0800e-003	0.0243	0.0172	3.0000e-005		1.2000e-003	1.2000e-003		1.1000e-003	1.1000e-003	0.0000	2.5200	2.5200	7.5000e-004	0.0000	2.5358
Total	**2.0800e-003**	**0.0243**	**0.0172**	**3.0000e-005**	**0.0107**	**1.2000e-003**	**0.0119**	**1.6200e-003**	**1.1000e-003**	**2.7200e-003**	**0.0000**	**2.5200**	**2.5200**	**7.5000e-004**	**0.0000**	**2.5358**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.4000e-003	0.0173	0.0136	4.0000e-005	8.4000e-004	2.6000e-004	1.1000e-003	2.3000e-004	2.4000e-004	4.7000e-004	0.0000	3.4500	3.4500	3.0000e-005	0.0000	3.4506
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	7.0000e-005	7.0000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1070
Total	**1.4500e-003**	**0.0174**	**0.0143**	**4.0000e-005**	**9.5000e-004**	**2.6000e-004**	**1.2100e-003**	**2.6000e-004**	**2.4000e-004**	**5.0000e-004**	**0.0000**	**3.5569**	**3.5569**	**4.0000e-005**	**0.0000**	**3.5576**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0107	0.0000	0.0107	1.6200e-003	0.0000	1.6200e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0800e-003	0.0243	0.0172	3.0000e-005		1.2000e-003	1.2000e-003		1.1000e-003	1.1000e-003	0.0000	2.5200	2.5200	7.5000e-004	0.0000	2.5358
Total	**2.0800e-003**	**0.0243**	**0.0172**	**3.0000e-005**	**0.0107**	**1.2000e-003**	**0.0119**	**1.6200e-003**	**1.1000e-003**	**2.7200e-003**	**0.0000**	**2.5200**	**2.5200**	**7.5000e-004**	**0.0000**	**2.5358**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.4000e-003	0.0173	0.0136	4.0000e-005	8.4000e-004	2.6000e-004	1.1000e-003	2.3000e-004	2.4000e-004	4.7000e-004	0.0000	3.4500	3.4500	3.0000e-005	0.0000	3.4506
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	7.0000e-005	7.0000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1070

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Total	**1.4500e-003**	**0.0174**	**0.0143**	**4.0000e-005**	**9.5000e-004**	**2.6000e-004**	**1.2100e-003**	**2.6000e-004**	**2.4000e-004**	**5.0000e-004**	**0.0000**	**3.5569**	**3.5569**	**4.0000e-005**	**0.0000**	**3.5576**

3.4 Concrete Placement - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0149	0.1062	0.0779	1.3000e-004		7.9800e-003	7.9800e-003		7.9800e-003	7.9800e-003	0.0000	11.3042	11.3042	1.2100e-003	0.0000	11.3297
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0149**	**0.1062**	**0.0779**	**1.3000e-004**		**7.9800e-003**	**7.9800e-003**		**7.9800e-003**	**7.9800e-003**	**0.0000**	**11.3042**	**11.3042**	**1.2100e-003**	**0.0000**	**11.3297**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8500e-003	0.0134	0.0215	3.0000e-005	5.8000e-004	1.8000e-004	7.6000e-004	1.6000e-004	1.7000e-004	3.3000e-004	0.0000	2.4619	2.4619	2.0000e-005	0.0000	2.4624
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.5000e-004	3.6000e-004	3.3700e-003	1.0000e-005	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.5128	0.5128	3.0000e-005	0.0000	0.5134
Total	**2.1000e-003**	**0.0138**	**0.0248**	**4.0000e-005**	**1.1300e-003**	**1.8000e-004**	**1.3100e-003**	**3.1000e-004**	**1.7000e-004**	**4.8000e-004**	**0.0000**	**2.9747**	**2.9747**	**5.0000e-005**	**0.0000**	**2.9758**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0149	0.1062	0.0779	1.3000e-004		7.9800e-003	7.9800e-003		7.9800e-003	7.9800e-003	0.0000	11.3042	11.3042	1.2100e-003	0.0000	11.3296
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0149**	**0.1062**	**0.0779**	**1.3000e-004**		**7.9800e-003**	**7.9800e-003**		**7.9800e-003**	**7.9800e-003**	**0.0000**	**11.3042**	**11.3042**	**1.2100e-003**	**0.0000**	**11.3296**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.8500e-003	0.0134	0.0215	3.0000e-005	5.8000e-004	1.8000e-004	7.6000e-004	1.6000e-004	1.7000e-004	3.3000e-004	0.0000	2.4619	2.4619	2.0000e-005	0.0000	2.4624
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.5000e-004	3.6000e-004	3.3700e-003	1.0000e-005	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.5128	0.5128	3.0000e-005	0.0000	0.5134

Total	**2.1000e-003**	**0.0138**	**0.0248**	**4.0000e-005**	**1.1300e-003**	**1.8000e-004**	**1.3100e-003**	**3.1000e-004**	**1.7000e-004**	**4.8000e-004**	**0.0000**	**2.9747**	**2.9747**	**5.0000e-005**	**0.0000**	**2.9758**

3.5 Dredging - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.6300e-003	0.0000	6.6300e-003	7.2000e-004	0.0000	7.2000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.4600e-003	0.0608	0.0431	9.0000e-005		2.8000e-003	2.8000e-003		2.8000e-003	2.8000e-003	0.0000	7.5697	7.5697	5.2000e-004	0.0000	7.5807
Total	**6.4600e-003**	**0.0608**	**0.0431**	**9.0000e-005**	**6.6300e-003**	**2.8000e-003**	**9.4300e-003**	**7.2000e-004**	**2.8000e-003**	**3.5200e-003**	**0.0000**	**7.5697**	**7.5697**	**5.2000e-004**	**0.0000**	**7.5807**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	7.0000e-005	7.0000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1070
Total	**5.0000e-005**	**7.0000e-005**	**7.0000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1068**	**0.1068**	**1.0000e-005**	**0.0000**	**0.1070**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.6300e-003	0.0000	6.6300e-003	7.2000e-004	0.0000	7.2000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.4600e-003	0.0608	0.0431	9.0000e-005		2.8000e-003	2.8000e-003		2.8000e-003	2.8000e-003	0.0000	7.5697	7.5697	5.2000e-004	0.0000	7.5806
Total	**6.4600e-003**	**0.0608**	**0.0431**	**9.0000e-005**	**6.6300e-003**	**2.8000e-003**	**9.4300e-003**	**7.2000e-004**	**2.8000e-003**	**3.5200e-003**	**0.0000**	**7.5697**	**7.5697**	**5.2000e-004**	**0.0000**	**7.5806**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	7.0000e-005	7.0000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1068	0.1068	1.0000e-005	0.0000	0.1070

Total	**5.0000e-005**	**7.0000e-005**	**7.0000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1068**	**0.1068**	**1.0000e-005**	**0.0000**	**0.1070**

VMT Phase 2 Construction

Solano-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	1.00	1000sqft	2.00	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	56
Climate Zone	4			**Operational Year**	2017
Utility Company					
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Estimating about 2 acres; however, mostly over water

Construction Phase - Phases based on equipment list

Off-road Equipment - Modeled Derrick Barge as 750 HP crane

Off-road Equipment - Added this phase for transporting demo material from Orcem to VMT.

Off-road Equipment - Concrete pumping every 1 out of 10 workdays

Off-road Equipment - Dredge modeled as crane (850 Hp)

Grading - Not including 50,000cy of dredsge material that will not be hauled

Demolition -

Trips and VMT - 224 cement truck trips at vendor length. Demo material transferred from Orcem (0.2 miles)

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	200.00	72.00
tblConstructionPhase	NumDays	4.00	8.00
tblConstructionPhase	NumDays	10.00	45.00
tblConstructionPhase	NumDays	2.00	80.00
tblConstructionPhase	PhaseEndDate	9/27/2016	6/7/2016
tblConstructionPhase	PhaseEndDate	5/24/2016	6/15/2016
tblConstructionPhase	PhaseEndDate	8/9/2016	5/12/2016
tblConstructionPhase	PhaseStartDate	6/18/2016	2/29/2016
tblConstructionPhase	PhaseStartDate	5/13/2016	6/6/2016
tblConstructionPhase	PhaseStartDate	6/8/2016	3/11/2016
tblGrading	AcresOfGrading	0.00	2.00
tblGrading	AcresOfGrading	0.00	3.00
tblGrading	MaterialImported	0.00	77,500.00
tblLandUse	LotAcreage	0.02	2.00
tblOffRoadEquipment	HorsePower	226.00	750.00
tblOffRoadEquipment	HorsePower	226.00	850.00
tblOffRoadEquipment	HorsePower	84.00	150.00
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	LoadFactor	0.36	0.36

tblOffRoadEquipment	LoadFactor	0.29	0.29
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentType		Cranes
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.20
tblProjectCharacteristics	OperationalYear	2014	2017
tblTripsAndVMT	HaulingTripLength	20.00	0.20
tblTripsAndVMT	HaulingTripLength	20.00	7.30
tblTripsAndVMT	HaulingTripNumber	0.00	224.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.2056	1.6977	1.7015	1.8000e-003	0.0110	0.0713	0.0823	2.0100e-003	0.0669	0.0689	0.0000	163.3647	163.3647	0.0377	0.0000	164.1558
Total	**0.2056**	**1.6977**	**1.7015**	**1.8000e-003**	**0.0110**	**0.0713**	**0.0823**	**2.0100e-003**	**0.0669**	**0.0689**	**0.0000**	**163.3647**	**163.3647**	**0.0377**	**0.0000**	**164.1558**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2016	0.2056	1.6977	1.7015	1.8000e-003	0.0110	0.0713	0.0823	2.0100e-003	0.0669	0.0689	0.0000	163.3645	163.3645	0.0377	0.0000	164.1556
Total	**0.2056**	**1.6977**	**1.7015**	**1.8000e-003**	**0.0110**	**0.0713**	**0.0823**	**2.0100e-003**	**0.0669**	**0.0689**	**0.0000**	**163.3645**	**163.3645**	**0.0377**	**0.0000**	**164.1556**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Transport material	Site Preparation	2/28/2016	6/17/2016	5	80	
2	Building Wharf Structure	Building Construction	2/29/2016	6/7/2016	5	72	
3	Concrete Placement	Paving	3/11/2016	5/12/2016	5	45	
4	Dredging	Grading	6/6/2016	6/15/2016	5	8	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Building Wharf Structure	Cranes	1	0.20	226	0.29
Concrete Placement	Cement and Mortar Mixers	1	8.00	9	0.56
Building Wharf Structure	Cranes	1	8.00	750	0.29
Building Wharf Structure	Generator Sets	1	8.00	84	0.74
Building Wharf Structure	Cranes	1	8.00	226	0.29
Building Wharf Structure	Forklifts	2	7.00	89	0.20
Transport material	Graders	0	8.00	174	0.41
Concrete Placement	Pavers	0	8.00	125	0.42
Concrete Placement	Rollers	0	8.00	80	0.38
Transport material	Rubber Tired Loaders	1	8.00	199	0.36
Dredging	Rubber Tired Dozers	0	8.00	255	0.40
Building Wharf Structure	Tractors/Loaders/Backhoes	0	6.00	97	0.37
Concrete Placement	Pumps	1	0.10	84	0.74
Dredging	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Concrete Placement	Tractors/Loaders/Backhoes	0	8.00	97	0.37
Transport material	Tractors/Loaders/Backhoes	0	7.00	97	0.37
Dredging	Graders	0	8.00	174	0.41
Concrete Placement	Paving Equipment	0	8.00	130	0.36
Transport material	Scrapers	0	8.00	361	0.48
Building Wharf Structure	Welders	0	8.00	46	0.45
Dredging	Cranes	1	21.80	850	0.29
Dredging	Generator Sets	1	21.80	150	0.74

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Transport material	1	3.00	0.00	9,688.00	12.40	7.30	0.20	LD_Mix	HDT_Mix	HHDT
Dredging	2	5.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Wharf Structure	6	0.00	0.00	0.00	12.40	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Concrete Placement	2	5.00	0.00	224.00	12.40	7.30	7.30	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Transport material - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.9700e-003	0.0000	5.9700e-003	8.4000e-004	0.0000	8.4000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0200	0.2598	0.0738	2.5000e-004		8.8600e-003	8.8600e-003		8.1500e-003	8.1500e-003	0.0000	23.2078	23.2078	7.0000e-003	0.0000	23.3548
Total	**0.0200**	**0.2598**	**0.0738**	**2.5000e-004**	**5.9700e-003**	**8.8600e-003**	**0.0148**	**8.4000e-004**	**8.1500e-003**	**8.9900e-003**	**0.0000**	**23.2078**	**23.2078**	**7.0000e-003**	**0.0000**	**23.3548**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0687	0.1295	0.9667	1.4000e-004	9.2000e-004	5.0000e-004	1.4200e-003	2.6000e-004	4.5000e-004	7.1000e-004	0.0000	11.0531	11.0531	2.6000e-004	0.0000	11.0586
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.4000e-004	6.4000e-004	5.9900e-003	1.0000e-005	1.0900e-003	1.0000e-005	1.1000e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	0.9893	0.9893	5.0000e-005	0.0000	0.9904
Total	**0.0692**	**0.1301**	**0.9727**	**1.5000e-004**	**2.0100e-003**	**5.1000e-004**	**2.5200e-003**	**5.5000e-004**	**4.6000e-004**	**1.0100e-003**	**0.0000**	**12.0424**	**12.0424**	**3.1000e-004**	**0.0000**	**12.0489**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.9700e-003	0.0000	5.9700e-003	8.4000e-004	0.0000	8.4000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0200	0.2598	0.0738	2.5000e-004		8.8600e-003	8.8600e-003		8.1500e-003	8.1500e-003	0.0000	23.2078	23.2078	7.0000e-003	0.0000	23.3548
Total	**0.0200**	**0.2598**	**0.0738**	**2.5000e-004**	**5.9700e-003**	**8.8600e-003**	**0.0148**	**8.4000e-004**	**8.1500e-003**	**8.9900e-003**	**0.0000**	**23.2078**	**23.2078**	**7.0000e-003**	**0.0000**	**23.3548**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0687	0.1295	0.9667	1.4000e-004	9.2000e-004	5.0000e-004	1.4200e-003	2.6000e-004	4.5000e-004	7.1000e-004	0.0000	11.0531	11.0531	2.6000e-004	0.0000	11.0586
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.4000e-004	6.4000e-004	5.9900e-003	1.0000e-005	1.0900e-003	1.0000e-005	1.1000e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	0.9893	0.9893	5.0000e-005	0.0000	0.9904

Total	0.0692	0.1301	0.9727	1.5000e-004	2.0100e-003	5.1000e-004	2.5200e-003	5.5000e-004	4.6000e-004	1.0100e-003	0.0000	12.0424	12.0424	3.1000e-004	0.0000	12.0489

3.3 Building Wharf Structure - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1040	1.2037	0.5530	1.2100e-003		0.0577	0.0577		0.0541	0.0541	0.0000	111.9005	111.9005	0.0295	0.0000	112.5196
Total	**0.1040**	**1.2037**	**0.5530**	**1.2100e-003**		**0.0577**	**0.0577**		**0.0541**	**0.0541**	**0.0000**	**111.9005**	**111.9005**	**0.0295**	**0.0000**	**112.5196**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1040	1.2037	0.5530	1.2100e-003		0.0577	0.0577		0.0541	0.0541	0.0000	111.9004	111.9004	0.0295	0.0000	112.5194
Total	**0.1040**	**1.2037**	**0.5530**	**1.2100e-003**		**0.0577**	**0.0577**		**0.0541**	**0.0541**	**0.0000**	**111.9004**	**111.9004**	**0.0295**	**0.0000**	**112.5194**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Total	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.4 Concrete Placement - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.5100e-003	9.6900e-003	8.0200e-003	2.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	1.1901	1.1901	1.2000e-004	0.0000	1.1927
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.5100e-003**	**9.6900e-003**	**8.0200e-003**	**2.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**1.1901**	**1.1901**	**1.2000e-004**	**0.0000**	**1.1927**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0400e-003	0.0140	0.0248	3.0000e-005	6.9000e-004	1.6000e-004	8.6000e-004	1.9000e-004	1.5000e-004	3.4000e-004	0.0000	2.9302	2.9302	2.0000e-005	0.0000	2.9307
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1000e-004	6.0000e-004	5.6100e-003	1.0000e-005	1.0300e-003	1.0000e-005	1.0300e-003	2.7000e-004	1.0000e-005	2.8000e-004	0.0000	0.9274	0.9274	5.0000e-005	0.0000	0.9285
Total	**2.4500e-003**	**0.0146**	**0.0304**	**4.0000e-005**	**1.7200e-003**	**1.7000e-004**	**1.8900e-003**	**4.6000e-004**	**1.6000e-004**	**6.2000e-004**	**0.0000**	**3.8576**	**3.8576**	**7.0000e-005**	**0.0000**	**3.8592**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.5100e-003	9.6900e-003	8.0200e-003	2.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	1.1901	1.1901	1.2000e-004	0.0000	1.1927
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.5100e-003**	**9.6900e-003**	**8.0200e-003**	**2.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**1.1901**	**1.1901**	**1.2000e-004**	**0.0000**	**1.1927**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0400e-003	0.0140	0.0248	3.0000e-005	6.9000e-004	1.6000e-004	8.6000e-004	1.9000e-004	1.5000e-004	3.4000e-004	0.0000	2.9302	2.9302	2.0000e-005	0.0000	2.9307
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1000e-004	6.0000e-004	5.6100e-003	1.0000e-005	1.0300e-003	1.0000e-005	1.0300e-003	2.7000e-004	1.0000e-005	2.8000e-004	0.0000	0.9274	0.9274	5.0000e-005	0.0000	0.9285

Total	**2.4500e-003**	**0.0146**	**0.0304**	**4.0000e-005**	**1.7200e-003**	**1.7000e-004**	**1.8900e-003**	**4.6000e-004**	**1.6000e-004**	**6.2000e-004**	**0.0000**	**3.8576**	**3.8576**	**7.0000e-005**	**0.0000**	**3.8592**

3.5 Dredging - 2016

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0600e-003	0.0000	1.0600e-003	1.1000e-004	0.0000	1.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.4500e-003	0.0796	0.0626	1.3000e-004		3.6300e-003	3.6300e-003		3.6300e-003	3.6300e-003	0.0000	11.0014	11.0014	6.8000e-004	0.0000	11.0156
Total	**8.4500e-003**	**0.0796**	**0.0626**	**1.3000e-004**	**1.0600e-003**	**3.6300e-003**	**4.6900e-003**	**1.1000e-004**	**3.6300e-003**	**3.7400e-003**	**0.0000**	**11.0014**	**11.0014**	**6.8000e-004**	**0.0000**	**11.0156**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	1.1000e-004	1.0000e-003	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1649	0.1649	1.0000e-005	0.0000	0.1651
Total	**7.0000e-005**	**1.1000e-004**	**1.0000e-003**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1649**	**0.1649**	**1.0000e-005**	**0.0000**	**0.1651**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.0600e-003	0.0000	1.0600e-003	1.1000e-004	0.0000	1.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.4500e-003	0.0796	0.0626	1.3000e-004		3.6300e-003	3.6300e-003		3.6300e-003	3.6300e-003	0.0000	11.0014	11.0014	6.8000e-004	0.0000	11.0156
Total	**8.4500e-003**	**0.0796**	**0.0626**	**1.3000e-004**	**1.0600e-003**	**3.6300e-003**	**4.6900e-003**	**1.1000e-004**	**3.6300e-003**	**3.7400e-003**	**0.0000**	**11.0014**	**11.0014**	**6.8000e-004**	**0.0000**	**11.0156**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	1.1000e-004	1.0000e-003	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1649	0.1649	1.0000e-005	0.0000	0.1651

Total	7.0000e-005	1.1000e-004	1.0000e-003	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1649	0.1649	1.0000e-005	0.0000	0.1651

Tug Boat Emission Factors and Emissions

Analysis Year = 2015

Main Engine(s)

No. Main Engines =	2	
Main Engine Horsepower (each) =	1200	
Total Main Engine Horsepower =	2400	Based on information provided
Average Load Factor =	0.5	
Main Engine(s) Age =	15	(1999 model year)
Annual Use Hours =	2274	
Project Daily Use Hours =	4	Daily Use

Main Engine Emission Factors

	Pollutant				
	NOx	ROG	CO	PM	CO2
Zero-Hour Emission Factor (g/hp-hr)	7.31	0.68	1.97	0.36	
Deterioration Factor	0.21	0.44	0.25	0.67	
Fuel Correction Factor	0.948	1	1	0.8	
In-Use Emission Factor (g/hp-hr)	7.97	0.89	2.32	0.43	546

Main Engine Emissions

	NOx	ROG	CO	PM	CO2
Hourly Emission Rate (lb/hr)	21.1	2.4	6.1	1.1	1,444
Daily Emission Rate (lb/day)	84.3	9.5	24.6	4.5	5,778

Auxiliary Engine(s)

No. Auxiliary Engines =	1	
Auxiliary Engine Horsepower (each) =	150	
Total Auxiliary Engine Horsepower =	150	
Average Load Factor =	0.31	
Auxiliary Engine(s) Age =	15	(1999 model year)
Annual Use Hours =	2486	
Project Daily Use Hours =	4	

Auxiliary Engine Emission Factors

	Pollutant				
	NOx	ROG	CO	PM	CO2
Zero-Hour Emission Factor (g/hp-hr)	7.31	1.18	3.59	0.58	
Deterioration Factor	0.14	0.28	0.16	0.44	
Fuel Correction Factor	0.948	1	1	0.8	
In-Use Emission Factor (g/hp-hr)	7.56	1.40	3.96	0.60	546

Auxiliary Engine Emissions

	NOx	ROG	CO	PM	CO2
Hourly Emission Rate (lb/hr)	0.8	0.1	0.4	0.1	1,444
Daily Emission Rate (lb/day)	3.1	0.6	1.6	0.2	5,778

Total Tug Boat Emissions

	Pollutant				
	NOx	ROG	CO	PM	CO2
Hourly Emission Rate (lb/hr)	**21.9**	**2.5**	**6.5**	**1.2**	**2889**
Daily Emission Rate (lb/day)	**87.4**	**10.0**	**26.2**	**4.8**	**11556**
Phase 1 Tug Boat Emissions (tons/MT)	**0.22**	**0.03**	**0.07**	**0.01**	**26**
Phase 2 Tug Boat Emissions (tons/MT)	**0.31**	**0.04**	**0.09**	**0.02**	**37**

Emission factors from (1) CARB's September 2007 Initial Statement of Reasons for Proposed Rulemaking, Proposed Regulation for Commercial Harbor Craft, Appendix B, Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, and Appendix D - Statewide Commercial Harbor Craft Survey, Final Report and (2) CARB's 2008 Assumptions for Estimating Greenhouse Gas Emissions from Commercial Harbor Craft Operating in California *http://www.arb.ca.gov/regact/2007/chc07/appgchc.pdf*

Attachment 3: Cancer Risk Assessment Calculations

Orcem - Construction Impacts
Maximum DPM Cancer Risk Calculations From Construction
Off-Site Residential Receptor Locations - 1.5 meters

Cancer Risk (per million) = CPF x Inhalation Dose x 1.0E6

Where: CPF = Cancer potency factor $(mg/kg\text{-}day)^{-1}$

Inhalation Dose = C_{air} x DBR x A x EF x ED x 10^{-6} / AT

Where: C_{air} = concentration in air ($\mu g/m^3$)
DBR = daily breathing rate (L/kg body weight-day)
A = Inhalation absorption factor
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time period over which exposure is averaged.
10^{-6} = Conversion factor

Values

Parameter	Child	Adult
CPF =	1.10E+00	1.10E+00
DBR =	581	302
A =	1	1
EF =	350	350
AT =	25,550	25,550

Construction Cancer Risk by Year - Maximum Impact Receptor Location

		Child - Exposure Information			Child	Adult - Exposure Information			Adult
	Exposure			Exposure	Cancer	Modeled		Exposure	Cancer
Exposure	Duration	DPM Conc (ug/m3)		Adjust	Risk	DPM Conc (ug/m3)		Adjust	Risk
Year	(years)	Year	Annual	Factor	(per million)	Year	Annual	Factor	(per million)
1	1	2015	0.0430	10	3.76	2015	0.0430	1	0.20
2	1	2016	0.0216	10	1.89	2016	0.0216	1	0.10
3	1		0.0000	4.75	0.00		0.0000	1	0.00
4	1		0.0000	3	0.00		0.0000	1	0.00
5	1		0.0000	3	0.00		0.0000	1	0.00
6	1		0.0000	3	0.00		0.0000	1	0.00
7	1		0.0000	3	0.00		0.0000	1	0.00
8	1		0.0000	3	0.00		0.0000	1	0.00
9	1		0.0000	3	0.00		0.0000	1	0.00
10	1		0.0000	3	0.00		0.0000	1	0.00
11	1		0.0000	3	0.00		0.0000	1	0.00
12	1		0.0000	3	0.00		0.0000	1	0.00
13	1		0.0000	3	0.00		0.0000	1	0.00
14	1		0.0000	3	0.00		0.0000	1	0.00
15	1		0.0000	3	0.00		0.0000	1	0.00
16	1		0.0000	3	0.00		0.0000	1	0.00
17	1		0.0000	1.5	0.00		0.0000	1	0.00
18	1		0.0000	1	0.00		0.0000	1	0.00
.•	.•	.•	.•	.•	.•	.•	.•	.•	.•
.•	.•	.•	.•	.•	.•	.•	.•	.•	.•
.•	.•	.•	.•	.•	.•	.•	.•	.•	.•
65	1		0.0000	1	0.00		0.0000	1	0.00
66	1		0.0000	1	0.00		0.0000	1	0.00
67	1		0.0000	1	0.00		0.0000	1	0.00
68	1		0.0000	1	0.00		0.0000	1	0.00
69	1		0.0000	1	0.00		0.0000	1	0.00
70	1		0.0000	1	0.00		0.0000	1	0.00
Total Increased Cancer Risk					**5.66**				**0.29**

	HI	Fugitive PM2.5	Total PM2.5
2015	0.009	0.0324	0.075
2016	0.004	0.0000	0.022

APPENDIX HRA

Intended for

VMT / Orcem

Date

May 2015

VMT / ORCEM HEALTH RISK ASSESSMENT VALLEJO, CA

RAMBOLL ENVIRON

CONTENTS

APPENDICES

Appendix 1

Modelled Source Stack and Location Data

Appendix 2

Modeling/HRA Compact Disk

1. HEALTH RISK ASSESSMENT ANALYSIS

This report presents the methodology and results of a human health risk assessment (HRA) which was performed to assess potential impacts and public exposure associated with the combined airborne emissions of toxic air contaminants (TAC) from the routine operation of both the ORCEM California Inc., Orcem Vallejo GBFS Plant (Orcem) and the Vallejo Marine Terminal (VMT). The combination of the Orcem and VMT is referred to as the "Project" in this document. This analysis is also applicable to the Reduced Operations Alternative (ROA) to the proposed Project, as the effects of the ROA with respect to health risks are substantially the same or slightly less than those of the Project. This report was done in conjunction with AWN Consulting.

Air will be the dominant pathway for public exposure to chemical substances released by the Project. Emissions to the air will consist primarily of combustion by-products produced by the dryer, and from diesel-fired engines. Emissions of toxics from fugitive processes from the various cement processing and handling systems were assessed Potential health risks from facility-wide emissions will occur almost entirely by direct inhalation. To be conservative, additional pathways were included in the health risk modeling, *i.e.*, soil ingestion, dermal exposure, mother's milk exposure. However, direct inhalation is considered the most likely exposure pathway. The HRA was conducted in accordance with guidance established by the California Office of Environmental Health Hazard Assessment (OEHHA), the California Air Resources Board (CARB), and the Bay Area Air Quality Management District (BAAQMD).

TACs are compounds designated by the California's Environmental Protection Agency's (Cal/EPA) OEHHA as known or suspected to cause adverse health effects after short-term (acute) or long-term (chronic) exposure. In addition to naming certain chemicals as TACs, OEHHA also provides information that allows the prediction of health impacts associated with the public's potential exposure to TACs. This information is used in an HRA to estimate the potential public health impacts resulting from TAC emissions from the Project and the ROA. The resulting incremental carcinogenic and non-carcinogenic health risks from the Project are then compared to the BAAQMD California Environmental Quality Act (CEQA) thresholds to assess compliance, and hence, significance.

The HRA process was designed to evaluate the health impacts of the Project and ROA, and to ensure that the Project scenario that resulted in the greatest health impacts was evaluated. The material throughput for both the Orcem and VMT projects would ramp up over time, as shown in Table 1.1 of the Air Quality and GHG Analysis. The greatest air quality impact would result from the activities described in #3 in Table 1.1 of the Air Quality and GHG Analysis, where the maximum material is moved through the facilities via trucks and rail. The maximum mode will not occur until at least 2020. Accordingly, the emissions are analyzed for 2020 fleet year for the shipping scenario where 160,000 metric tonnes of material is shipped to the facility monthly via four vessels, and of that, 91,900 metric tonnes is shipped by truck, and 68,100 metric tons is shipped by rail. This is equivalent to two 100-car trans per week, or eight per month. While there may be up to 12 100-car trains per month, such a scenario would result in lower emissions, as there would be fewer truck trips. Note that the ROA would have the same number of cars, but it would be delivered in 50-car trains rather than 100-car trains. As discussed below, the emissions associated with marine traffic and diesel truck traffic had the greatest impacts on the health impacts. Accordingly, the Project scenarios with the greatest marine and truck traffic was analyzed.

2. PROJECT DESCRIPTION

Orcem has filed an application with the City of Vallejo to approve a Major Use Permit and Site Development Plan to construct and operate a processing plant for the manufacture of ground granulated blast furnace slag (GGBFS) and other cement products. Orcem's primary finished product, GGBFS, will be produced on site, via the following major steps:

1. Receive via several alternative transport modes, various raw materials, including, Granulated Blast Furnace Slag (GBFS), clinker, Portland cement, pozzolan, gypsum and limestone.
2. Store the GBFS, clinker, Portland cement, pozzolan, gypsum and limestone on the site.
3. Process, by milling within a closed system, the GBFS granulate and gypsum into GGBFS powder, and all the materials into a variety of hydraulic cements.
4. Store the GGBFS and cement products within enclosed storage facilities on the site.
5. Distribute the GGBFS and cement from the enclosed storage facilities on the site for use in construction projects throughout California and neighboring states.

Orcem will import its raw materials (GBFS, Clinker, portland cement, gypsum, limestone and pozzolan) for production via several methods of transport including ocean going vessels which will berth at the VMT dock. The raw materials will be unloaded and transported to open or covered stockpiles on the site, as appropriate, to fully contain fugitive dust. The raw materials will then be reclaimed from these stockpiles by front end loaders to be transported by conveyors into fully enclosed processing equipment for milling into fine powders (the finished products). The finished products will be transported in fully enclosed conveyance systems into storage silos, for subsequent loading into truck or rail tankers for distribution to customers in the region. GGBFS is manufactured by recycling a by-product, GBFS, from the steel industry. It is used as a partial replacement for traditional (portland) cement.

Given the nature of the operation outlined above, the proposed facility will require review under the BAAQMD Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants. This HRA was prepared consistent with the requirements of Regulation 2, Rule 5 as well as the BAAQMD CEQA Guidelines.

The site is located at the former General Mills facility, Vallejo, California. The site is currently not in operation and it is proposed to redevelop the land for the following uses:

- Orcem is proposing to locate a GGGBS (Ground Granulated Blast Furnace Slag) manufacturing facility on the site as described above, and;
- Vallejo Marine Terminal (VMT) is planning to develop a new dry bulk and break bulk cargo import/export facility at the Project Site. The terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets. It will also facilitate the import of raw materials for the Orcem operation.
- This report covers the cumulative health risks from these proposed developments operating simultaneously.
- The site in question is illustrated in Figure 1 below. The site is located adjacent to the Napa River and is bounded to the east by a steep incline with thick vegetation, to the west by the Napa

River, to the south by undeveloped land and Sandy Beach residential development beyond and to the North by other industrial lands.

- The nearest residential receptor locations to the site are located to the east within the condominium development on Seawitch Lane overlooking the site at a distance of approximately 20 feet from the nearest boundary of the VMT Site.
- As part of the overall development of the site there will be new TAC and $PM_{2.5}$ emission sources introduced. These can broadly be described as follows:
  - Vehicle movements on site;
  - Off-road equipment activity on site;
  - New air emissions from emission point P-1 (Main Stack) and various minor emission points associated with bag filters;
  - Fugitive dust emissions from hoppers & material transfer points;
  - Truck movements on the local road network;
  - Port activity, e.g. ship hotelling, ship unloading, stockpiling etc, and;
  - Rail activity.
- This report discusses the human health impacts of these elements using the following methodology:
  - Identification and quantification of TAC emissions for the two facilities in operation.
  - Identification of the potentially exposed off-site populations (adult and child residents, school child, off-site workers).
  - Quantification of project-related TAC concentrations at locations of the exposed population through the use of air quality dispersion modeling of project TAC emissions.
  - Calculation of health risks (increased cancer risks, chronic and acute non-cancer health effects, and $PM_{2.5}$ concentrations) and comparison to applicable health risk significance thresholds; and
  - Discussion of possible mitigation measures (where required).

2.1 Quantification of Project Toxic Air Contaminants

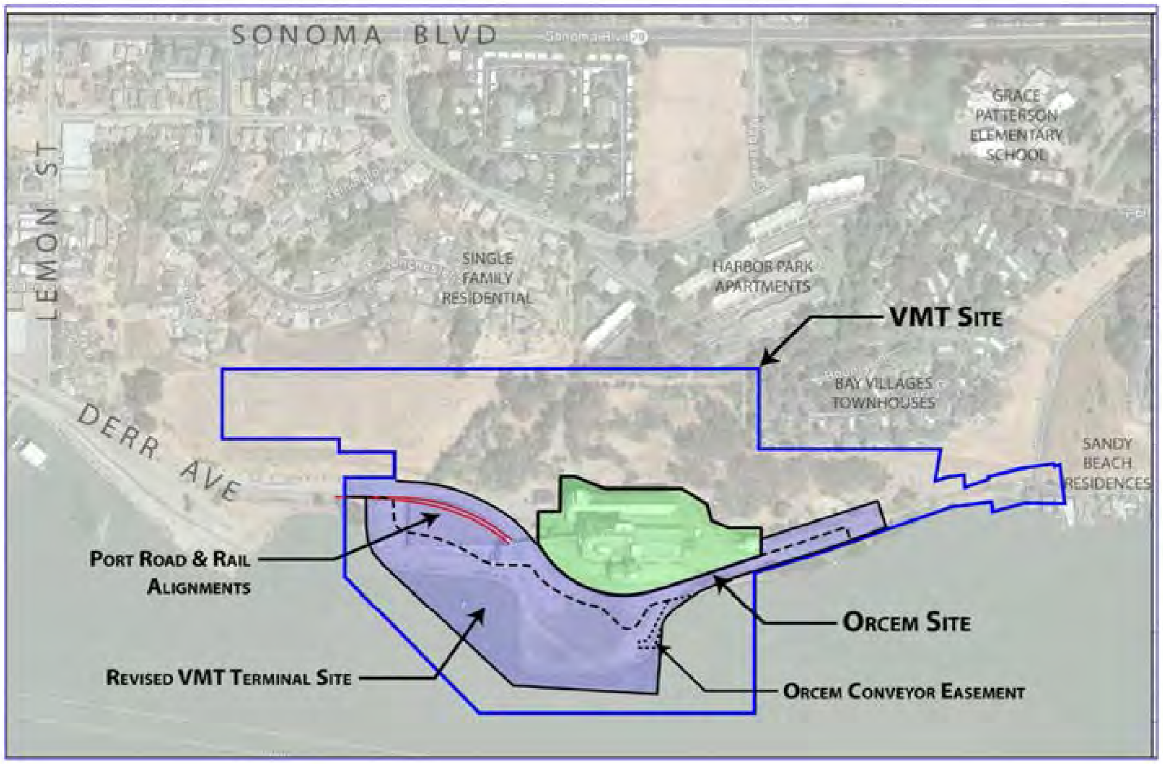
The major sources of emissions of TACs from Project operations are the transportation related combustion air emissions. Transportation-related combustion air emissions sources include vessels associated with marine shipping, locomotives associated with rail transport, and trucks associated with bringing materials into and out of the Project. For purposes of evaluating the health risks from the combustion of diesel fuels in internal combustion engines (ICE), combustion formed PM_{10} was used as the surrogate for diesel particulate matter (DPM), which is used to represent all compounds of diesel combustion related emissions, i.e., particulate and gaseous toxic pollutants. This procedure is consistent with CARB and BAAQMD guidance, as well as its use in numerous other large facility health risk assessments prepared for the BAAMQD. For other diesel fueled sources that do not use an ICE, such as ship boilers, total organic gas (TOG) and PM_{10} emissions were speciated into their individual TAC compounds using CARB PM and organic gas speciation profile data.

The operational phase of the development will see simultaneous operation of both Orcem and VMT in their respective areas. Cumulative emissions associated with the following major activities were quantified in the following sections:

- Port activity, e.g. tug operations, ship exhaust emissions during transit, maneuvering, hotelling and ship unloading;
- Material Unloading and Handling Emissions – stockpiling, uploading of material, material drop points etc;
- Fugitive Dust Emissions and process emissions from the dryer ;
- Off-road equipment activity on site;
- Truck movements both on-site and on the local road network;
- Rail activity.

For the HRA, emissions of DPM (as exhaust PM_{10}), TACs from boiler exhaust, TACS from material handling and processing sources, and total $PM_{2.5}$ (combined exhaust $PM_{2.5}$ plus fugitive $PM_{2.5}$ emissions) were based on those identified and quantified in the Air Quality Analysis. The Air Quality Analysis provides detailed discussions of the emission calculations and associated assumptions and are not repeated here. In cases where TAC emissions were calculated specifically for the HRA (e.g., non-DPM speciated emissions), a discussion of the emission calculations is provided.

Figure 1.1



Project
Orcem & VMT Air Modelling Assessment

Reference
13/6740AR01

Figure 1.1
Site Location

awnconsulting

The Tecpro Building, Clonshaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257

2.2 Port Activity

The principal raw materials to be processed in the Orcem facility will be GBFS and Clinker. These materials will arrive by ship at the proposed upgraded VMT Phase 1 wharf to be owned and operated by VMT. Two types of ships will be utilized as follows:

2.2.1 Geared Ships

Nominally a 40,000 metric tonne bulk carrier with on board cranes (geared ship). This ship will berth at the dock and the raw material on board will be discharged from the ship using clamshell grabs fitted to the on board cranes. The clamshell grabs will lift the raw material from the ship holds and deposit it into mobile hoppers located on the dock.

2.2.2 Self-Discharge Ships

Nominally a 70,000 metric tonne bulk carrier with on board reclaim conveyors and a discharge boom with an integral belt conveyor (self-discharge ship). This ship will berth at the dock and the raw material on board will be discharged from the ship via the self-discharge boom which will swing into the required position and transport the raw material from the ship and deposit it into receiving hopper located on the shore. Although these types of vessels may call at the dock, emissions on a per-ton basis will be greater if geared ships were used. Therefore, all vessels were assumed to be geared ships.

2.2.3 Shipping Emissions

The principal raw materials to be processed in the Orcem plant will be GBFS and Clinker. Sand and aggregates will be transported by VMT. Both Orcem and VMT will move these materials through the Phase 1 wharf which will be owned and operated by VMT by nominally 40,000 metric tonnes Handymax vessels. The frequency of vessel calls per phase is outlined in Table 1 with Phases 4 and 5 assuming Orcem in operation at Milestone 5. The air emissions associated with the transportation of GBFS within the 24 nautical miles (nm) of the Californian coast (within the low-sulfur fuel zone (0.1% sulfur marine oil) are outlined below.

Table 1. Number of Vessel Calls Per Milestone

Project Mode 1, 2 & 3 For Milestones	Vessel	Annual Orcem Vessel Calls	Annual VMT Vessel Calls
1	40,000 tonne Handymax	3	12
2	40,000 tonne Handymax	6	18
3	40,000 tonne Handymax	9	34
4	40,000 tonne Handymax	12	29
5	40,000 tonne Handymax	19	29

TAC emissions associated with ocean going vessels would be DPM, except for the boiler. For the boiler, TOG and PM_{10} emissions were speciated into their individual TAC compounds using PM and organic gas speciation profile data approved by the BAAQMD in a certified EIR. The unspeciated boiler PM_{10} and TOG emissions are in table 2, and the speciation profiles are presented in table 3.

Table 2. Emissions from Ship Boilers used for TAC Speciation

Source Name	Description	Number of Sources	Source Type	Pollutant	PM_{10} Emissions per Source	
					Maximum Hourly (lb/hr/source)	Average Annual (lb/year/source)
SHPHT LB	Ship Hotelling - Boiler	2	Point	PM_{10}	0.02	100.12
SHPHT LB	Ship Hotelling - Boiler	2	Point	ROG	0.01	93.16

Table 3. Ship Boiler TAC Speciation Profiles for PM_{10} and TOG

Toxic Air Contaminant	PM_{10} Weight %[1]	TOG Weight %[2]
Aluminum	0.92%	-
Ammonium	6.20%	-
Antimony	0.02%	-
Arsenic	0.00%	-
Barium	0.02%	-
Bromine Atom	0.01%	-
Cadmium	0.00%	-
Calcium	0.04%	-
Chlorine atom	0.06%	-
Chromium	0.00%	-
Cobalt	0.01%	-
Copper	0.01%	-
Elemental Carbon	28.90%	-
Gallium	0.01%	-
Indium	0.01%	-
Iron	0.59%	-
Lanthanum	0.03%	-
Lead	0.03%	-
Magnesium	0.01%	-
Molybdenum	0.01%	-
Nickel	0.72%	-
Nitrate	0.24%	-
Organic carbon	4.80%	-
Phosphorus	0.37%	-
Potassium	0.00%	-
Rubidium	0.00%	-
Selenium	0.00%	-

Table 3. Ship Boiler TAC Speciation Profiles for PM_{10} and TOG

Toxic Air Contaminant	PM_{10} Weight %[1]	TOG Weight %[2]
Silicon	0.89%	-
Sodium	0.25%	-
Strontium	0.00%	-
Sulfate	44.18%	-
Tin	0.01%	-
Titanium	0.00%	-
Vanadium	1.83%	-
Zinc	0.03%	-
1-methyl-2-ethylbenzene	-	0.08%
2,4,5-trimethylheptane	-	1.18%
2,4-dimethyl-1-pentene	-	0.09%
2,4-dimethyloctane	-	1.30%
2-methyldecane	-	0.84%
2-methylnonane	-	0.84%
2-methyloctane	-	0.30%
Acetylene	-	4.33%
a-pinene	-	0.02%
Benzene	-	2.16%
Benzothiazole	-	0.01%
Butylcyclohexane	-	0.34%
C10 alkylphenols	-	0.08%
C10 internal alkenes	-	0.43%
C11 alkylphenols	-	0.03%
C11 dialkyl benzenes	-	0.02%
C11 internal alkenes	-	0.20%
C12 internal alkenes	-	0.02%
Chlorobenzene	-	0.05%
Diethylcyclohexane	-	0.09%
Diethylmethylcyclohexanes	-	0.11%
Dimethylbenzylalcohol	-	0.03%
Dimethylbutylcyclohexane	-	0.01%
Dimethyldecane	-	0.06%
Dimethylethylcyclohexane	-	0.19%
Dimethylheptanes	-	0.11%
Dimethylnonane	-	0.50%
Dimethylundecane	-	0.05%
Dimethyoctyne diol	-	0.02%

Table 3. Ship Boiler TAC Speciation Profiles for PM_{10} and TOG

Toxic Air Contaminant	PM_{10} Weight %[1]	TOG Weight %[2]
Ethane	-	0.46%
Ethene	-	12.19%
Ethyl propylcyclohexanes	-	0.10%
Ethylbenzene	-	0.07%
Ethylcyclohexane	-	0.12%
Ethylhexane	-	0.07%
Ethylmethylcyclohexanes	-	0.86%
Ethylmethylhexane	-	0.02%
Ethyloctane	-	0.04%
Formaldehyde	-	0.10%
Indene	-	0.07%
Isomers of butylbenzene	-	0.75%
Isomers of decane	-	2.41%
Isomers of decyne	-	0.01%
Isomers of dodecane	-	0.22%
Isomers of tridecane	-	0.01%
Isomers of undecane	-	1.59%
Isomers of undecyne	-	0.04%
Isomers of xylene	-	0.34%
Isopropylcyclohexane	-	0.42%
Isopropylmethylcyclohexane	-	0.09%
Methane	-	5.01%
Methyl propylcyclohexanes	-	1.20%
Methyldecalins	-	0.11%
Methyldecene	-	0.13%
Methylundecane	-	0.18%
m-xylene	-	0.45%
Naphthalene	-	0.07%
n-butane	-	3.64%
n-heptane	-	0.46%
n-hexane	-	1.59%
n-nonane	-	1.86%
n-octane	-	0.46%
Nonadiene	-	0.03%
n-pentadecane	-	39.98%
n-pentane	-	2.05%
n-propylbenzene	-	0.20%

Table 3. Ship Boiler TAC Speciation Profiles for PM_{10} and TOG

Toxic Air Contaminant	PM_{10} Weight %[1]	TOG Weight %[2]
Octahydroindenes	-	0.03%
Octahydropentalene	-	0.02%
Octanol	-	0.02%
o-xylene	-	0.31%
Pentylindenecyclohexane	-	0.03%
Propene	-	4.56%
Propenylcyclohexane	-	0.15%
Propyl heptene	-	0.11%
t-butylbenzene	-	0.06%
t-decahydronaphthalene	-	0.12%
Tetramethylcyclopentane	-	0.11%
Tetramethylpentanone	-	0.13%
Tetramethylthiourea	-	0.01%
Toluene	-	2.15%
Trans-1,3-dimethylcyclohexane	-	0.09%
Tethylbenzenes (mixed)	-	0.68%
Trimethylcyclohexane	-	0.40%
Trimethylcyclohexanol	-	0.03%
Trimethylcyclopentanone	-	0.03%
Trimethylhexene	-	0.07%
Trimethyloctanes	-	0.07%

Notes:

[1] PM10 speciated by conservatively combining EPA emissions profiles #5676 and #127102.5 (i.e., taking the greater fraction for each overlapping compound).

[2] OG speciated according to California Air Resources Board (CARB) emissions profile #504

Fugitive TAC emissions would be associated with the storage, handling, and processing of GBFS and gypsum. Fugitive GBFS and gypsum PM_{10} emissions, presented in table 4, were speciated into their individual TAC compounds using the speciation data shown in Table 5.

Table 4. PM_{10} Emissions from Material Handling Sources used for TAC Speciation

Source Name	Description	No. of Sources	Source Type	Area Source Size (m^2)	GBFS PM Emissions		Gypsum PM Emissions	
					(lb/hr)	(lb/year)	(lb/hr)	(lb/year)
RMSP_S	Raw material storage south	1	Area	1440	6.21E-04	1.18E+00	0	0
RWSP_N	Raw material storage north	1	Area Poly	3879.4	1.55E-04	7.93E-01	0	0
RMSA_GYP	Gypsum RMSA	1	Area Poly	113.7	0	0	2.03E-05	0.233
STACK	Main Stack	1	Point	–	5.17E-01	3927.02	1.55E-02	117.81
SILO1	Silo 1	1	Point	–	1.23E-04	0.936	3.69E-06	0.028
SILO2	Silo 2	1	Point	–	2.65E-05	0.201	7.95E-07	6.04E-03
SILO3	Silo 3	1	Point	–	2.65E-05	0.201	7.95E-07	6.04E-03
LOAD1	Truck loading 1	1	Point	–	9.60E-05	0.729	2.88E-06	2.19E-02
LOAD2	Truck loading 2	1	Point	–	9.60E-05	0.729	2.88E-06	2.19E-02
LOAD3	Truck loading 3	1	Point	–	9.60E-05	0.729	2.88E-06	2.19E-02
FLS1F1- FLS1F26	RMSP1 to mobile hopper fugitives	26	Volume	-	6.95E-04	5.29E+00	0	0
FLS2F1 - FLS1F13	RMSP2 to mobile hopper fugitives	13	Volume	-	6.65E-04	5.06E+00	0	0
GYPSFUG1 - GYPSFUG12	gypsum to mobile hopper fugitives	12	Volume	-	0	0	1.71E-04	1.298
SHP_UPLD	ship upload 1	1	Volume	–	2.72E-03	6.826	0	0
SHPUPLD2	ship upload 2	1	Volume	–	2.72E-03	6.826	0	0
MOB_HOP1	mobile hopper 1	1	Volume	–	2.72E-03	6.826	0	0
MOB_HOP2	mobile hopper 2	1	Volume	–	2.72E-03	6.826	0	0
INTAKEH	intake hopper	1	Volume	–	5.44E-03	13.651	0	0
MILLFEED	mill feed hopper	1	Volume	–	1.80E-03	13.651	5.39E-05	4.10E-01
MAINSILO	mill silo	1	Volume	–	1.80E-03	13.651	0	0
MILLIN	mill intake	1	Volume	–	1.80E-03	13.651	5.39E-05	4.10E-01
FL_S1	front loader S1 material handling	1	Volume	–	9.00E-04	6.826	0	0
FL_S2	front loader S2 material handling	1	Volume	–	9.00E-04	6.826	0	0
EC_HAND1	excavator material loading and unloading 1	1	Volume	–	1.80E-03	13.651	0	0
EC_HAND2	excavator material loading and unloading 2	1	Volume	–	1.80E-03	13.651	0	0
GYP_MH	gypsum material handling	1	Volume	–	0	0	1.08E-04	8.19E-01
GYPSILO	gypsum silo	1	Volume	–	0	0	5.39E-05	4.10E-01
ELEVAT	elevator drop	1	Volume	–	1.80E-03	13.651	5.39E-05	0.41
GYPCONV	gypsum to conveyor	1	Volume	–	0	0	5.39E-05	0.41
MAINCON	main silo to conveyor	1	Volume	–	1.80E-03	13.651	0	0
CONVY1	mobile conveyor drop	1	Volume	–	5.44E-03	13.651	0	0
RMSPD1	conveyor drop 1	1	Area Poly	230.4	3.00E-03	6.825	0	0
RMSPD2	conveyor drop 2	1	Area Poly	90.4	3.00E-03	6.825	0	0

1. Sources listed here are for Orcem activity only. As described in section 5.3 VMT Activites of the Air Quality Appendix, sand and aggregates were assumed for VMT materials, and thus VMT emissions do not require TAC speciation.

Table 5 GBFS and Gypsum TAC Speciation Profiles for PM_{10}

Toxic Air Contaminant	GBFS PM_{10} Weight %	Gypsum PM_{10} Weight %
Beryllium	0.00069	0
Manganese	0.12	0.001
Selenium	0.00026	0.00013
Vanadium	0.0029	0

2.2.4 Orcem Process Operations and Emissions

TAC emissions would be produced from the combustion of pipeline quality natural gas in the drier, as well as TAC emissions associated with the PM_{10} emitted from the stack and bag filtration systems due to GBFS and gypsum use in the production process. TAC emissions from combustion of natural gas in the dryer were calculated based on fuel use and emission factors from CARB's California Air Toxics Emission Factor (CATEF) database shown in Table 6.

Table 6 Cement Dryer Emission Values

Pollutant	Emission Factor lb / MMscf (1)	Lbs / Hour	Lbs / Year
Acetaldehyde	4.61E-03	1.53E-04	1.16E+00
Acrolein	4.51E-03	1.49E-04	1.14E+00
Ammonia	0.00E+00	0.00E+00	0.00E+00
Benzene	2.34E-03	7.75E-05	5.89E-01
1,3-Butadiene	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	2.25E-03	7.46E-05	5.67E-01
Formaldehyde	4.75E-03	1.57E-04	1.20E+00
Hexane	6.30E-03	2.09E-04	1.59E+00
Naphthalene	2.37E-04	7.85E-06	5.97E-02
PAH	7.93E-05	2.63E-06	2.00E-02
Propylene	4.63E-01	1.53E-02	1.17E+02
Propylene oxide	0.00E+00	0.00E+00	0.00E+00
Toluene	3.23E-02	1.07E-03	8.13E+00
Xylene	1.87E-02	6.20E-04	4.71E+00
Chrysene	1.39E-06	4.61E-08	3.50E-04
Lead	4.08E-04	1.35E-05	1.03E-01
Beryllium	(2)	3.57E-06	2.71E-02
Manganese	(2)	6.20E-04	4.71E+00
Selenium	(2)	1.36E-06	1.04E-02
Vanadium	(2)	1.50E-05	1.14E-01

Notes:
1.Emission factors for natural gas external combustion CARB CATEF Database (34.3 MMBtu/hr)
2 Speciated emission factors based on percent weight from dryer stack PM10 (see Table 3)

2.3 Truck Movements on Local Road Network

DPM emissions from truck exhaust were calculated based on a 70-year weighted average. Emission factors from EMFAC2011 for the 70-year operational exposure period were weighted based on the age sensitivity factor (ASF) from BAAQMD guidance (BAAQMD 2010[1]). Each year's emission factor was calculated as the average of the preceding 13 truck model year emission factors, based on the CARB Truck and Bus regulations that mandate 2010 or later engines in all vehicles by 2023 (CARB 2014[2]). Running and idling emission factors, as well as the ASF weighting for each, are presented in Table 7.

[1] http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx

[2] http://www.arb.ca.gov/msprog/onrdiesel/documents/faqModelyr.pdf

Table 7 70-Year Weighted Truck Emission Factors

Operating Year	10 mph Running EF[1] (g/mile)	20 mph Running EF[1] (g/mile)	40 mph Running EF[1] (g/mile)	Idling EF[1] (g/mile)	Age Sensitivity Factor[2]	10 mph Weighted Running EF (g/mile)	20 mph Weighted Running EF (g/mile)	40 mph Weighted Running EF (g/mile)	Weighted Idling EF (g/mile)
2020	0.0297	0.0228	0.0166	0.0037	10	0.2967	0.2276	0.1658	0.0366
2021	0.0256	0.0196	0.0143	0.0015	10	0.2559	0.1963	0.1430	0.0150
2022	0.0215	0.0165	0.0120	0.0015	4.75	0.1021	0.0783	0.0571	0.0071
2023	0.0174	0.0134	0.0097	0.0015	3	0.0523	0.0401	0.0292	0.0045
2024	0.0133	0.0102	0.0074	0.0015	3	0.0400	0.0307	0.0223	0.0045
2025	0.0093	0.0071	0.0052	0.0015	3	0.0278	0.0213	0.0155	0.0045
2026	0.0117	0.0089	0.0065	0.0015	3	0.0350	0.0268	0.0195	0.0045
2027	0.0116	0.0089	0.0065	0.0015	3	0.0349	0.0268	0.0194	0.0045
2028	0.0116	0.0089	0.0065	0.0015	3	0.0348	0.0267	0.0194	0.0045
2029	0.0116	0.0089	0.0064	0.0015	3	0.0347	0.0266	0.0193	0.0045
2030	0.0116	0.0089	0.0064	0.0015	3	0.0347	0.0266	0.0193	0.0045
2031	0.0115	0.0088	0.0064	0.0015	3	0.0346	0.0265	0.0193	0.0045
2032	0.0115	0.0088	0.0064	0.0015	3	0.0346	0.0265	0.0193	0.0045
2033	0.0115	0.0088	0.0064	0.0015	3	0.0346	0.0265	0.0192	0.0045
2034	0.0115	0.0088	0.0064	0.0015	3	0.0345	0.0265	0.0192	0.0045
2035	0.0115	0.0088	0.0064	0.0015	1.5	0.0173	0.0132	0.0096	0.0022
2036	0.0115	0.0088	0.0064	0.0015	1	0.0115	0.0088	0.0064	0.0015
2037	0.0115	0.0089	0.0064	0.0015	1	0.0115	0.0089	0.0064	0.0015
2038	0.0116	0.0089	0.0064	0.0015	1	0.0116	0.0089	0.0064	0.0015
2039	0.0116	0.0089	0.0064	0.0015	1	0.0116	0.0089	0.0064	0.0015
2040	0.0116	0.0089	0.0065	0.0015	1	0.0116	0.0089	0.0065	0.0015
2041	0.0116	0.0089	0.0065	0.0015	1	0.0116	0.0089	0.0065	0.0015
2042	0.0116	0.0089	0.0064	0.0015	1	0.0116	0.0089	0.0064	0.0015
2043	0.0115	0.0088	0.0064	0.0015	1	0.0115	0.0088	0.0064	0.0015
2044	0.0114	0.0087	0.0063	0.0015	1	0.0114	0.0087	0.0063	0.0015
2045	0.0112	0.0086	0.0062	0.0015	1	0.0112	0.0086	0.0062	0.0015
2046	0.0109	0.0084	0.0061	0.0015	1	0.0109	0.0084	0.0061	0.0015
2047	0.0106	0.0081	0.0059	0.0015	1	0.0106	0.0081	0.0059	0.0015
2048	0.0102	0.0078	0.0057	0.0015	1	0.0102	0.0078	0.0057	0.0015
2049	0.0098	0.0075	0.0054	0.0015	1	0.0098	0.0075	0.0054	0.0015
2050	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2051	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2052	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2053	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2054	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2055	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2056	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2057	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2058	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2059	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2060	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2061	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2062	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2063	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2064	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2065	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2066	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2067	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2068	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2069	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2070	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2071	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2072	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2073	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2074	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2075	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2076	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2077	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2078	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2079	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2080	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015

Table 7 70-Year Weighted Truck Emission Factors

Operating Year	10 mph Running EF[1] (g/mile)	20 mph Running EF[1] (g/mile)	40 mph Running EF[1] (g/mile)	Idling EF[1] (g/mile)	Age Sensitivity Factor[2]	10 mph Weighted Running EF (g/mile)	20 mph Weighted Running EF (g/mile)	40 mph Weighted Running EF (g/mile)	Weighted Idling EF (g/mile)
2081	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2082	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2083	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2084	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2085	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2086	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2087	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2088	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
2089	0.0092	0.0071	0.0051	0.0015	1	0.0092	0.0071	0.0051	0.0015
70-Year Weighted EF:						0.0137	0.0105	0.0076	0.0016

Notes:
1. Calculated from EMFAC2011 emission factors, assuming 13 model years of truck active in each year.
2. From BAAQMD guidance.
Sources:
EMFAC2011

2.4 Rail Movements Accessing the Orcem and VMT Facilities

The existing California Northern Railroad short line currently extends into the VMT Site, running parallel to Orcem's westerly boundary which serves Vallejo and the North Bay, and connects to the Union Pacific Railroad. It is proposed that as part of this development the line be upgraded with capacity for the storage of rail cars and loading/unloading of materials. Rail tanker cars will be loaded at a location immediately north of the Orcem Site within the VMT site, along the westerly side of the main access road. Trucks will transfer materials to the rail cars from the Loading Silos and Outload Building; materials arriving via rail will be transferred by enclosed pipeline to the material storage areas.

An area for transferring goods and materials between rail cars and trucks ("Rail Transloading" area) will be established. A wheel loader reclaim hopper will be positioned opposite the Orcem Plant (between VMT the Phase 1 and 2 boundaries), and connected to a rail car loading station via an enclosed transfer conveyor. This common mobile system makes it possible for both VMT and Orcem to load and unload rail cars, while maximizing the efficiency of lay-down areas for VMT vessel cargos.

Processing and movement of bulk cargo, under the worst case scenario described earlier in this report, through the use of rail transportation serving the combined VMT Terminal Phases 1 and 2 may require up to 8 monthly unit trains of up to 100 cars per episode (800 total monthly cars). The VMT Project anticipates the use of 2 switch-mobiles or a small locomotive to handle rail car movements on the VMT Site and to and from the California Northern Railroad track spurs adjacent to the Site.

The project rail movements for Orcem are outlined in the Air Quality Analysis (Section 5.2.7 for Orcem and Section 5.4.6 for VMT) and are broken down into raw material imports (cement only under Mode 3) and finished product exports (GGBFS under both Mode 1 and 3). Also discussed in those sections, there is a reduction in truck movements associated with the use of rail to export GGBFS finished product. Thus, should GGBFS be exported by rail, the number of trucks required would be reduced by an equivalent number. However, the risk assessment analyzes full truck movements for VMT of 83 trucks per day, six out of seven days of the week, plus an additional four trucks used for other purposes. The ROA reduces the length of these trains to 50 cars each, along with a doubling of the number of trains. This change in the ROA was designed to reduce traffic and safety effects of the original Project, and will not have a meaningful effect on the analysis or conclusions of this report.

2.5 Diesel Particulate Emissions

Diesel particulate (DPM) emissions from ships, trucks, rail, and onsite diesel equipment were included in this HRA. All PM_{10} from these sources was assumed to be DPM. The DPM emissions by source are provided in Table 8.

Table 8 DPM Emission Sources and Annual Emissions from the Orcem and VMT Sites

Source Name(s)	Source Description	Source Type	Number of Sources	DPM Emissions (lb/year/source)
CONVY1-7	Mobile conveyors (exhaust)	Point	7	2.14
MOB_HOP1 - MOB_HOP2	Mobile hoppers (exhaust)	Point	2	2.14
RAIL_ID - RAILID3	Rail idling #1	Point	1	0.04
SHPHTAX	Ship Hotelling - Auxiliary Engine	Point	2	261.92
TRANS1 - TRANS34	Ship Transit within 3 km	Volume	34	0.27
TRANS35 - TRANS99	Ship Transit beyond 3 km	Volume	65	0.51
BARGE	Barge hoteling emission point	Volume	1	0
BARGE1 - BARGE29	Barge emissions	Volume	29	0
BARGE30 - BARG126	Barge in transit area	Volume	97	0
MANV1 - MANV26	Ship Maneuvering	Volume	26	1.29
TUG1 - TUG26	Tug boat - ship assist inbound emissions	Volume	26	0.79
TUGB1 - TUGB26	Tug boat - ship assist inbound emissions	Volume	26	0.79
NTUG1 - NTUG26	Tug boat - ship assist inbound emissions (night)	Volume	26	0.79
NTUGB1 - NTUGB26	Tug boat - ship assist inbound emissions (night)	Volume	26	0.79
RAILST1 - RAILST75	Rail switching	Volume	75	0.14
RAILLN1 - RAILLN41	Rail line emissions @ 10 kph	Volume	41	0.01
RAILLN42 - RAILLN65	Rail line emissions @ 15 kph	Volume	24	0.02
NRAILST1 - NRAILST75	Rail switching (night)	Volume	75	0.14
NRAILLN1 - NRAILLN41	Rail line emissions @ 10 kph (night)	Volume	41	0.01
NRAILN42 - NRAILN65	Rail line emissions @ 15 kph (night)	Volume	24	0.02
ONFUG1 - ONFUG41	On-site exhaust emissions (Orcem & VMT)	Volume	41	0.02
ONFUG64 - ONFUG83	On-site exhaust emissions (Orcem & VMT)	Volume	20	0.02
ORFUG42 - ORFUG63	Orcem Only - on-site exhaust emissions	Volume	22	0.01
LMFUG1 - LMFUG51	Lemon St exhaust	Volume	51	0.04
SNFUG1 - SNFUG22	Sonoma Blvd North exhaust	Volume	22	0.003

SSFUG1 - SSFUG31	Sonoma Blvd South exhaust	Volume	31	0.003
SMFUG1 - SMFUG29	Sonoma Blvd South of Magazine exhaust	Volume	29	0.02
LEFUG1 - LEFUG51	Lemon St exhaust	Volume	51	0.03
VMTFUG1 - VMTFUG19	VMT Only - on-site exhaust emissions[1]	Volume	19	0.01
FLS1F1 - FLS1F5	Orcem Only - front-end loader exhaust	Volume	5	0.77
FLS2F1 - FLS1F16	Orcem Only - front-end loader exhaust	Volume	16	0.77
FLS3F1 - FLS3F7	Orcem Only - front-end loader exhaust	Volume	7	0.77
FL_PH1	Front loader Phase 1[1]	Volume	1	35.99
FL_PH2	Front loader Phase 2[1]	Volume	1	0
FORK1	Forklift operation exhaust[1]	Volume	1	1.79

1. Sources assocaited with onsite VMT activity

2.6 Modeling Methodology

Two primary methods were used to assess the potential for TAC impacts in the surrounding areas. Both methods relied on the USEPA AERMOD dispersion model to calculate initial concentrations of TACs.

The air dispersion modeling, including the model used, the sources and receptors, the meteorological data that was used, and the methods used to process that data are described in Appendix MODEL of the Air Quality and GHG Analysis, which contains a description of the modeling used to evaluate CO and $PM_{2.5}$ concentrations resulting from the Project. The sources and locations of emissions can be found in Appendix1 of this document.

Consistent with the BAAQMD’s recommendations (BAAQMD, 2012), this analysis estimated TAC concentrations at potential sensitive receptor locations including people—children, adults, and seniors—occupying or residing in:

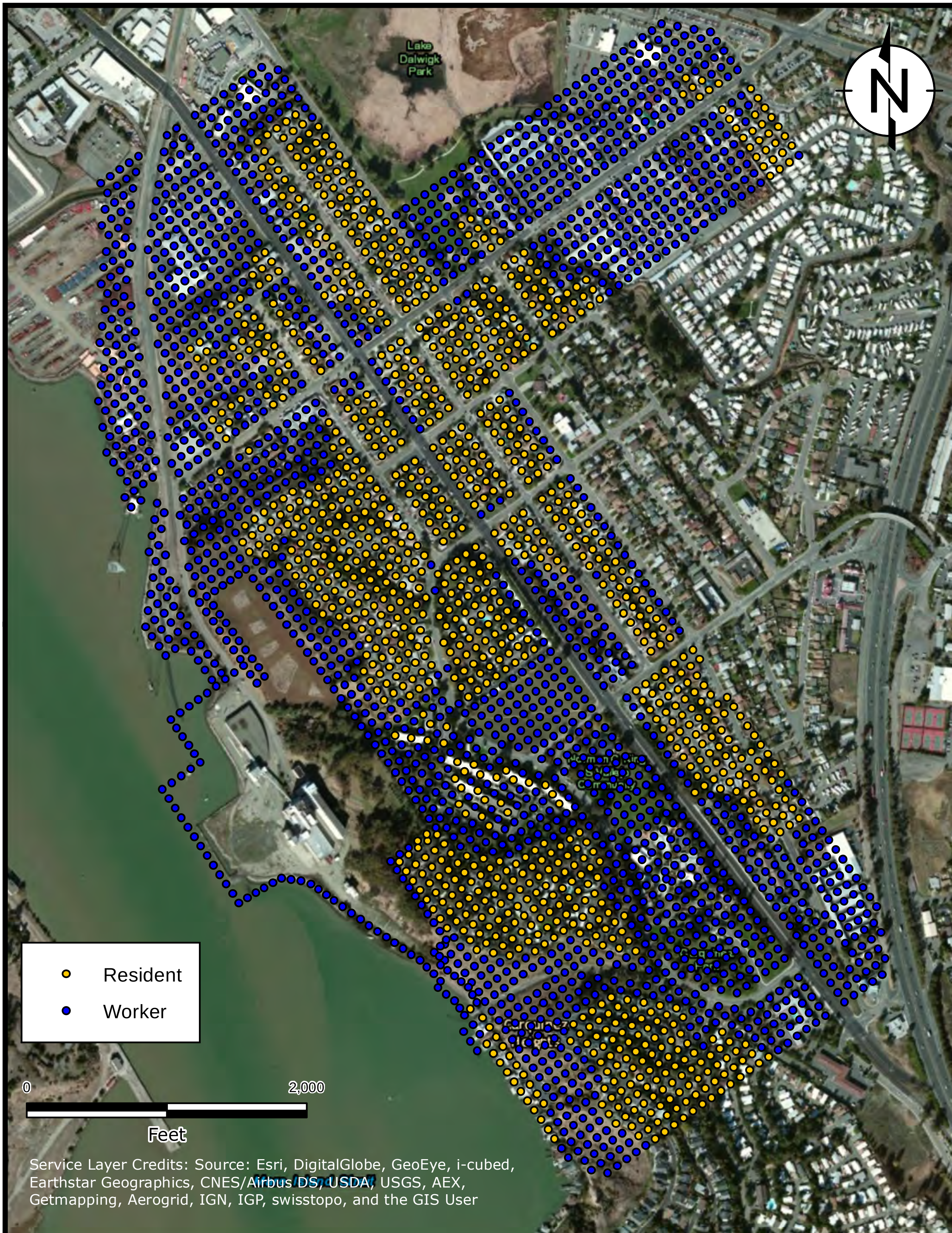
- Residential dwellings, including apartments, houses, condominiums;
- Schools, colleges, and universities;
- Daycare;
- Hospitals; and
- Senior-care facilities.

BAAQMD CEQA Guidance (BAAQMD, 2012) requires sensitive receptors within a “radius of impact,” which is typically 1,000 feet surrounding the Facility boundary. Moreover, the Guidance indicates that locations where “people reside for long periods should [also] be considered sensitive, residential receptors”, and should be included in the CEQA analysis. Because of the size and nature of the Project, the receptors included in this analysis extended beyond the radius of impact in areas along Lemon Avenue and Sonoma Road. Figure 2 displays the locations of the receptors used in the HRA. The 20 meter resolution receptor grid also included areas zoned for both residential and industrial.

Two different approaches were used to model the risks from the TACs, depending on the TACs being modelled:

1. For the calculation of risk impacts associated with DPM, AERMOD was run with the emissions of DPM unit emissions of 1 gram/second to calculate concentrations of DPM dispersion factors in units of μg/m3/g/s. DPM concentrations were then calculated via the "unit emission rate" method, by multiplying these dispersion factors by the actual emission rates. These concentrations were then multiplied by the DPM unit risk factors and adjusted to reflect the age sensitivity weighting factors (discussed below) in order to calculate total DPM risk. DPM risk is only based on the inhalation pathway, therefore, there is no multipathway risk evaluation.
2. For the remaining TACs, both AERMOD and the CARB HARP On-Ramp models were used to assess acute, cancer, and chronic impacts for all receptors. As some of the TACs have exposure pathways that include non-inhalation pathways, HARP is the approved method to assess these impacts. TAC emissions from ship hotelling boilers were evaluated using HARP methodology in an external database to efficiently accommodate changes in input parameters.

The results of the DPM risks were then added to the additional TAC risks from HARP and HARP methodology (for boilers, as noted above) in order to calculate a total cancer risk at each receptor. Both models are discussed below. These calculations are contained in Appendix 2.



RAMBOLL ENVIRON

Modeled Receptor Grid
Orcem-VMT
Vallejo, California

FIGURE
2

DRAFTED BY: MJH

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Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure. As mentioned above, schools, both public and private, day care facilities, convalescent homes, and hospitals are of particular concern. There were a number of sensitive receptors identified within an approximate 2.5 mile radius of the site. These receptors are noted in Table 9.

Table 9 Sensitive Receptors Within the Regional Area of the Project

Receptor ID	Receptor Type	Receptor ID	UTM Coordinates (E/N), m	Distance (mile)
15	medical facility	Mare Island VA Hosp	562359, 4217056	2.78
8	school	Mare Island Academy	563474, 4215422	1.8
2	school	Touro Univ.	564493, 4215574	1.1
11	school	Reignierd School	566142, 4218726	2.3
1	school	Grace Patterson ES	566878, 4214937	0.36
13	school	St. Basils School	566881, 4218709	2.3
10	school	Cal Maritime Academy	567463, 4213715	1.3
12	school	Cave ES	567736, 4218848	2.5
4	school	Beverly Hills ES	568008, 4215793	1.24
9	school	John Swett HS	568280, 4211942	2.3
14	convalescent home	Genesis Home Care	568897, 4215861	1.59
7	daycare facility	Village Childcare	569207, 4216011	2.3
6	school	Annie Pennycook ES	569251, 4216011	1.4
3	school	Glen Cove ES	569365, 4214485	2
5	school	St. Patrick HS	569974, 4215797	2.3
16	daycare facility	Benecia Kinder Care	570897, 4215220	2.8

In accordance with BAAQMD CEQA Guidance, receptors were also placed in areas zoned as industrial in order to calculate worker impacts. The same 20 meter grid was used in all worker zoned areas.

In general, receptors were not placed directly on roadways, overwater, or at other locations where long-term exposure would not occur. For 1-hour acute impact analyses, fence line receptors were assessed. The receptor grid is shown in Figure 2.

Meteorology

Associated with each point, volume and area source, are unique source and stack release parameters. These parameters include release height, exit velocity, exit temperature, stack diameter, base elevation, area source size, and sigma y/sigma z. These parameters as well as the UTM locations in NAD83 for each source and source type are summarized in Appendix A. Health Risk Methodology and Assessment.

3. HEALTH RISK ASSESSMENT

A health risk assessment includes the evaluation of cancer risks and non-cancer chronic and acute health impacts.

3.1 Cancer Risks

Cancer risk is the probability or chance of contracting cancer over a human life span (assumed to be 70 years). Carcinogens are not assumed to have a threshold below which there would be no human health impact. In other words, any exposure to a carcinogen is assumed to have some probability of causing cancer; the lower the exposure, the lower the cancer risk (i.e., a linear, no threshold model). Under various state and local regulations, an incremental cancer risk greater than 10 in a million due to a project is considered to be a significant impact on public health. For example, the 10 in a million risk level is used by the Air Toxics Hot Spots (California Health and Safety Code [CHSC] 44300 et seq.) program and California's Proposition 65 as the public notification level for air toxic emissions from existing sources.

3.2 Non-Cancer Health Effects

Non-cancer health effects can be classified as either chronic or acute. In determining the potential health risks of non-cancerous air toxics, it is assumed there is a dose of the chemical of concern below which there would be no impact on human health. The air concentration corresponding to this dose is called the Reference Exposure Level (REL). Non cancer health risks are measured in terms of a hazard quotient, which is the calculated exposure of each contaminant divided by its REL. Hazard quotients for pollutants affecting the same target organ are typically summed with the resulting totals expressed as hazard indices for each organ system. A hazard index of less than 1.0 is considered to be an insignificant health risk. For this HRA, all hazard quotients were summed regardless of target organ. This method leads to a conservative, upper-bound assessment. RELs used in the hazard index calculations were those published in the CARB/OEHHA listings dated June 2014.

Chronic toxicity is defined as adverse health effects from prolonged chemical exposure, caused by chemicals accumulating in the body, i.e. typically over a lifetime of seventy years. Because chemical accumulation to toxic levels typically occurs slowly, symptoms of chronic effects usually do not appear until long after exposure commences. The lowest no effect chronic exposure level for a non carcinogenic air toxic is the chronic REL. Below this threshold, the body is capable of eliminating or detoxifying the chemical rapidly enough to prevent its accumulation. The chronic hazard index was calculated using the hazard quotients calculated with annual concentrations.

Acute toxicity is defined as adverse health effects caused by a brief chemical exposure over periods ranging from 1 to 8 hours. For most chemicals, the air concentration required to produce acute effects is higher than the level required to produce chronic effects because the exposure duration is shorter. Because acute toxicity is predominantly manifested in the upper respiratory system at threshold exposures, all hazard quotients are typically summed to calculate the acute hazard index. Average short-term modelled concentrations are divided by acute RELs to obtain a hazard index for health effects caused by relatively high, short term exposure to air toxics.

3.3 Significance Criteria

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA. These thresholds were designed to establish the level at which BAAQMD identified air pollution emissions would cause significant environmental impacts under CEQA and were posted on BAAQMD's website and included in the Air District's updated CEQA Guidelines (updated May 2011). The significance thresholds identified by BAAQMD and used in this analysis are summarized in Table 10.

BAAQMD's adoption of significance thresholds contained in the 2011 CEQA Air Quality Guidelines was called into question by an order issued March 5, 2012, in California Building Industry Association (CBIA) v. BAAQMD (Alameda Superior Court Case No. RGI0548693). The order requires BAAQMD to set aside its approval of the thresholds until it has conducted environmental review under CEQA. The ruling made in the case concerned the environmental impacts of adopting the thresholds and how the thresholds would indirectly affect land use development patterns. In August 2013, the Appellate Court struck down the lower court's order to set aside the thresholds. However, this litigation remains pending as the California Supreme Court recently accepted a portion of CBIA's petition to review the appellate court's decision to uphold BAAQMD's adoption of the thresholds. The specific portion of the argument to be considered is in regard to whether CEQA requires consideration of the effects of the environment on a project (as contrasted to the effects of a proposed project on the environment). Therefore, the health risk significance thresholds contained in the 2011 CEQA Air Quality Guidelines have been used for evaluation of this Project and the ROA.

Table 10. BAAQMD Health Risks and Hazards Thresholds of Significance

Category	Operational Threshold
Health Risks and Hazards for New Sources	
Excess Cancer Risk	10 in a million
Chronic or Acute Hazard Index	1
Incremental annual average $PM_{2.5}$	0.3 µg/m^3
Cumulative Health Risks and Hazards for New Sources	
Excess Cancer Risk	100 per one million
Chronic Hazard Index	10
Annual Average $PM_{2.5}$	0.8 µg/m^3

Cancer risks less than 10 in a million are unlikely to represent significant public health impacts that require additional controls of facility emissions. Risks higher than 10 in a million may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population, and toxicity of the risk-driving chemicals.

Increased cancer risks and non-carcinogenic health effects were evaluated for the following exposure types and receptor locations.

- 70 year residential exposure – residential receptors were assumed to be at locations of existing and potential future residential structures.
- 9 year school child exposure – school child receptors were assumed to be at the location of school(s) where children under the age of 16 are present.
- Worker exposure – non-residential receptors where workers are likely to be present.

Human health risks associated with emissions from the proposed Project and the ROA were calculated for each modeling receptor for each applicable exposure type and the location of the receptor with the maximum health risk, or maximum impact receptor (MIR), identified. Health risks from the Project and the ROA are unlikely to be higher at any other location in the Project area than at the location of the MIRs. If there is no significant impact associated with the health risks at the

MIR locations, it is unlikely there would be significant impacts in any other location in the vicinity of the Project for the exposure scenario evaluated.

3.4 Chemicals of Concern

The human health risks associated with Toxic Air Contaminants (TACs) were evaluated in this HRA. The chemical substances emitted to the air from the proposed Project stationary and mobile sources, including fugitives from other miscellaneous support and handling systems are listed in Table 11.

Table 11. Toxicity Values Used To Characterize Health Risks (Inhalation)

Compound	Unit Risk Factor $(mg/m^3)^{-1}$	Chronic Reference Exposure Level (mg/m^3)	Acute Reference Exposure Level (mg/m^3)
Acetaldehyde	0.0000027	140	470
Acrolein	-	0.35	2.5
Benzene	0.000029	60	1,300
1-3 Butadiene	0.00017	20	-
Ethylbenzene	0.0000025	2,000	-
Formaldehyde	0.000006	9	55
Hexane	-	7,000	-
Naphthalene	0.000034	9	-
PAHs (as BaP)	0.0011	-	-
Chrysene	0.000011	-	-
Propylene	-	3,000	-
Propylene Oxide	0.0000037	30	3,100
Toluene	-	300	37,000
Xylene	-	700	22,000
Chlorine	-	0.2	210
Chlorobenzene	-	1000	-
MEK	-	-	13000
Antimony	-	-	-
Barium	-	-	-
$Chromium^6$	-	-	-
Beryllium	0.0024	0.007	-
Manganese	-	0.09	-
Selenium	-	20	-
Vanadium	-	-	30
Arsenic	0.0033	0.015	0.2
Cadmium	0.0042	0.02	-
Copper	-	-	100
Lead	0.000012	-	-
Mercury	-	0.03	0.6
Nickel	0.00026	0.014	0.2
Diesel PM	0.0003	5	-

Sources:

BAAQMD. 2010. Regulation 2, Rule 5. January. Available at: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Rules%20and%20Regs/reg%2002/rg0205.ashx?la=en. Accessed 9 May, 2015.

OEHHA. 2009. Revised Air Toxics Hot Spots Program Technical Support Document for Cancer Potency Factors. June. Available at: http://www.oehha.org/air/hot_spots/tsd052909.html. Accessed 9 May, 2015.

3.5 Calculation of Risks

Emissions of toxic pollutants potentially associated with the Project and ROA were estimated using emission factors approved by CARB and the U.S. Environmental Protection Agency (EPA). Concentrations of these pollutants in air potentially associated with Project emissions were estimated using approved dispersion modeling techniques. Modeling allows the estimation of both short-term and long-term average concentrations in air for use in a HRA, accounting for site-specific terrain and meteorological conditions. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of excess lifetime cancer risks (for carcinogenic substances), or comparison with reference exposure levels for non-cancer health effects (for non carcinogenic substances).

Calculation of TAC concentrations for use in HRA analysis requires the selection of appropriate concentration averaging times. In accordance with OEHHA guidance (OEHHA, 2003), annual average concentrations were estimated and used to evaluate cancer risk, chronic non-cancer impacts. Acute non-cancer impacts were estimated using the maximum 1-hr concentration from each activity, irrespective of hour of occurrence. This results in a conservative estimate of acute impacts. For acute non-cancer hazard analyses, the calculated 1-hour maximum concentrations for each emission source group were used. Note that because the maximum emissions for each group are not expected to occur during the same hour of the year, summing the maximum 1-hour concentrations across all source groups yields conservative (i.e., overestimates of) total air concentrations.

Health risks potentially associated with concentrations of carcinogenic air pollutants were calculated as estimated excess lifetime cancer risks. The excess lifetime cancer risk for a pollutant is estimated as the product of the concentration in air and a unit risk value. The unit risk value is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 microgram per cubic meter (μg/m3) over a 70-year lifetime. In other words, it represents the increased cancer risk associated with continuous exposure to a concentration in air over a 70-year lifetime.

The BAAQMD's adopted thresholds are based on estimation of cancer risk using methods from OEHHA's Technical Support Document for Cancer Potency Factors: Methodologies for Derivation, Listing of Available Values, and Adjustment to Allow for Early Life Stage Exposures (Cal/EPA, 2009). The OEHHA Technical Support Document proposes the use of age-specific sensitivity factors to account for an "anticipated sensitivity to carcinogens" of infants and children. Under this approach, cancer risk estimates are weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to 2 years of age and by a factor of 3 for exposures that occur from 2 years to 16 years of age. The cancer risk adjustment factor (CRAF) is the weighted factor over the entire exposure duration. The BAAQMD recommended CRAF for a 70-year residential exposure is 1.7 (BAAQMD, 2010) and was applied to the cancer risk estimation for a residential exposure. Worker exposures were assumed to occur for adults over 16 years old; therefore, no adjustment factor was applied in the cancer risks estimations for these populations. School children were assumed to be 16 years of age or younger and a CRAF) of 3 was applied in estimating cancer risks over an assumed 9 year exposure period. The BAAQMD adoptedexposure factors are summarized in Table 12.

Table 12 Cancer Risk Adjustment Factors

Receptor	Cancer Risk Adjustment Factor[1] (CRAF)
Resident[2]	1.7[a,b]
Worker[3]	1[a,c]
School Child[4]	3[a,d]
Day Care Child[5]	5.2[a,e]

Notes:

[1] All values based on BAAQMD Health Risk Screening Analysis guidelines (BAAQMD 2010).

[2] A resident was assumed to be exposed for the whole lifetime (70 years).

3. A worker was assumed to represent age 16 to age 70.
4. A school child was assumed to be from 7 years old to 16 years old.
5. Daycare centers were assumed to accept children from 6 weeks to 6 years old.

Sources:

AAQMD. 2010. Air Toxic NSR Program Health Risk Screening Analysis Guidelines. January. Available at: http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx. Accessed 9 May 2015.

Evaluation of potential non-cancer health effects from exposure to short-term and long-term concentrations in air was performed by comparing modelled concentrations in air with the RELs. A REL is a concentration in air at or below which no adverse health effects are anticipated. RELs are based on the most sensitive adverse effects reported in the medical and toxicological literature. Potential non-cancer effects were evaluated by calculating a ratio of the modelled concentration in air and the REL. This ratio is referred to as a hazard quotient. The unit risk values and RELs used to characterize health risks associated with modelled concentrations in air were obtained from the *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB, 2014), and the BAAQMD (Table 2.5-1 of Regulation 2 Rule 5).

DPM was used as the surrogate compound for all diesel combustion related emissions, i.e., particulate and gaseous toxic pollutants, consistent with BAAQMD guidance.

The DPM surrogate was applied to the following diesel fuel combustion sources related to or part of this facility:

- Off-road mobile diesel-fueled equipment, i.e., onsite excavator, loaders, etc.
- Railroad engine related emissions, i.e., haul and switching engines, etc.
- Ship, barge, and tug boat emissions, i.e., primary and auxiliary engines.
- Mobile source diesel engines, i.e., diesel truck engines, and offroad equipment engines

For purposes of the CEQA risk assessment the following sources were included in the analysis:

- All on-site stationary point, area, and fugitive sources.
- All on-site mobile source emissions.
- All off-site mobile source emissions.

3.5.1 Characterization of Risks from Toxic Air Pollutants

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The estimated risk is expressed as a unit less probability. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (e.g., lungs) by the chemical-specific cancer potency factor (CPF).The equation used to calculate the potential excess lifetime cancer risk for the inhalation pathway is as follows:

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The estimated risk is expressed as a unit less probability. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (e.g., lungs) by the chemical-specific cancer potency factor (CPF).The equation used to calculate the potential excess lifetime cancer risk for the inhalation pathway is as follows:

$$Risk_{inh} = \Sigma\, C_i x\ CF\ x\ IF_{inh}\ x\ CPF_i\ x\ CRAF\ x\ 10^6$$

Where:

$Risk_{inh}$ = Cancer Risk; the incremental probability of an individual developing cancer as a result of inhalation exposure to a particular potential carcinogen (risk per million)
C_i= Annual Average Air Concentration for $Chemical_i$ (µg/m_3)
CF = Conversion Factor (mg/µg)
IF_{inh} = Intake Factor for Inhalation ($m^{3}{}_{3}$/kg-day)
CPF_I= Cancer Potency Factor for $Chemical_i$ (mg chemical/kg body weight-day)$^{-1}$
CRAF = Cancer Risk Adjustment Factor (unitless)

and

$$IF_{inh} = DBR\ x\ ET\ x\ EF\ x\ ED\ x\ CF/AT$$

Where:

DBR = Daily Breathing Rate (L/kg-day)
ET = Exposure Time (hours/24 hours)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
AT = Averaging Time (days)
CF = Conversion Factor, 0.001 ($m^{3}{}_{3}$/L)

The potential for exposure to result in chronic non-cancer effects is evaluated by comparing the estimated annual average air concentration (which is equivalent to the average daily air concentration) to the chemical-specific non-cancer chronic RELs. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient or HQ. To evaluate the potential for adverse chronic non-cancer health effects from simultaneous exposure to multiple chemicals, the HQs for all chemicals are summed, yielding an HI.

The equations used to calculate the chemical-specific HQs and the overall HI are:

$$Chronic\ HQ_i = C_i\ /\ cREL_i$$

$$\text{Chronic HI} = \Sigma HQ_i$$

Where:

Chronic HQ_i = Chronic Hazard Quotient for $Chemical_i$ (unitless)
Chronic HI = Hazard Index (unitless)
C_i = Annual Average Air Concentration for $Chemical_i$ (µg/ m^3)
$cREL_i$ = Chronic Non-cancer Reference Exposure Level for $Chemical_i$ (µg/ m^3)

The potential for exposure to result in acute non-cancer effects is evaluated by comparing the estimated 1-hour maximum air concentration to the chemical specific non-cancer acute RELs. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient or HQ. To evaluate the potential for adverse acute non-cancer health effects from simultaneous exposure to multiple chemicals, the HQs for all chemicals are summed, yielding an HI.

The equations used to calculate the chemical-specific HQs and the overall HI are:

$$\text{Acute } HQ_i = C_i / aREL_i$$
$$\text{Acute HI} = \Sigma HQ_i$$

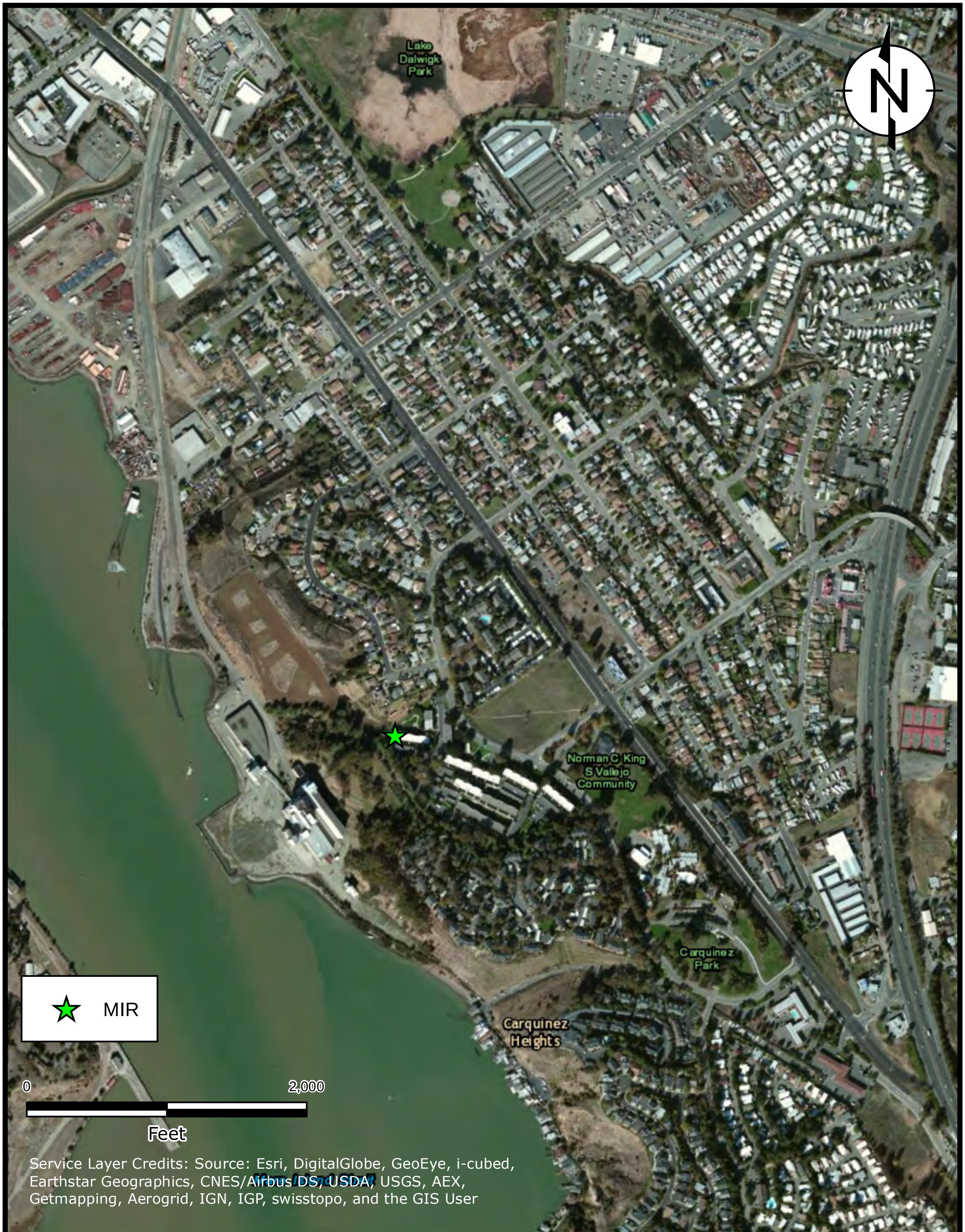
Where:
Acute HQ_i = Acute Hazard Quotient for $Chemical_i$ (unitless)
Acute HI = Hazard Index (unitless)
C_i = 1-hour Maximum Air Concentration for $Chemical_i$ (µg/m^3)
$aREL_i$ = Acute Non-cancer Reference Exposure Level for $Chemical_i$ (µg/ m^3)

The excess lifetime cancer risks associated with the multi-pathway analyses were calculated for residential, school (child), and worker exposures. The maximum excess cancer risks for each of these exposure types are summarized in Table 13. The maximum residential MIR location, with respect to the Project site is in Figure 3. Excess lifetime cancer risks less than 10 in a million are unlikely to represent significant public health impacts that require additional controls of facility emissions. Risks higher than 10 in a million may or may not be of concern, depending upon several factors. These include the conservatism of assumptions used in risk estimation, size of the potentially exposed population, and toxicity of the risk-driving chemicals. Health effects risk thresholds are listed in Table 10.

The excess cancer risks resulting from Project operation presented in Table 13 would be above the BAAQMD Threshold of significance of an excess cancer risk greater 10.0 in a million with no additional mitigation at maximum activity (as defined by the number of ship calls). Mitigation measures to achieve compliance with the BAAQMD adopted Thresholds are discussed in section 3.5.2 below.

Table 13. Unmitigated Project Health Risks Summary

	Project Impacts	
Risk Category	**Project Values at MIR**	**Applicable Significance Threshold**
70-Year Residential Exposure		
Cancer Risk	13.34	Greater than10.0 in a million
Chronic Hazard Index (HI)	0.1	Chronic HI greater than 1.0
Acute Hazard Index (HI)	0.0097	Acute HI greater than 1.0
MIR Location: 566410.58 meters easting, 4215178.79 meters northing		
Sensitive Receptor Exposure (School Child)		
Cancer Risk	0.86	Greater than10.0 in a million
Chronic Hazard Index	0.019	Chronic HI greater than 1.0
Acute Hazard Index (HI)	0.0097	Acute HI greater than 1.0
MIR Location: 566878.0 meters easting, 4214937.0 meters northing		
Offsite Worker Exposure		
Cancer Risk	1.68	Greater than 10.0 in a million
MIR Location: 566059.60 meters easting, 4215591.11 meters northing		



RAMBOLL ENVIRON

MIR Location
Orcem-VMT
Vallejo, California

FIGURE
3

DRAFTED BY: MJH | DATE:

0336906A

U:\Orcem - VMT\GIS\Updated Risk Results.mxd

4. MITIGATION MEASURES AND MITIGATED HEALTH IMPACTS

In order to determine the annual average number of ship calls that results in no significant impact before additional mitigation is applied, specific emission sources were scaled with shipping activity. Transiting, maneuvering, barges, tugs, and ship hotelling emissions (auxiliary engines and boilers) were all scaled directly with the total number of ship calls. Onsite equipment was similarly scaled, but based on the operator. In other words, Orcem's conveyors, hoppers, and front-end loaders were scaled based on Orcem ship calls (from a maximum of 19 ships), and VMT's forklift and front-end loader were scaled based on VMT ship calls (from a maximum of 29 ships).

Potential mitigation measures include the following:

- Use of biodiesel in all diesel equipment – the unmitigated case assumes the use of 20% biodiesel, consistent with the City of Vallejo Climate Action Plan (2012). Mitigation may include the use of higher fractions of biodiesel in various equipment, up to 100%. 20% biodiesel results in an 18% reduction in DPM (See Section 5 of the Air Quality and GHG Analysis), and 100% biodiesel would result in a maximum reduction of 60% (CalEPA 2012) of DPM;
- Compressed Natural Gas (CNG) front-end loaders – This measure can be applied to either Orcem's front-end loaders, VMT's front-end loader, or all equipment. Implementation would eliminate DPM from these sources entirely;
- Electric-powered Orcem mobile conveyors and hoppers which would eliminate DPM from these sources;
- Electric-powered VMT forklift which would eliminate DPM from that source

Table 14 shows the MEIR cancer risks for various mitigation scenarios, as well as the maximum annual average number of ships under each scenario that would result in less than significant impact. If, during the operation of the Project or ROA, the annual average number of ships exceeded the level of the existing mitigation, additional mitigation would need to be applied to maintain less than significant impact.

Table 14. Mitigation Measure Summary

Mitigation Measures	Maximum Residential Cancer Risk (in a million)	Maximum Number of Ship Calls for Less than Significant Impact	Maximum Residential Cancer Risk at Maximum Ship Calls (in a million)
20% Biodiesel in all on-site equipment (Base Case)	13.34	28	9.92
100% Biodiesel in conveyors and hoppers, 20% Biodiesel in all other on-site equipment	11.96	36	9.91
20% Biodiesel in all equipment, with Orcem natural gas-fueled (CNG) front end loaders (FELs)	10.17	47	9.995
20% Biodiesel in all equipment, with Orcem and VMT CNG FELs	9.39	--	9.39
100% Biodiesel in conveyors and hoppers, 20% Biodiesel in forklift and VMT FEL, Orcem CNG FELs	9.74	--	9.74

Results from the air toxics HRA based on emissions modeling indicate that, after mitigation, there will be no significant incremental public health risks from operation of the Project. All modelled impacts are less than the BAAQMD health risk based CEQA significance levels with the proper adoption of mitigation measures.

5. CUMULATIVE IMPACTS

The maximum mitigated excess cancer risk from the Project and the ROA (Orcem and VMT operation) was calculated to be 9.4 in a million, which is below the BAAQMD significance threshold of an increased cancer risk of greater than 10.0 in one million. Additionally, acute and chronic non-cancer health effects would be well below the BAAQMD significance threshold of a hazard index greater than 1.0.

As recommended by the BAAQMD (BAAQMD, 2012), to assist in evaluating cumulative risks, permitted stationary sources of TACs near the Project Site were identified using BAAQMD's *Stationary Source Risk and Hazard Analysis Tool* for sources in Napa-Solano counties.

This mapping tool uses Google Earth to identify the location of stationary sources and their estimated screening level cancer risk and hazard impacts. Three stationary sources within a 0.5 mile radius of the Project site were identified:

- Plant G10729 is the Discount Gas Grocery & Liquor located at 605 Magazine Street, approximately 1,300 feet northeast of the Project boundary. This gas station has a cancer risk value of 4.02, a hazard value of 0.004, and no $PM_{2.5}$ value associated with it.
- Plant 16677 is Original Display Fixtures located at 206 Lemon Street, about 600 feet northwest of the Project boundary. There are no cancer risk, hazard or $PM_{2.5}$ values associated with this source.
- Plant 17907 is the Sousa Solano Auto Body & Paint shop located at 407 Lemon Street, about 970 feet north of the Project boundary. There are no cancer risk, hazard or $PM_{2.5}$ values associated with this source.

It is assumed that both Plants 16677 and 17907 would not contribute to cumulative risks or hazards. For Plant G10729 it is highly unlikely that the gas station will significantly contribute to any significant cumulative cancer risk or hazard when combined with the Project's cancer risks and hazards since the BAAQMD Thresholds for significant cumulative risk are a cancer risk of greater than 100 in a million and a hazard index of greater than 10.0 for all local sources combined.

Based on the above, the project would not exceed the adopted BAAQMD Thresholds with respect to cumulative community risk caused during project operation since single-source and cumulative and cancer risk and hazard index would all be less than the BAAQMD Thresholds. Therefore, the Project and ROA impacts are found to be less-than-significant.

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APPENDIX 1

MODELLED SOURCE STACK AND LOCATIONAL DATA

APPENDIX 2

MODELING/HRA

APPENDIX MODEL

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APPENDIX MODEL
–
CARBON MONOXIDE AND $PM_{2.5}$ EMISSION INVENTORY AND IMPACT ASSESSMENT OF ORCEM AND VMT FACILITIES, VALLEJO, CALIFORNIA

Technical Report Prepared For

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EP/13/6740AR06

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Name	Dr Edward Porter	Dr Fergal Callaghan
Title	Director (Air Quality)	Director (Environmental Sciences)
Date	12 May 2015	12 May 2015

EXECUTIVE SUMMARY

AWN Consulting Limited (AWN) has been commissioned by Orcem California Inc. (Orcem) and Vallejo Marine Terminal LLC (VMT) to quantify the carbon monoxide (CO) and $PM_{2.5}$ emissions from their respective facilities and to conduct an air quality impact assessment of the planned cumulative developments at the former General Mills site, Vallejo, California. The site is currently derelict and it is proposed to redevelop the land for the following uses:

- Orcem is proposing to construct and operate a manufacturing plant on the site which focuses primarily on production of GGGBS (Ground Granulated Blast Furnace Slag), and;

- Vallejo Marine Terminal (VMT) is planning to redevelop the existing deteriorated wharf in order to operate a new dry bulk cargo import facility at the site. The new terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets. It will also facilitate the import of raw materials for the Orcem operation.

This document presents the results and conclusions of the cumulative CO and $PM_{2.5}$ emission inventory and impact assessment of both developments simultaneously in operation.

The maximum and average day and annual emission rate of CO and $PM_{2.5}$ from the process emission points / transfer points at Orcem and VMT combined are outlined in Tables ES1 and ES2. The estimates are based on detailed calculations, engineering data and based on maximum worst-case scenarios at both facilities (Orcem Milestone 5 and VMT Phase 1 Alternative).

Cumulative Maximum / Average Day Emission Total (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem Milestone 5 (Contribution to Maximum Day)	219	12.7
VMT Phase 1 Alternative (Contribution to Maximum Day)	32	0.51
Cumulative - Maximum Day	251	13.2
BACT Permit Handbook Thresholds	**10**	**10**
Review of BACT Required	**Yes**	**Yes**
Cumulative – Average Day	140	6.9
BAAQMD CEQA Thresholds	**N/A**	**54**
Significant Under CEQA	**N/A**	**No**

Table ES1 Maximum / Average Day CO And $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (lbs/day).

Table ES.2 outlines the cumulative annual mean CO and $PM_{2.5}$ emission totals (tons/yr) for the Orcem and VMT operations combined.

Cumulative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Cumulative Total (lbs/yr)	51244	2508
Cumulative Total (tons/yr)	25.6	1.25
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table ES.2 Annual Emissions Of CO And $PM_{2.5}$ From The Cumulative Operations Of VMT and Orcem (tons/yr).

The results of the modeling assessment for CO and $PM_{2.5}$ have been summarized in Section 5. The approach to the air dispersion modelling assessment has been to over-estimate the likely operations at the facility to ensure that the assessment is conservative.

The conservative assumptions include the selection of worst-case modes of operations which will have varying air emission levels. For example Orcem Mode 3 will have higher truck numbers but much of the on-site operations will be conducted within an enclosed building under negative pressure linked to bag filters compatible with BACT. In contrast, Orcem Mode 1 will have lower truck numbers but material storage and transfers will be undertaken in the open air. However, in order to capture the worst-case scenario, the current assessment has used Mode 3, Milestone 5 traffic levels but assumed all operations were undertaken as per Mode 1 (in the open air).

The results of the air dispersion modelling assessment, based on these conservative assumptions, undertaken using the EPA regulatory model AERMOD, demonstrate that the modelled project impacts, when combined with existing background ambient air quality data, are in compliance with the NAAQS and CAAQS for CO and $PM_{2.5}$.

CONTENTS

1.0 INTRODUCTION

Orcem California Inc. (Orcem) has filed an application with the City of Vallejo to approve a Major Use Permit and Site Development Plan to construct and operate a processing plant for the manufacture of ground granulated blast furnace slag (GGBFS) and other cement products.

This document outlines the methodology adopted to quantify the carbon monoxide (CO) and $PM_{2.5}$ emission inventory and to assess the potential air quality impact related to the operation of the proposed facility in line with the BAAQMD Permit Modeling Guidance (BAAQMD (2007)) and the resultant results based on a detailed air dispersion modelling study. The intent of the modeling analysis was to demonstrate that the proposed source emissions will not interfere with the attainment or maintenance of the National Ambient Air Quality Standards (NAAQS) including both California and Federal standards.

The site is located at the former General Mills facility, Vallejo, California. The site is derelict and it is proposed to redevelop the land for the following uses:

- Orcem is proposing to locate a GGGBS (Ground Granulated Blast Furnace Slag) manufacturing facility on the site as described above, and;

- Vallejo Marine Terminal (VMT) is planning to develop a new dry bulk cargo import facility at the site. The terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets. It will also facilitate the import of raw materials for the Orcem operation.

This report covers the cumulative air quality impact on the local environment of these proposed developments operating simultaneously.

As part of the overall development of the site there will be new CO and $PM_{2.5}$ emissions sources introduced. These can broadly be described as follows:

- Vehicle movements on site;
- Material handling emissions from permitted sources on-site:
- New air emissions from emission point P-1 (Main Stack);
- Truck movements on the local road network;
- Port activity, e.g. ship hoteling, ship transiting, tugs, and;
- Rail activity.

This appendix discusses the potential air quality impact of these elements using the following methodology:

- Quantification of the CO and $PM_{2.5}$ emission inventory for the two facilities in operation.
- Review of the appropriate guidance in order to derive appropriate ambient air quality criteria for the proposed operations;
- Review of the appropriate guidance in order to derive appropriate operating criteria for the proposed facilities;
- Determination of the existing baseline CO and $PM_{2.5}$ levels by reviewing nearby baseline air quality data;
- Assessment of the proposed development through the development of a detailed air dispersion model of the site.

2.0 AIR QUALITY EMISSION INVENTORY METHODOLOGY

The operational phase of the development will see both Orcem and VMT operating their respective areas of the site simultaneously. The following sections have quantified the air emissions associated with their operations cumulatively as a result of the following air emission generating activities:

- Port activity, e.g. ship exhaust emissions;
- Material handling emissions from permitted sources on-site;
- Offroad vehicle movements on site;
- Air emissions from emission point P-1 (Main Stack);
- Truck movements both onsite and on the local road network;
- Rail activity;
- Barge activity.

2.1 Orcem Operational Phase

Emissions of CO and $PM_{2.5}$ to the atmosphere from the Hot Air Generator will be released via a 50m stack. The emission rates were calculated based on vendor data and default USEPA AP-42 emission rates and additional conservative assumptions related to emission variability. An estimate of the maximum / average day and annual CO and $PM_{2.5}$ emission rate from the Orcem process emission points onsite is outlined in Tables 2.1 and 2.2. The estimates are based on detailed calculations, engineering data and based on 7,600 hours of operation at maximum build-out (Milestone 5). Detail calculations are outlined in Annex A.

Milestone 5 Facility Emission Totals (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem – Maximum Day	219	12.7
Orcem – Average Day	103	4.2
BAAQMD CEQA Thresholds	**N/A**	**54**

Table 2.1 Maximum / Average Day CO and $PM_{2.5}$ Emissions From Orcem, Vallejo Under Milestone 5 (lbs/day).

Milestone 5 Facility Emission Totals (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Orcem (lbs/yr)	37,441	1537
Orcem (tons/yr)	18.7	0.77
BAAQMD CEQA Thresholds	**N/A**	**10**

Table 2.2 Annual CO and $PM_{2.5}$ Emissions From Orcem, Vallejo Under Milestone 5 (tons/yr).

2.2 VMT Operational Phase

VMT is proposing to construct a multi-phased bulk aggregate import and distribution facility on the existing terminal footprint. The general transportation method is to unload dry bulk cargo from vessels, temporarily store, and reclaim from storage to cargo trucks and railcars for local and regional distribution. In addition, the terminal design allows re-loading cargo to barges to enable VMT to engage in short-sea shipping initiatives with other California ports and terminals.

An estimate of the maximum / average day and annual emission rate of CO and $PM_{2.5}$ from the emission points onsite is outlined in Tables 2.3 and 2.4 respectively. The estimates are based on detailed calculations, engineering data and based on 5,760 hours of operation at maximum load (Phase 1 Alternative). Detailed calculations are detailed are outlined in Annex A.

VMT Facility Phase 1 Alternative Emission Totals (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
VMT – Maximum Day	**105.4**	**9.8**
VMT – Average Day	**37.8**	**2.7**
BAAQMD CEQA Thresholds	**N/A**	**54**

Table 2.3 Maximum / Average Day CO and $PM_{2.5}$ Emissions From VMT, Vallejo Under Phase 1 Alternative (lbs/day).

VMT Facility Phase 1 Alternative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
VMT (lbs/yr)	**13,803**	**970**
VMT (tons/yr)	**6.9**	**0.49**
BAAQMD CEQA Thresholds	**N/A**	**10**

Table 2.4 Annual CO and $PM_{2.5}$ Emissions From VMT, Vallejo Under Phase 1 Alternative (tons/yr).

2.3 Maximum / Average Day Operations

Shown in Table 2.5 is the cumulative maximum / average day emission level broken down into the respective contributions from Orcem and VMT. Given the nature of the two facilities, certain operations can only be undertaken by one of the operators at any one time. For example, ship unloading can only be undertaken from one ship at a time. Thus, when Orcem is unloading GBFS, VMT will not be unloading during this period. Likewise, when Orcem or VMT is loading export material into railcars, the other operator cannot simultaneously load railcars. Thus, these exclusions lead to a cumulative maximum day emission level significantly lower than the respective Orcem (Table 2.1) and VMT (Table 2.3) summed emission levels.

Cumulative Maximum Day Emission Total (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem (Contribution to Maximum Day)	219.1	12.7
VMT (Contribution to Maximum Day)	32.3	0.51
Cumulative - Maximum Day	251.4	13.2
BACT Permit Handbook Thresholds	**10**	**10**
Review of BACT Required	**Yes**	**Yes**
Cumulative – Average Day	140.4	6.9
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table 2.5 Maximum Day CO and $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (lbs/day).

Table 2.6 outlines the cumulative annual mean emission totals (tons/yr) for the Orcem and VMT operations combined.

Cumulative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Cumulative Total (lbs/yr)	51,244	2508
Cumulative Total (tons/yr)	25.6	1.25
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table 2.6 Annual CO and $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (tons/yr).

3.0 AIR DISPERSION MODELLING PROTOCOL

A modeling protocol was developed and approved for use by the BAAQMD. The modeling protocol outlined the data and methods that were used to assess the air quality impacts associated with the operation of the proposed project. The protocol stated that the modeling of air emissions from the Orcem main stack (P-1) and other relevant emission sources both on the Orcem facility and the VMT facility have been undertaken using the EPA regulatory model AERMOD (Version 14134). The Orcem main stack has been modeled as a point source and is subject to building downwash. As such, the BPIPPRM program was run prior to the running of the AERMOD algorithm.

CO emissions also occur from ship emissions, rail emissions and from tailpipe emissions associated with vehicles both on-site and off-site. $PM_{2.5}$ emissions also occur from ship emissions, material handling emissions from permitted sources on-site, rail emissions and from tailpipe emissions associated with vehicles both on-site and off-site. On-site and off-site exhaust emissions were calculated using EMFAC2011 (updated January 2013) for finished product movements whilst on-site front loaders / excavators / forklifts emissions were calculated using OFFROAD2011. CO and $PM_{2.5}$ emissions from worker commutes and material deliveries off-site were also calculated. Modeling of on-site sources, other than the main stack, were modeled variously as point, volume or area sources and were included in the AERMOD modeling input file for each scenario modeled. Figures 3.1 and 3.2 show the specific locations of the various air emission sources used in the model.

Modeled ambient process concentrations from the facility were added to the maximum 3-year background concentration for CO and $PM_{2.5}$ and compared to the State and Federal ambient air quality standards (CAAQS and NAAQS). The modeling analysis demonstrated that the proposed source emissions will not interfere with the attainment or maintenance of the NAAQS or CAAQS for CO and $PM_{2.5}$ as outlined in Section 5.

Project
Orcem & VMT Air Modelling Assessment

Reference
13/6740AR05

Figure 3.1
AERMOD Model Set-Up (UTM NAD83 Coordinates) – Full Modelling Domain

Project
Orcem & VMT Air Modelling Assessment

Reference
13/6740AR05

Figure 3.2
AERMOD Model Set-Up (UTM NAD83 Coordinates) – Modelling Domain Near Orcem / VMT Facilities

3.1 AERMOD Modeling System

The air dispersion modeling methodology followed the approach outlined in the EPA's Guideline On Air Quality Models (40 CFR 51, Appendix W) (*EPA, 2005*) in addition to BAAQMD California Environmental Quality Act Air Quality Guidelines (*BAAQMD (2012)*).

Emissions from the proposed facility were modeled using the AERMOD dispersion model (Version 14134) which has been developed in part by the Environmental Protection Agency. The regulatory model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model package includes the following sub-models:

- AERMOD (AERMIC Modeling System, Version 14134) – using the following regulatory defaults:
    - Use of elevated terrain algorithms requiring input of terrain height data for receptors and emission sources,
    - Stack tip downwash,
    - Use of calm processing routines,
    - Include buoyancy-induced dispersion,
    - Use of routines for missing meteorological data processing,
    - Rural dispersion model (land use within 3 kilometers is predominately classified as rural based on the Auer Method, therefore, AERMOD was not run with urban coefficients).

- AERMAP (AERMIC Mapping System, Version 11103)

- AERMET (AERMIC Meteorological Preprocessor, Version 12345). Although AERMET has recently been updated to Version 14134, and previous to that Version 13350, the meteorological data processed and provided by the BAAQMD has been used directly in the model.

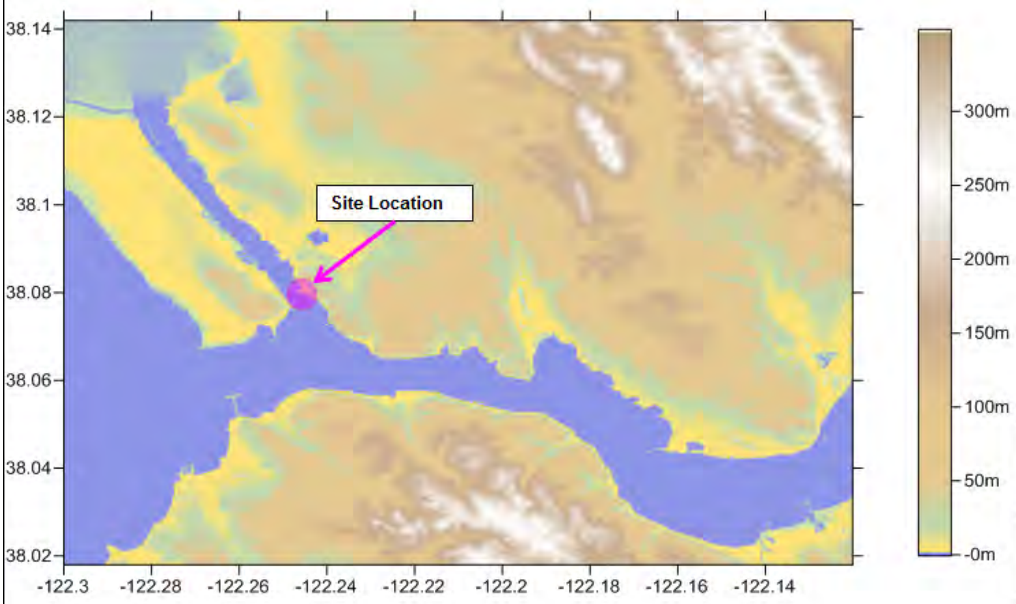
- BPIP-PRIME (Building Profile Input Program – Plume Rise Model Enhancement Version 04274). Given the height of the proposed buildings on-site (up to 40m in height) relative to the proposed stack height of 50m, building downwash will be a consideration. In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. The building heights onsite was input into the USEPA Building Profile Input Program for PRIME (PBIPPRM, Version 04274) which was used to compute formula GEP stack height and to generate wind direction specific building profiles for sequential modeling.

AERMOD input data options are listed below. Use of these options follows the EPA's modeling guidance, BAAQMD guidance, and/or sound scientific practice:

- Final plume rise,
- Stack tip downwash,
- PRIME downwash algorithm,
- Regulatory default option (calm and missing meteorological data processing),
- Elevated receptor terrain heights option.

3.2 Terrain and Receptor Set-up

The AERMOD air dispersion model has a terrain pre-processor AERMAP (version 11103) which was used to map the physical environment over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was produced by the U.S. Geological Survey (USGS) as part of the National Mapping Program. DEM data for 7.5-minute units correspond to the USGS 7.5-minute topographic quadrangle map series for all of the United States and its territories except Alaska. Each 7.5-minute DEM is based on 30- by 30-meter data spacing with the Universal Transverse Mercator (UTM) North American Datum 83 (NAD83) projection (see Figure 3.3).



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Reference
13/6740AR01

Figure 3.3
Site Location Showing Nearby Terrain Features (Lat / Long)

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This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, H_{crit}, for each receptor. The terrain height scale is derived from the Digitial Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

A nested NAD83 Cartesian coordinate receptor gird system was used to provide sufficient spatial coverage of the surrounding project area to ensure that the extent of the significant impacts and the maximum impact location is identified. The following nested grid system was used to identify all maximum impact locations:

- Fence line receptors were spaced at 10-metre intervals,
- 20-meter spacing from the property boundary to 300m from the fence line,
- 100-meter spacing from 300m to 1000m from the fence line,
- 200-meter from 1km to 5km from the fence line,
- Concentrations within the facility fence line were not calculated.

Throughout this study a worst-case approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The worst-case assumptions are outlined below:

- Maximum predicted CO and $PM_{2.5}$ concentrations were reported in this study, even if no residential receptors were near the location of this maximum (in many cases the maximum concentration was over open water at the boundary of the site);

- Conservative single value background CO and $PM_{2.5}$ concentrations were used to assess the baseline level of CO and $PM_{2.5}$;

- It is assumed that Orcem Milestone 5 operations will occur for 7,600 hours per year at an hourly production tonnage of 100 metric tonnes of raw material (GBFS) / hr (equating to a modeled annual tonnage of 760,000 metric tonnes) from year 2020 onwards.

- Similarly, it is assumed that VMT Phase 1 Alternative operations will occur for up to 5,760 hours per year at an hourly unloading rate of 303 metric tonnes of material (typically sand / aggregate) / hr based on 29 shipments (equating to a modeled annual tonnage of 1,116,000 metric tonnes) from year 2020 onwards.

3.3 Meteorological Data

The selection of appropriate meteorological data for the current assessment was made in consultation with the BAAQMD (*Cordova (2013)*). Per BAAQMD guidance, the five most recent years of available surface meteorological data, with greater than 90% data coverage on a quarterly basis, from Vallejo meteorological station and from Conoco-Phillips Rodeo meteorological station was used in the assessment (*Cordova (2013)*) in addition to Upper Air data from WBAN 23230 (Oakland International Airport, CA). In relation to Vallejo meteorological station the five most recent datasets available are years 2012, 2010, 2009, 2008 and 2006. The five most recent years available for the Conoco-Phillips Rodeo meteorological station are 2012, 2010, 2009, 2008 and 2007. The two surface stations have different attributes which make them suitable candidates for use in the assessment. Both stations have similar surface elevations to the facility (within ±5m). The Vallejo station is located within 2.5km of the facility fence line but would have differing land use characteristics to that present at the facility. In contrast the Conoco-Phillips Rodeo met station is located at a greater distance from the facility at 4.6km from the facility fence line but is located in proximity to the shoreline and would have a more similar land use characterisation to the project site than the Vallejo station. As shown in Figure 3.4 and Figure 3.5, the windrose for both stations are relatively similar with a prevailing south-westerly wind although the wind speed in Vallejo tends to be somewhat higher than Conoco-Phillips Rodeo on average. Initial modelling undertaken using both meteorological stations found that Conoco-Phillips Rodeo routinely gave higher ambient concentrations than Vallejo. Thus in the detailed modelling assessment the Conoco-Phillips Rodeo station was used to derive the maximum concentration(s) for comparison with the CAAQS and NAAQS.

The AERMET processed meteorological data was obtained from BAAQMD. Surface characteristics such as albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use types was carried out in line with USEPA recommendations using the AERSURFACE program (Version 13016) by BAAQMD. The sectors and surface characteristics used for the Vallejo and Conoco-Phillips surface stations were defined by BAAQMD. The average surface moisture condition values and the seasons were also provided by BAAQMD.

In relation to Conoco-Phillips Rodeo, meteorological year 2010 had over 30% missing cloud cover data and thus was deemed not suitable for inclusion in the assessment. It was thus agreed in consultation with BAAQMD (Jim Cordova, email 04/15/14) that for year 2010 all cloud cover data would be obtained from Napa County Airport.

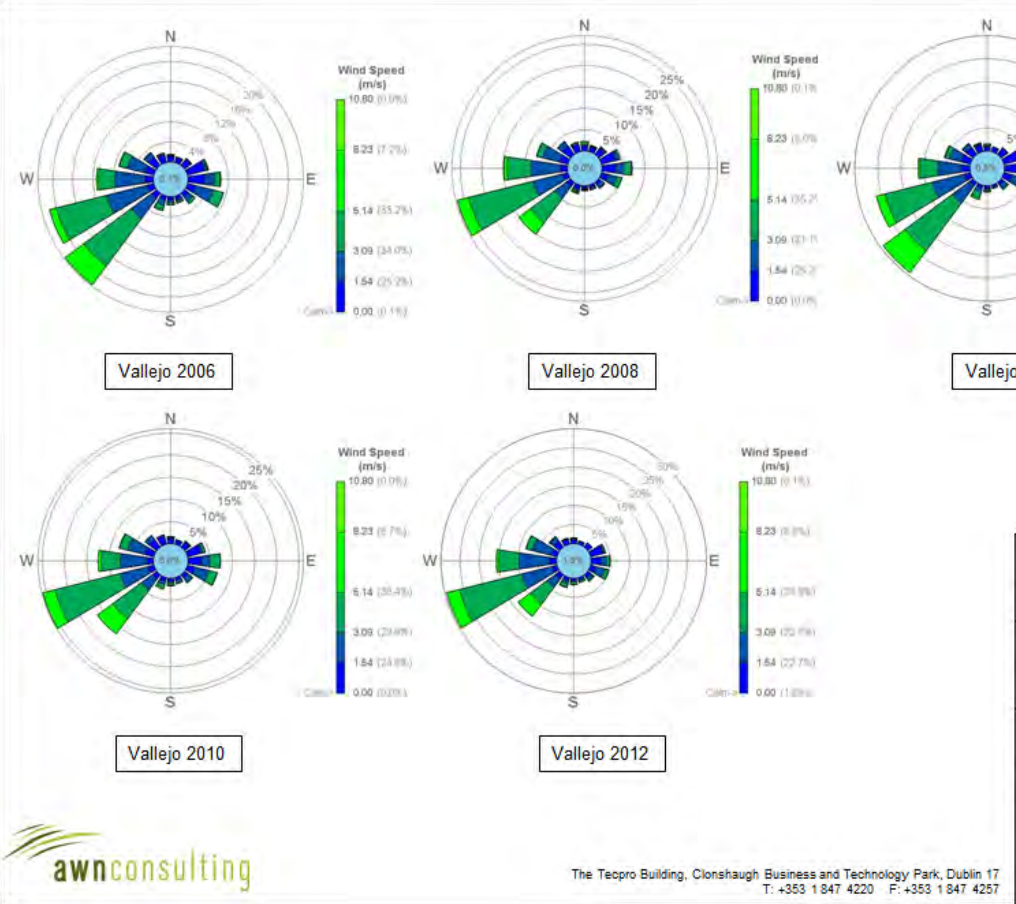

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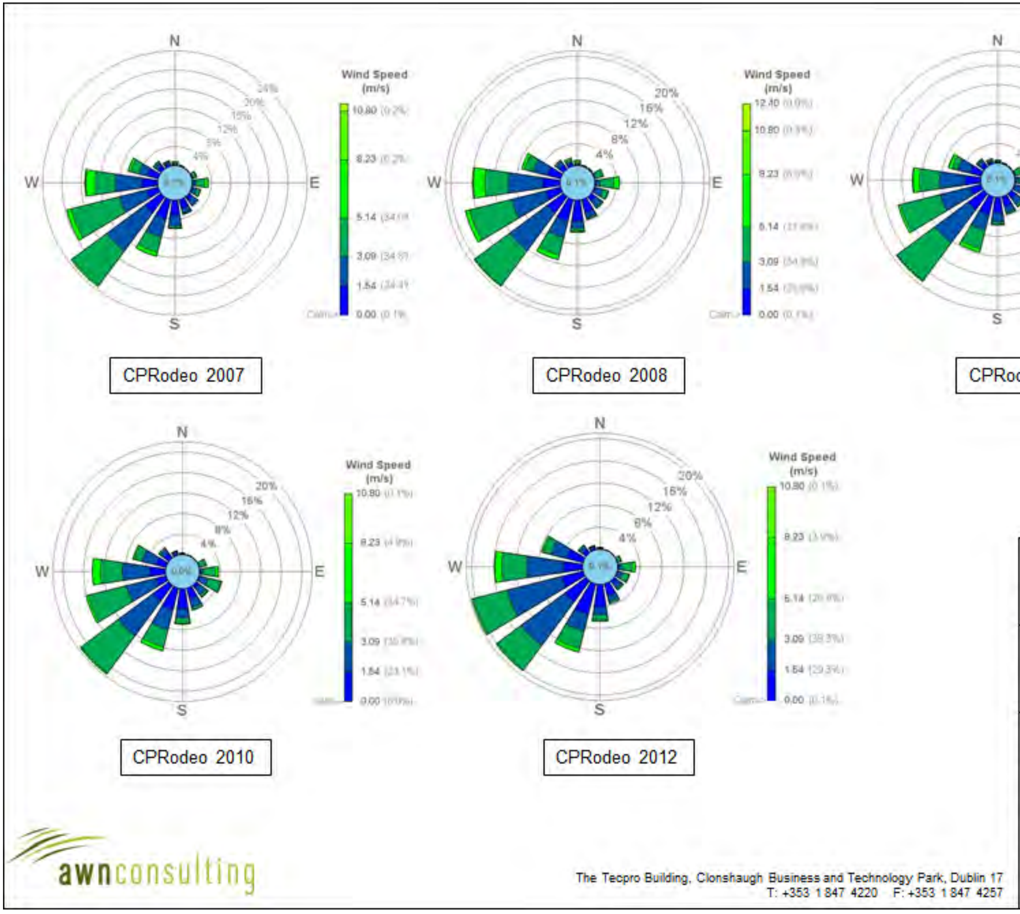
Figure 3.4
Vallejo Met Station
Windrose 2006, 2008- - 2010, 2012



Project
Orcem & VMT Air Modeling Assessment
Reference
13/6740AR05
Figure 3.5
Conoco-Phillips Rodeo Meteorological Station
Windrose 2007 - 2010, 2012

4.0 BASELINE CO ASSESSMENT

4.1 Background CO and $PM_{2.5}$ Concentration

The BAAQMD operates a regional 32-station monitoring network that measures the ambient concentrations of criteria pollutants. During the past three years (2011 – 2013), no exceptional event designations were requested by the Air District. Therefore, design values listed in the tables below have not been adjusted for exceptional events. In the Bay Area, exceptional events would generally be restricted to wildfires or industrial accidents that contribute to exceedances of the NAAQS.

Representative background concentrations for CO and $PM_{2.5}$ are based on the ambient monitoring station located on Tuolumne Street, Vallejo, CA (Station No. 06-095-0004) and covers the three most recent complete years (2011-2013). The station is designated a neighbourhood scale station (with a range of 500m – 4km) and is suitable for assigning a background concentration for determining project impacts. The monitoring station is located 2.5km north-east of the proposed facility. The monitoring station is also located approximately downwind of the facility based on the wind rose data for both Vallejo and Conoco-Phillips Rodeo meteorological stations (see Figures 3.4 and 3.5) and thus should be broadly representative of the location at which the maximum emissions from the facilities will occur. The background data for CO and $PM_{2.5}$ is outlined below in Table 4.1 for the last three years where data is available.

The 1st high concentration over the period 2011 – 2013 was used as background for assessing the California Ambient Air Quality Standards whilst the average concentration over the three year period was used as background for assessing against the National Air Quality Standards.

Pollutant	Year	Maximum 1-Hour Concentration (ppm)	Maximum 8-Hour Concentration (ppm)	
Carbon Monoxide	2013	2.8	2.3	
	2012	2.8	2.2	
	2011	3.0	2.4	
	Year	Maximum 24-Hour Concentration ($\mu g/m^3$)	98th%ile of Maximum 24-hr Concentrations ($\mu g/m^3$)	Annual Mean Concentration ($\mu g/m^3$)
$PM_{2.5}$	2013	NA	32.8	10.42
	2012	NA	21.4	8.96
	2011	NA	31.0	10.08

Note 1 Concentrated reported at STP.
Source: BAAQMD Air Quality Monitoring Summaries for 2011-2013. EPA AIRS Data System, EPA Website, 2014.
Table 4.1 Available Ambient CO and $PM_{2.5}$ Data In Tuolumne St, Vallejo, California 2011 – 2013

5.0 OPERATIONAL PHASE AIR DISPERSION MODELLING RESULTS

Air dispersion modelling was undertaken using the USEPA regulatory model, AERMOD which was discussed in Section 3. The model input parameters and source references for selected model parameters are outlined in Annex B.

The results of the modeling assessment for CO and $PM_{2.5}$ are summarized in this Section. The modeling results demonstrate that the modelled project impacts, when combined with existing background ambient air quality data, demonstrate compliance with the NAAQS and CAAQS for CO and $PM_{2.5}$.

5.1 Ambient Operational CO Concentrations

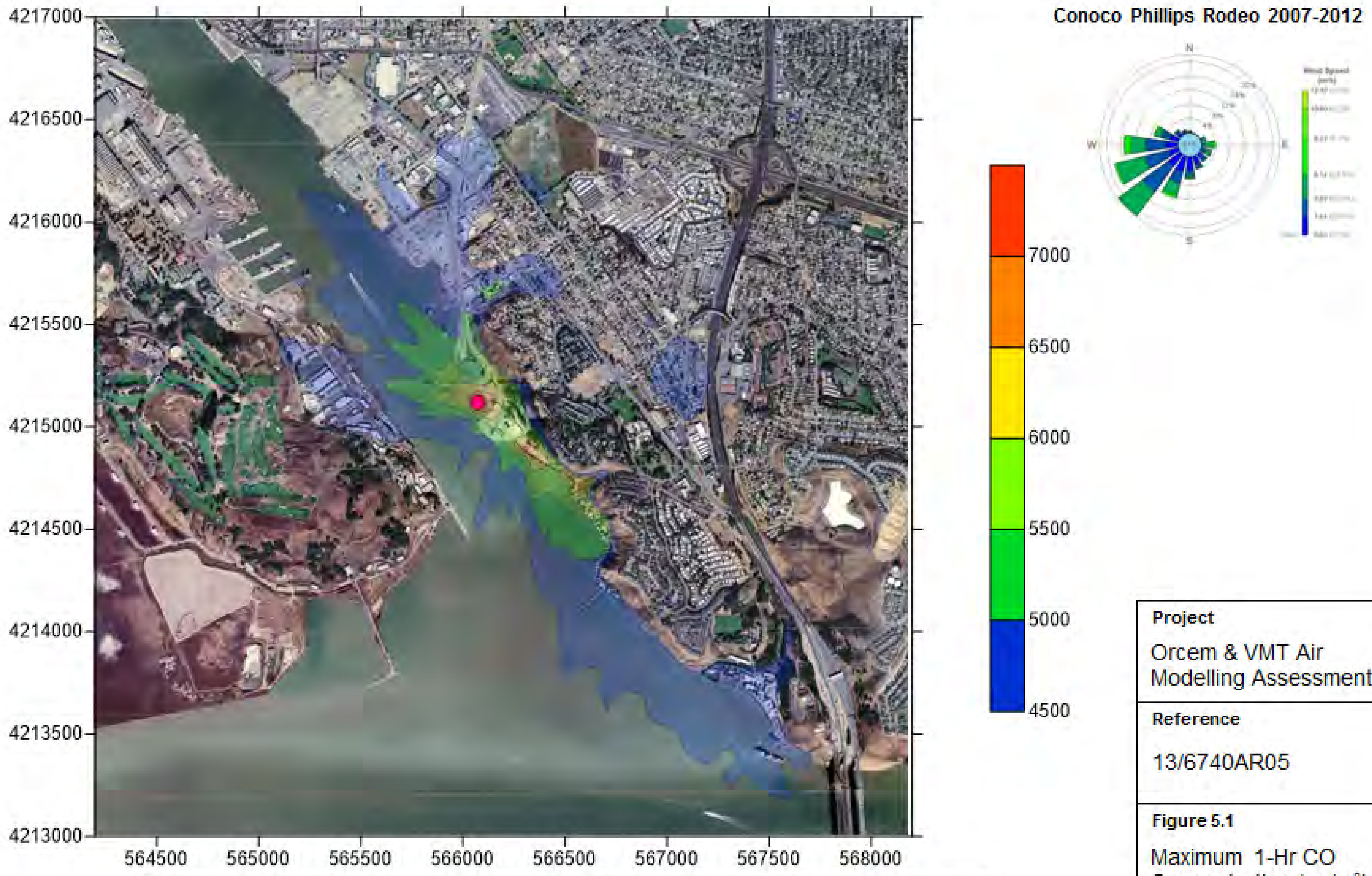
The CO modelling results based on the operation of the Orcem and VMT facilities simultaneously for a full year are outlined in Table 5.1 and Figure 5.1. The results have been compared with both the California and National ambient air quality standards for CO. This scenario leads to ambient CO concentrations (including background) which reach at most 35% of the California maximum 1-hour limit value, 19% of the National maximum 1-hour limit value, 42% of the California 24-limit value and 41% of the National 24-hour limit value at the worst-case off-site ambient receptor.

Pollutant / Met Years	Background Concentration	Averaging Period	Process Contribution CO	Predicted Ambient Concentration CO	Standard
CO 2007 - 2012	3700 µg/m^3	California Maximum 1-hr mean	4293 µg/m^3	7993 µg/m^3	23,000 µg/m^3 Note 1
	3700 µg/m^3	Federal Maximum 1-hr mean	3741 µg/m^3	7441 µg/m^3	40,000 µg/m^3 Note 2
	3000 µg/m^3	California Maximum 8-hr mean	1188 µg/m^3	4188 µg/m^3	10,000 µg/m^3 Note 1
	3000 µg/m^3	Federal Maximum 8-hr mean	1116 µg/m^3	4116 µg/m^3	10,000 µg/m^3 Note 2

Note 1 California 1-Hour and 8-Hour value is a value not to be exceeded.
Note 2 National Standard not to be exceeded more than once per year.

Table 5.1 CO Concentrations In The Ambient Environment

In relation to the 1-hr maximum CO concentration (Figure 5.1), the maximum concentration peaks at a location along the north-western project site boundary along the Mare Island Straits. Maximum CO locations are located in non-residential areas. Maximum concentrations in residential areas are reduced significantly, with the maximum process CO contribution from the facility reducing by almost a factor of two at the worst-case residential receptor.



Maximum 1-Hr CO Concentration At Location Of Maximum Receptor (●)
= 7993 µg/m³

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Figure 5.1

Maximum 1-Hr CO Concentration (µg/m³) (including background concentration) (UTM NAD83 Coordinates)

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5.2 Ambient Operational $PM_{2.5}$ Concentrations

The $PM_{2.5}$ modelling results based on the operation of the Orcem and VMT facilities simultaneously for a full year are outlined in Tables 5.2 and 5.3 and Figures 5.2 and 5.3. The results have been compared with both the California and National ambient air quality standards for $PM_{2.5}$.

Ambient $PM_{2.5}$ concentrations (including background) reach at most 89% of the Federal maximum 24-hour limit value (as shown in Figure 5.2), 89% of the California annual limit value and 89% of the National annual limit value (as shown in Figure 5.3) at the worst-case off-site ambient receptor as outlined in Tables 5.2 and 5.3.

In relation to the Federal 24-hr daily maximum (Figure 5.2), the maximum concentration peaks at a location along the north-western project site boundary along the Mare Island Straits. The annual mean concentration (Figure 5.3) peaks at the northern boundary of the site adjacent to the site entrance.

Pollutant / Met Year	Background Concentration	Averaging Period	Process Contribution $PM_{2.5}$	Predicted Ambient Concentration $PM_{2.5}$	Standard Note 1
$PM_{2.5}$ / 2012	28.4 µg/m³	Maximum 24-hr (as a 98th%ile)	2.82 µg/m³	31.2 µg/m³	35 µg/m³

Note 1 To attain the National 24-hour standard, the 3-year average of the annual 98th percentile of the daily concentrations is equal or less than the standard.

Table 5.2 Maximum 24-Hr $PM_{2.5}$ Concentrations (as a 98th%ile) In The Ambient Environment

Pollutant / Met Years	Background Concentration	Averaging Period	Process Contribution $PM_{2.5}$	Predicted Ambient Concentration $PM_{2.5}$	Standard
$PM_{2.5}$ / 2007	9.82 µg/m³	California & National Annual Mean	0.77 µg/m³	10.59 µg/m³	12 µg/m³
$PM_{2.5}$ / 2008	9.82 µg/m³	California & National Annual Mean	0.78 µg/m³	10.60 µg/m³	12 µg/m³
$PM_{2.5}$ / 2009	9.82 µg/m³	California & National Annual Mean	0.78 µg/m³	10.60 µg/m³	12 µg/m³
$PM_{2.5}$ / 2010	9.82 µg/m³	California & National Annual Mean	0.76 µg/m³	10.58 µg/m³	12 µg/m³
$PM_{2.5}$ / 2012	9.82 µg/m³	California & National Annual Mean	0.88 µg/m³	10.70 µg/m³	12 µg/m³

Table 5.3 Annual Mean $PM_{2.5}$ Concentrations In The Ambient Environment

As before, maximum $PM_{2.5}$ locations are located in non-residential areas. Maximum concentrations in residential areas are lower, with the maximum 24-hr (as a 98th%ile) process $PM_{2.5}$ contribution from the facility reducing by a factor of two at the worst-case residential receptor. In relation to the annual mean (Figure 5.3), the concentration gradient is significant in the region of the maximum impact (southern boundary of the site) with process impacts above 50% of the maximum impact reported confined to non-residential areas.

6.0 REFERENCES

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APPENDIX X
–
CARBON MONOXIDE AND $PM_{2.5}$ EMISSION INVENTORY AND IMPACT ASSESSMENT OF ORCEM AND VMT FACILITIES, VALLEJO, CALIFORNIA

Technical Report Prepared For

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Our Reference

EP/13/6740AR06

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Signature		
Name	Dr Edward Porter	Dr Fergal Callaghan
Title	Director (Air Quality)	Director (Environmental Sciences)
Date	12 May 2015	12 May 2015

EXECUTIVE SUMMARY

AWN Consulting Limited (AWN) has been commissioned by Orcem California Inc. (Orcem) and Vallejo Marine Terminal LLC (VMT) to quantify the carbon monoxide (CO) and $PM_{2.5}$ emissions from their respective facilities and to conduct an air quality impact assessment of the planned cumulative developments at the former General Mills site, Vallejo, California. The site is currently derelict and it is proposed to redevelop the land for the following uses:

- Orcem is proposing to construct and operate a manufacturing plant on the site which focuses primarily on production of GGGBS (Ground Granulated Blast Furnace Slag), and;

- Vallejo Marine Terminal (VMT) is planning to redevelop the existing deteriorated wharf in order to operate a new dry bulk cargo import facility at the site. The new terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets. It will also facilitate the import of raw materials for the Orcem operation.

This document presents the results and conclusions of the cumulative CO and $PM_{2.5}$ emission inventory and impact assessment of both developments simultaneously in operation.

The maximum and average day and annual emission rate of CO and $PM_{2.5}$ from the process emission points / transfer points at Orcem and VMT combined are outlined in Tables ES1 and ES2. The estimates are based on detailed calculations, engineering data and based on maximum worst-case scenarios at both facilities (Orcem Milestone 5 and VMT Phase 1 Alternative).

Cumulative Maximum / Average Day Emission Total (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem Milestone 5 (Contribution to Maximum Day)	219	12.7
VMT Phase 1 Alternative (Contribution to Maximum Day)	32	0.51
Cumulative - Maximum Day	251	13.2
BACT Permit Handbook Thresholds	**10**	**10**
Review of BACT Required	**Yes**	**Yes**
Cumulative – Average Day	140	6.9
BAAQMD CEQA Thresholds	**N/A**	**54**
Significant Under CEQA	**N/A**	**No**

Table ES1 Maximum / Average Day CO And $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (lbs/day).

Table ES.2 outlines the cumulative annual mean CO and $PM_{2.5}$ emission totals (tons/yr) for the Orcem and VMT operations combined.

Cumulative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Cumulative Total (lbs/yr)	51244	2508
Cumulative Total (tons/yr)	25.6	1.25
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table ES.2 Annual Emissions Of CO And $PM_{2.5}$ From The Cumulative Operations Of VMT and Orcem (tons/yr).

The results of the modeling assessment for CO and $PM_{2.5}$ have been summarized in Section 5. The approach to the air dispersion modelling assessment has been to over-estimate the likely operations at the facility to ensure that the assessment is conservative.

The conservative assumptions include the selection of worst-case modes of operations which will have varying air emission levels. For example Orcem Mode 3 will have higher truck numbers but much of the on-site operations will be conducted within an enclosed building under negative pressure linked to bag filters compatible with BACT. In contrast, Orcem Mode 1 will have lower truck numbers but material storage and transfers will be undertaken in the open air. However, in order to capture the worst-case scenario, the current assessment has used Mode 3, Milestone 5 traffic levels but assumed all operations were undertaken as per Mode 1 (in the open air).

The results of the air dispersion modelling assessment, based on these conservative assumptions, undertaken using the EPA regulatory model AERMOD, demonstrate that the modelled project impacts, when combined with existing background ambient air quality data, are in compliance with the NAAQS and CAAQS for CO and $PM_{2.5}$.

CONTENTS

1.0 INTRODUCTION

Orcem California Inc. (Orcem) has filed an application with the City of Vallejo to approve a Major Use Permit and Site Development Plan to construct and operate a processing plant for the manufacture of ground granulated blast furnace slag (GGBFS) and other cement products.

This document outlines the methodology adopted to quantify the carbon monoxide (CO) and $PM_{2.5}$ emission inventory and to assess the potential air quality impact related to the operation of the proposed facility in line with the BAAQMD Permit Modeling Guidance (BAAQMD (2007)) and the resultant results based on a detailed air dispersion modelling study. The intent of the modeling analysis was to demonstrate that the proposed source emissions will not interfere with the attainment or maintenance of the National Ambient Air Quality Standards (NAAQS) including both California and Federal standards.

The site is located at the former General Mills facility, Vallejo, California. The site is derelict and it is proposed to redevelop the land for the following uses:

- Orcem is proposing to locate a GGGBS (Ground Granulated Blast Furnace Slag) manufacturing facility on the site as described above, and;

- Vallejo Marine Terminal (VMT) is planning to develop a new dry bulk cargo import facility at the site. The terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets. It will also facilitate the import of raw materials for the Orcem operation.

This report covers the cumulative air quality impact on the local environment of these proposed developments operating simultaneously.

As part of the overall development of the site there will be new CO and $PM_{2.5}$ emissions sources introduced. These can broadly be described as follows:

- Vehicle movements on site;
- Material handling emissions from permitted sources on-site:
- New air emissions from emission point P-1 (Main Stack);
- Truck movements on the local road network;
- Port activity, e.g. ship hoteling, ship transiting, tugs, and;
- Rail activity.

This appendix discusses the potential air quality impact of these elements using the following methodology:

- Quantification of the CO and $PM_{2.5}$ emission inventory for the two facilities in operation.
- Review of the appropriate guidance in order to derive appropriate ambient air quality criteria for the proposed operations;
- Review of the appropriate guidance in order to derive appropriate operating criteria for the proposed facilities;
- Determination of the existing baseline CO and $PM_{2.5}$ levels by reviewing nearby baseline air quality data;
- Assessment of the proposed development through the development of a detailed air dispersion model of the site.

2.0 AIR QUALITY EMISSION INVENTORY METHODOLOGY

The operational phase of the development will see both Orcem and VMT operating their respective areas of the site simultaneously. The following sections have quantified the air emissions associated with their operations cumulatively as a result of the following air emission generating activities:

- Port activity, e.g. ship exhaust emissions;
- Material handling emissions from permitted sources on-site;
- Offroad vehicle movements on site;
- Air emissions from emission point P-1 (Main Stack);
- Truck movements both onsite and on the local road network;
- Rail activity;
- Barge activity.

2.1 Orcem Operational Phase

Emissions of CO and $PM_{2.5}$ to the atmosphere from the Hot Air Generator will be released via a 50m stack. The emission rates were calculated based on vendor data and default USEPA AP-42 emission rates and additional conservative assumptions related to emission variability. An estimate of the maximum / average day and annual CO and $PM_{2.5}$ emission rate from the Orcem process emission points onsite is outlined in Tables 2.1 and 2.2. The estimates are based on detailed calculations, engineering data and based on 7,600 hours of operation at maximum build-out (Milestone 5). Detail calculations are outlined in Annex A.

Milestone 5 Facility Emission Totals (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem – Maximum Day	219	12.7
Orcem – Average Day	103	4.2
BAAQMD CEQA Thresholds	**N/A**	**54**

Table 2.1 Maximum / Average Day CO and $PM_{2.5}$ Emissions From Orcem, Vallejo Under Milestone 5 (lbs/day).

Milestone 5 Facility Emission Totals (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Orcem (lbs/yr)	37,441	1537
Orcem (tons/yr)	18.7	0.77
BAAQMD CEQA Thresholds	**N/A**	**10**

Table 2.2 Annual CO and $PM_{2.5}$ Emissions From Orcem, Vallejo Under Milestone 5 (tons/yr).

2.2 VMT Operational Phase

VMT is proposing to construct a multi-phased bulk aggregate import and distribution facility on the existing terminal footprint. The general transportation method is to unload dry bulk cargo from vessels, temporarily store, and reclaim from storage to cargo trucks and railcars for local and regional distribution. In addition, the terminal design allows re-loading cargo to barges to enable VMT to engage in short-sea shipping initiatives with other California ports and terminals.

An estimate of the maximum / average day and annual emission rate of CO and $PM_{2.5}$ from the emission points onsite is outlined in Tables 2.3 and 2.4 respectively. The estimates are based on detailed calculations, engineering data and based on 5,760 hours of operation at maximum load (Phase 1 Alternative). Detailed calculations are detailed are outlined in Annex A.

VMT Facility Phase 1 Alternative Emission Totals (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
VMT – Maximum Day	**105.4**	**9.8**
VMT – Average Day	**37.8**	**2.7**
BAAQMD CEQA Thresholds	**N/A**	**54**

Table 2.3 Maximum / Average Day CO and $PM_{2.5}$ Emissions From VMT, Vallejo Under Phase 1 Alternative (lbs/day).

VMT Facility Phase 1 Alternative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
VMT (lbs/yr)	**13,803**	**970**
VMT (tons/yr)	**6.9**	**0.49**
BAAQMD CEQA Thresholds	**N/A**	**10**

Table 2.4 Annual CO and $PM_{2.5}$ Emissions From VMT, Vallejo Under Phase 1 Alternative (tons/yr).

2.3 Maximum / Average Day Operations

Shown in Table 2.5 is the cumulative maximum / average day emission level broken down into the respective contributions from Orcem and VMT. Given the nature of the two facilities, certain operations can only be undertaken by one of the operators at any one time. For example, ship unloading can only be undertaken from one ship at a time. Thus, when Orcem is unloading GBFS, VMT will not be unloading during this period. Likewise, when Orcem or VMT is loading export material into railcars, the other operator cannot simultaneously load railcars. Thus, these exclusions lead to a cumulative maximum day emission level significantly lower than the respective Orcem (Table 2.1) and VMT (Table 2.3) summed emission levels.

Cumulative Maximum Day Emission Total (lbs/day)		
Facility	**CO**	**$PM_{2.5}$**
Orcem (Contribution to Maximum Day)	219.1	12.7
VMT (Contribution to Maximum Day)	32.3	0.51
Cumulative - Maximum Day	251.4	13.2
BACT Permit Handbook Thresholds	**10**	**10**
Review of BACT Required	**Yes**	**Yes**
Cumulative – Average Day	140.4	6.9
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table 2.5 Maximum Day CO and $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (lbs/day).

Table 2.6 outlines the cumulative annual mean emission totals (tons/yr) for the Orcem and VMT operations combined.

Cumulative Annual Emission (tons/yr)		
Facility	**CO**	**$PM_{2.5}$**
Cumulative Total (lbs/yr)	51,244	2508
Cumulative Total (tons/yr)	25.6	1.25
BAAQMD CEQA Thresholds	**N/A**	**10**
Significant Under CEQA	**No**	**No**

Table 2.6 Annual CO and $PM_{2.5}$ Emissions From The Cumulative Operations Of VMT and Orcem (tons/yr).

3.0 AIR DISPERSION MODELLING PROTOCOL

A modeling protocol was developed and approved for use by the BAAQMD. The modeling protocol outlined the data and methods that were used to assess the air quality impacts associated with the operation of the proposed project. The protocol stated that the modeling of air emissions from the Orcem main stack (P-1) and other relevant emission sources both on the Orcem facility and the VMT facility have been undertaken using the EPA regulatory model AERMOD (Version 14134). The Orcem main stack has been modeled as a point source and is subject to building downwash. As such, the BPIPPRM program was run prior to the running of the AERMOD algorithm.

CO emissions also occur from ship emissions, rail emissions and from tailpipe emissions associated with vehicles both on-site and off-site. $PM_{2.5}$ emissions also occur from ship emissions, material handling emissions from permitted sources on-site, rail emissions and from tailpipe emissions associated with vehicles both on-site and off-site. On-site and off-site exhaust emissions were calculated using EMFAC2011 (updated January 2013) for finished product movements whilst on-site front loaders / excavators / forklifts emissions were calculated using OFFROAD2011. CO and $PM_{2.5}$ emissions from worker commutes and material deliveries off-site were also calculated. Modeling of on-site sources, other than the main stack, were modeled variously as point, volume or area sources and were included in the AERMOD modeling input file for each scenario modeled. Figures 3.1 and 3.2 show the specific locations of the various air emission sources used in the model.

Modeled ambient process concentrations from the facility were added to the maximum 3-year background concentration for CO and $PM_{2.5}$ and compared to the State and Federal ambient air quality standards (CAAQS and NAAQS). The modeling analysis demonstrated that the proposed source emissions will not interfere with the attainment or maintenance of the NAAQS or CAAQS for CO and $PM_{2.5}$ as outlined in Section 5.

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Figure 3.1
AERMOD Model Set-Up (UTM NAD83 Coordinates) – Full Modelling Domain

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Figure 3.2
AERMOD Model Set-Up (UTM NAD83 Coordinates) – Modelling Domain Near Orcem / VMT Facilities

3.1 AERMOD Modeling System

The air dispersion modeling methodology followed the approach outlined in the EPA's Guideline On Air Quality Models (40 CFR 51, Appendix W) (*EPA, 2005*) in addition to BAAQMD California Environmental Quality Act Air Quality Guidelines (*BAAQMD (2012)*).

Emissions from the proposed facility were modeled using the AERMOD dispersion model (Version 14134) which has been developed in part by the Environmental Protection Agency. The regulatory model is a steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model package includes the following sub-models:

- AERMOD (AERMIC Modeling System, Version 14134) – using the following regulatory defaults:
  - Use of elevated terrain algorithms requiring input of terrain height data for receptors and emission sources,
  - Stack tip downwash,
  - Use of calm processing routines,
  - Include buoyancy-induced dispersion,
  - Use of routines for missing meteorological data processing,
  - Rural dispersion model (land use within 3 kilometers is predominately classified as rural based on the Auer Method, therefore, AERMOD was not run with urban coefficients).

- AERMAP (AERMIC Mapping System, Version 11103)

- AERMET (AERMIC Meteorological Preprocessor, Version 12345). Although AERMET has recently been updated to Version 14134, and previous to that Version 13350, the meteorological data processed and provided by the BAAQMD has been used directly in the model.

- BPIP-PRIME (Building Profile Input Program – Plume Rise Model Enhancement Version 04274). Given the height of the proposed buildings on-site (up to 40m in height) relative to the proposed stack height of 50m, building downwash will be a consideration. In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. The building heights onsite was input into the USEPA Building Profile Input Program for PRIME (PBIPPRM, Version 04274) which was used to compute formula GEP stack height and to generate wind direction specific building profiles for sequential modeling.

AERMOD input data options are listed below. Use of these options follows the EPA's modeling guidance, BAAQMD guidance, and/or sound scientific practice:

- Final plume rise,
- Stack tip downwash,
- PRIME downwash algorithm,
- Regulatory default option (calm and missing meteorological data processing),
- Elevated receptor terrain heights option.

3.2 Terrain and Receptor Set-up

The AERMOD air dispersion model has a terrain pre-processor AERMAP (version 11103) which was used to map the physical environment over the receptor grid. The digital terrain input data used in the AERMAP pre-processor was produced by the U.S. Geological Survey (USGS) as part of the National Mapping Program. DEM data for 7.5-minute units correspond to the USGS 7.5-minute topographic quadrangle map series for all of the United States and its territories except Alaska. Each 7.5-minute DEM is based on 30- by 30-meter data spacing with the Universal Transverse Mercator (UTM) North American Datum 83 (NAD83) projection (see Figure 3.3).

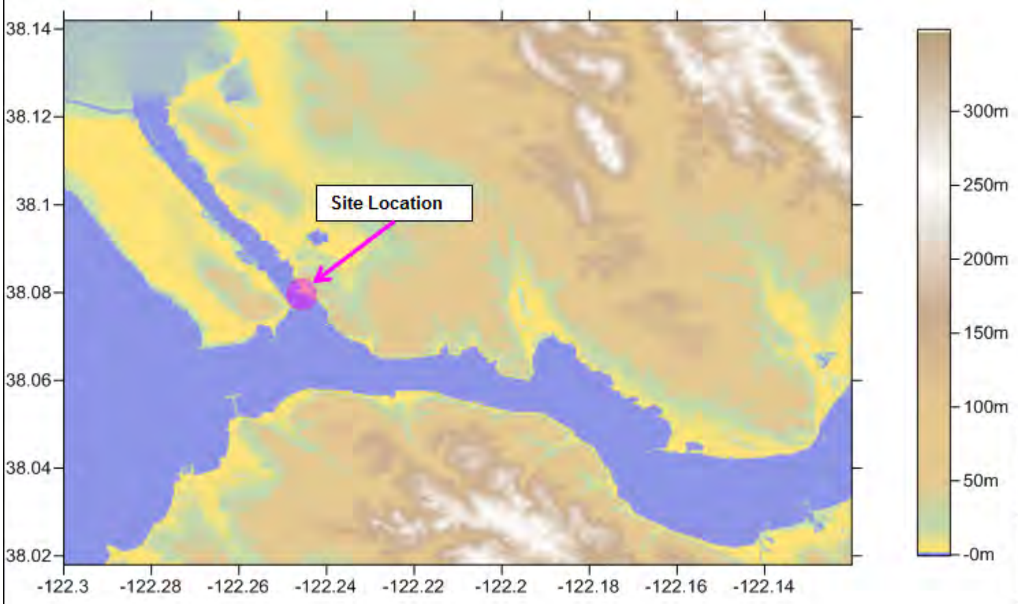

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Figure 3.3
Site Location Showing Nearby Terrain Features (Lat / Long)

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This data was run to obtain for each receptor point the terrain height and the terrain height scale. The terrain height scale is used in AERMOD to calculate the critical dividing streamline height, H_{crit}, for each receptor. The terrain height scale is derived from the Digitial Elevation Model (DEM) files in AERMAP by computing the relief height of the DEM point relative to the height of the receptor and determining the slope. If the slope is less than 10%, the program goes to the next DEM point. If the slope is 10% or greater, the controlling hill height is updated if it is higher than the stored hill height.

A nested NAD83 Cartesian coordinate receptor gird system was used to provide sufficient spatial coverage of the surrounding project area to ensure that the extent of the significant impacts and the maximum impact location is identified. The following nested grid system was used to identify all maximum impact locations:

- Fence line receptors were spaced at 10-metre intervals,
- 20-meter spacing from the property boundary to 300m from the fence line,
- 100-meter spacing from 300m to 1000m from the fence line,
- 200-meter from 1km to 5km from the fence line,
- Concentrations within the facility fence line were not calculated.

Throughout this study a worst-case approach was taken. This will most likely lead to an over-estimation of the levels that will arise in practice. The worst-case assumptions are outlined below:

- Maximum predicted CO and $PM_{2.5}$ concentrations were reported in this study, even if no residential receptors were near the location of this maximum (in many cases the maximum concentration was over open water at the boundary of the site);

- Conservative single value background CO and $PM_{2.5}$ concentrations were used to assess the baseline level of CO and $PM_{2.5}$;

- It is assumed that Orcem Milestone 5 operations will occur for 7,600 hours per year at an hourly production tonnage of 100 metric tonnes of raw material (GBFS) / hr (equating to a modeled annual tonnage of 760,000 metric tonnes) from year 2020 onwards.

- Similarly, it is assumed that VMT Phase 1 Alternative operations will occur for up to 5,760 hours per year at an hourly unloading rate of 303 metric tonnes of material (typically sand / aggregate) / hr based on 29 shipments (equating to a modeled annual tonnage of 1,116,000 metric tonnes) from year 2020 onwards.

3.3 Meteorological Data

The selection of appropriate meteorological data for the current assessment was made in consultation with the BAAQMD (*Cordova (2013)*). Per BAAQMD guidance, the five most recent years of available surface meteorological data, with greater than 90% data coverage on a quarterly basis, from Vallejo meteorological station and from Conoco-Phillips Rodeo meteorological station was used in the assessment (*Cordova (2013)*) in addition to Upper Air data from WBAN 23230 (Oakland International Airport, CA). In relation to Vallejo meteorological station the five most recent datasets available are years 2012, 2010, 2009, 2008 and 2006. The five most recent years available for the Conoco-Phillips Rodeo meteorological station are 2012, 2010, 2009, 2008 and 2007. The two surface stations have different attributes which make them suitable candidates for use in the assessment. Both stations have similar surface elevations to the facility (within ±5m). The Vallejo station is located within 2.5km of the facility fence line but would have differing land use characteristics to that present at the facility. In contrast the Conoco-Phillips Rodeo met station is located at a greater distance from the facility at 4.6km from the facility fence line but is located in proximity to the shoreline and would have a more similar land use characterisation to the project site than the Vallejo station. As shown in Figure 3.4 and Figure 3.5, the windrose for both stations are relatively similar with a prevailing south-westerly wind although the wind speed in Vallejo tends to be somewhat higher than Conoco-Phillips Rodeo on average. Initial modelling undertaken using both meteorological stations found that Conoco-Phillips Rodeo routinely gave higher ambient concentrations than Vallejo. Thus in the detailed modelling assessment the Conoco-Phillips Rodeo station was used to derive the maximum concentration(s) for comparison with the CAAQS and NAAQS.

The AERMET processed meteorological data was obtained from BAAQMD. Surface characteristics such as albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use types was carried out in line with USEPA recommendations using the AERSURFACE program (Version 13016) by BAAQMD. The sectors and surface characteristics used for the Vallejo and Conoco-Phillips surface stations were defined by BAAQMD. The average surface moisture condition values and the seasons were also provided by BAAQMD.

In relation to Conoco-Phillips Rodeo, meteorological year 2010 had over 30% missing cloud cover data and thus was deemed not suitable for inclusion in the assessment. It was thus agreed in consultation with BAAQMD (Jim Cordova, email 04/15/14) that for year 2010 all cloud cover data would be obtained from Napa County Airport.

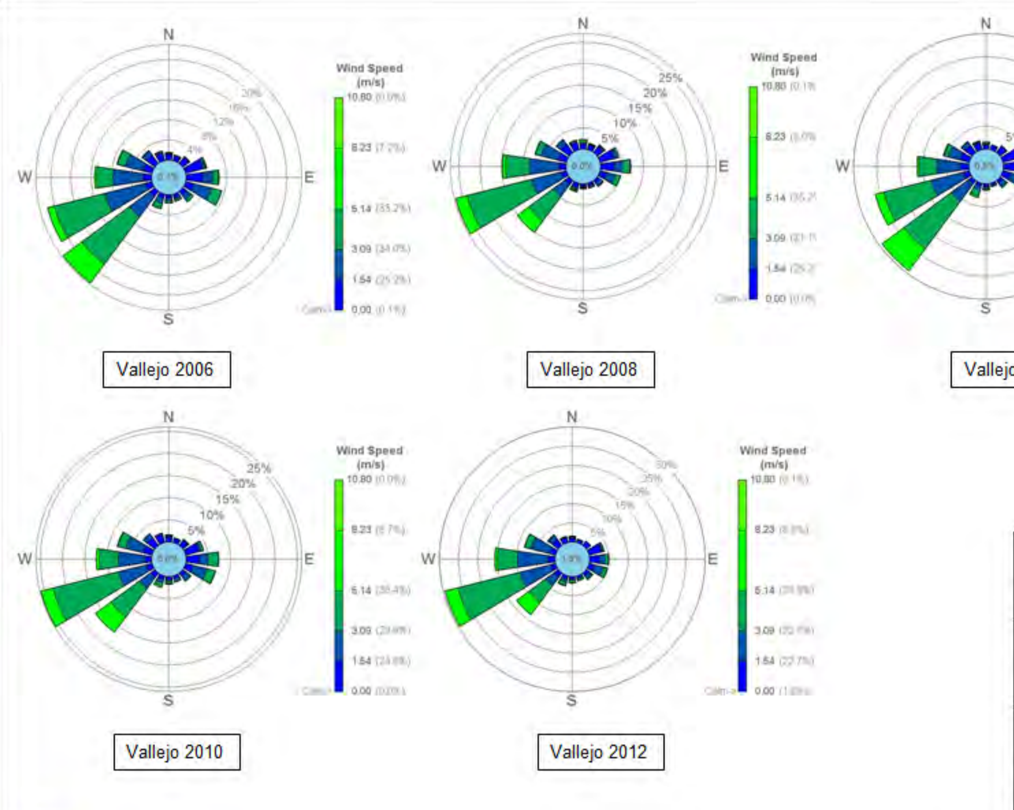

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Figure 3.4

Vallejo Met Station

Windrose 2006, 2008-- 2010, 2012

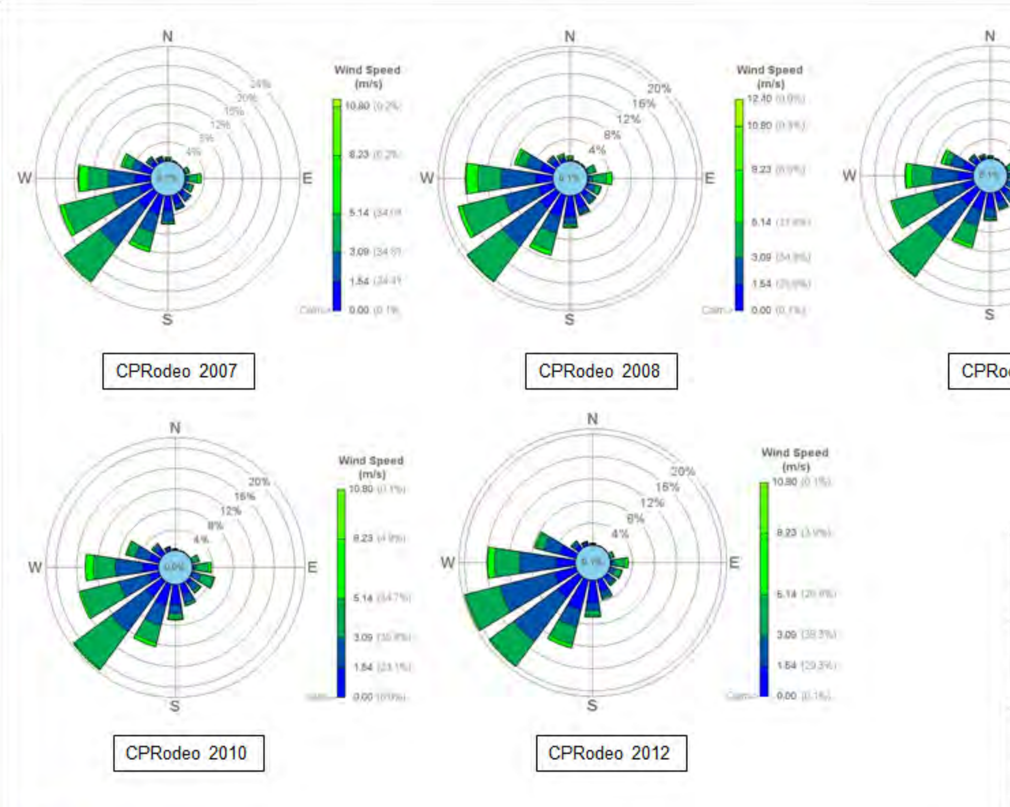

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Figure 3.5

Conoco-Phillips Rodeo Meteorological Station

Windrose 2007 - 2010, 2012

4.0 BASELINE CO ASSESSMENT

4.1 Background CO and $PM_{2.5}$ Concentration

The BAAQMD operates a regional 32-station monitoring network that measures the ambient concentrations of criteria pollutants. During the past three years (2011 – 2013), no exceptional event designations were requested by the Air District. Therefore, design values listed in the tables below have not been adjusted for exceptional events. In the Bay Area, exceptional events would generally be restricted to wildfires or industrial accidents that contribute to exceedances of the NAAQS.

Representative background concentrations for CO and $PM_{2.5}$ are based on the ambient monitoring station located on Tuolumne Street, Vallejo, CA (Station No. 06-095-0004) and covers the three most recent complete years (2011-2013). The station is designated a neighbourhood scale station (with a range of 500m – 4km) and is suitable for assigning a background concentration for determining project impacts. The monitoring station is located 2.5km north-east of the proposed facility. The monitoring station is also located approximately downwind of the facility based on the wind rose data for both Vallejo and Conoco-Phillips Rodeo meteorological stations (see Figures 3.4 and 3.5) and thus should be broadly representative of the location at which the maximum emissions from the facilities will occur. The background data for CO and $PM_{2.5}$ is outlined below in Table 4.1 for the last three years where data is available.

The 1st high concentration over the period 2011 – 2013 was used as background for assessing the California Ambient Air Quality Standards whilst the average concentration over the three year period was used as background for assessing against the National Air Quality Standards.

<table>
<tr><th>Pollutant</th><th>Year</th><th colspan="2">Maximum 1-Hour Concentration (ppm)</th><th colspan="2">Maximum 8-Hour Concentration (ppm)</th></tr>
<tr><td rowspan="3">Carbon Monoxide</td><td>2013</td><td colspan="2">2.8</td><td colspan="2">2.3</td></tr>
<tr><td>2012</td><td colspan="2">2.8</td><td colspan="2">2.2</td></tr>
<tr><td>2011</td><td colspan="2">3.0</td><td colspan="2">2.4</td></tr>
<tr><th></th><th>Year</th><th>Maximum 24-Hour Concentration ($\mu g/m^3$)</th><th colspan="2">98th%ile of Maximum 24-hr Concentrations ($\mu g/m^3$)</th><th>Annual Mean Concentration ($\mu g/m^3$)</th></tr>
<tr><td rowspan="3">$PM_{2.5}$</td><td>2013</td><td>NA</td><td colspan="2">32.8</td><td>10.42</td></tr>
<tr><td>2012</td><td>NA</td><td colspan="2">21.4</td><td>8.96</td></tr>
<tr><td>2011</td><td>NA</td><td colspan="2">31.0</td><td>10.08</td></tr>
</table>

Note 1 Concentrated reported at STP.

Source: BAAQMD Air Quality Monitoring Summaries for 2011-2013. EPA AIRS Data System, EPA Website, 2014.

Table 4.1 Available Ambient CO and $PM_{2.5}$ Data In Tuolumne St, Vallejo, California 2011 – 2013

5.0 OPERATIONAL PHASE AIR DISPERSION MODELLING RESULTS

Air dispersion modelling was undertaken using the USEPA regulatory model, AERMOD which was discussed in Section 3. The model input parameters and source references for selected model parameters are outlined in Annex B.

The results of the modeling assessment for CO and $PM_{2.5}$ are summarized in this Section. The modeling results demonstrate that the modelled project impacts, when combined with existing background ambient air quality data, demonstrate compliance with the NAAQS and CAAQS for CO and $PM_{2.5}$.

5.1 Ambient Operational CO Concentrations

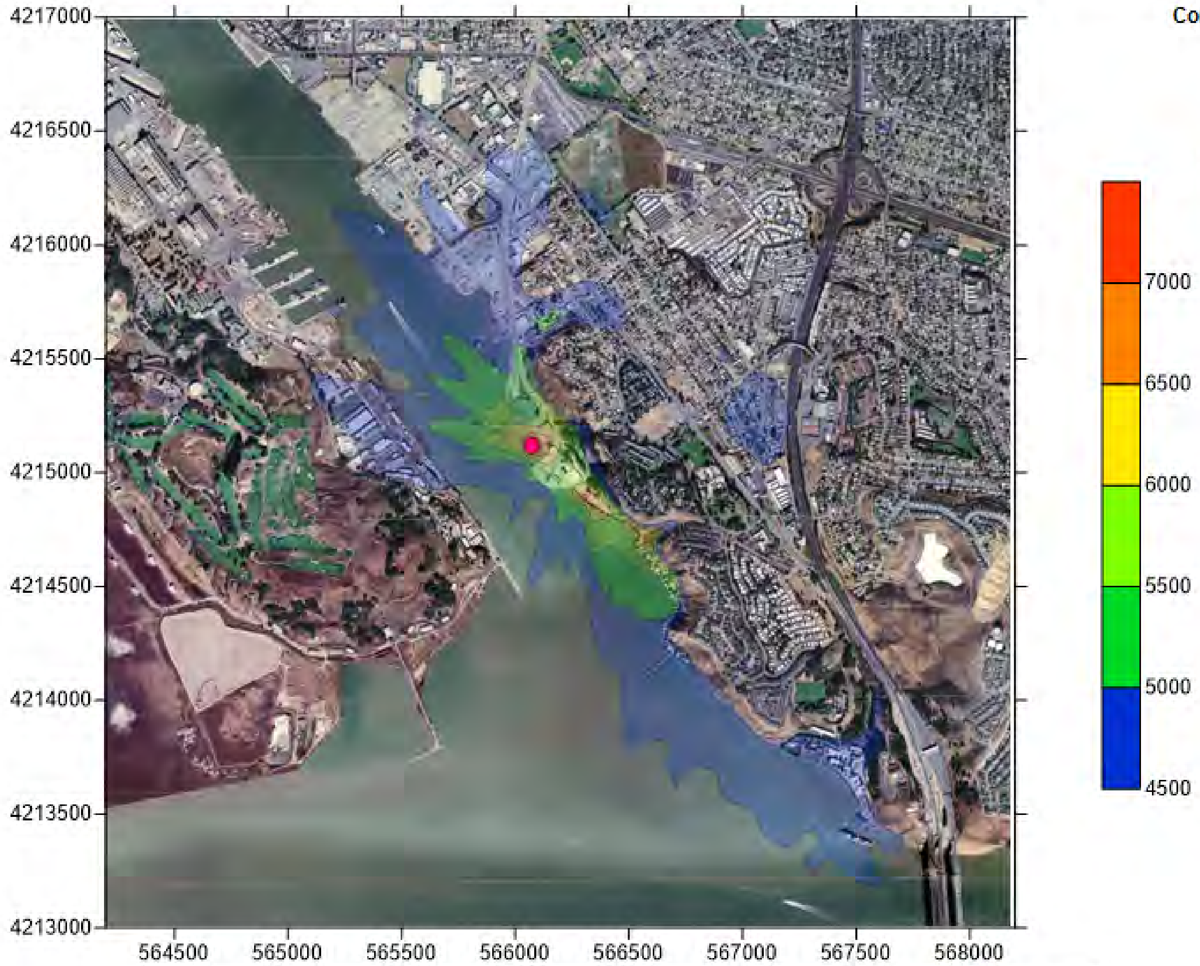
The CO modelling results based on the operation of the Orcem and VMT facilities simultaneously for a full year are outlined in Table 5.1 and Figure 5.1. The results have been compared with both the California and National ambient air quality standards for CO. This scenario leads to ambient CO concentrations (including background) which reach at most 35% of the California maximum 1-hour limit value, 19% of the National maximum 1-hour limit value, 42% of the California 24-limit value and 41% of the National 24-hour limit value at the worst-case off-site ambient receptor.

Pollutant / Met Years	Background Concentration	Averaging Period	Process Contribution CO	Predicted Ambient Concentration CO	Standard
CO 2007 - 2012	3700 µg/m^3	California Maximum 1-hr mean	4293 µg/m^3	7993 µg/m^3	23,000 µg/m^3 Note 1
	3700 µg/m^3	Federal Maximum 1-hr mean	3741 µg/m^3	7441 µg/m^3	40,000 µg/m^3 Note 2
	3000 µg/m^3	California Maximum 8-hr mean	1188 µg/m^3	4188 µg/m^3	10,000 µg/m^3 Note 1
	3000 µg/m^3	Federal Maximum 8-hr mean	1116 µg/m^3	4116 µg/m^3	10,000 µg/m^3 Note 2

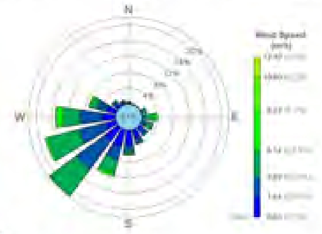
Note 1 California 1-Hour and 8-Hour value is a value not to be exceeded.
Note 2 National Standard not to be exceeded more than once per year.

Table 5.1 CO Concentrations In The Ambient Environment

In relation to the 1-hr maximum CO concentration (Figure 5.1), the maximum concentration peaks at a location along the north-western project site boundary along the Mare Island Straits. Maximum CO locations are located in non-residential areas. Maximum concentrations in residential areas are reduced significantly, with the maximum process CO contribution from the facility reducing by almost a factor of two at the worst-case residential receptor.



Conoco Phillips Rodeo 2007-2012



Maximum 1-Hr CO Concentration At Location Of Maximum Receptor (●)
= 7993 µg/m³

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Figure 5.1

Maximum 1-Hr CO Concentration ($\mu g/m^3$) (including background concentration) (UTM NAD83 Coordinates)

5.2 Ambient Operational $PM_{2.5}$ Concentrations

The $PM_{2.5}$ modelling results based on the operation of the Orcem and VMT facilities simultaneously for a full year are outlined in Tables 5.2 and 5.3 and Figures 5.2 and 5.3. The results have been compared with both the California and National ambient air quality standards for $PM_{2.5}$.

Ambient $PM_{2.5}$ concentrations (including background) reach at most 89% of the Federal maximum 24-hour limit value (as shown in Figure 5.2), 89% of the California annual limit value and 89% of the National annual limit value (as shown in Figure 5.3) at the worst-case off-site ambient receptor as outlined in Tables 5.2 and 5.3.

In relation to the Federal 24-hr daily maximum (Figure 5.2), the maximum concentration peaks at a location along the north-western project site boundary along the Mare Island Straits. The annual mean concentration (Figure 5.3) peaks at the northern boundary of the site adjacent to the site entrance.

Pollutant / Met Year	Background Concentration	Averaging Period	Process Contribution $PM_{2.5}$	Predicted Ambient Concentration $PM_{2.5}$	Standard Note 1
$PM_{2.5}$ / 2012	28.4 µg/m³	Maximum 24-hr (as a 98th%ile)	2.82 µg/m³	31.2 µg/m³	35 µg/m³

Note 1 To attain the National 24-hour standard, the 3-year average of the annual 98th percentile of the daily concentrations is equal or less than the standard.

Table 5.2 Maximum 24-Hr $PM_{2.5}$ Concentrations (as a 98th%ile) In The Ambient Environment

Pollutant / Met Years	Background Concentration	Averaging Period	Process Contribution $PM_{2.5}$	Predicted Ambient Concentration $PM_{2.5}$	Standard
$PM_{2.5}$ / 2007	9.82 µg/m³	California & National Annual Mean	0.77 µg/m³	10.59 µg/m³	12 µg/m³
$PM_{2.5}$ / 2008	9.82 µg/m³	California & National Annual Mean	0.78 µg/m³	10.60 µg/m³	12 µg/m³
$PM_{2.5}$ / 2009	9.82 µg/m³	California & National Annual Mean	0.78 µg/m³	10.60 µg/m³	12 µg/m³
$PM_{2.5}$ / 2010	9.82 µg/m³	California & National Annual Mean	0.76 µg/m³	10.58 µg/m³	12 µg/m³
$PM_{2.5}$ / 2012	9.82 µg/m³	California & National Annual Mean	0.88 µg/m³	10.70 µg/m³	12 µg/m³

Table 5.3 Annual Mean $PM_{2.5}$ Concentrations In The Ambient Environment

As before, maximum $PM_{2.5}$ locations are located in non-residential areas. Maximum concentrations in residential areas are lower, with the maximum 24-hr (as a 98th%ile) process $PM_{2.5}$ contribution from the facility reducing by a factor of two at the worst-case residential receptor. In relation to the annual mean (Figure 5.3), the concentration gradient is significant in the region of the maximum impact (southern boundary of the site) with process impacts above 50% of the maximum impact reported confined to non-residential areas.

6.0 REFERENCES

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Commercial Rail Yard (Davis Yard) Emission Inventory, Los Angeles (*Sierra Research (2007))*

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Annex A – Detailed CO And $PM_{2.5}$ Inventory Calculations

CO Emission Inventory Calculations

Orcem & VMT Shipping Emission Inventory	
Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to reduced speed transit for 1.7km and maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Assumption	Orcem Mode 1 Milestone 5		VMT Phase 2
Visits Per Year	19	visits	29
Hours Per Visit	138	hrs	138
Ship Capacity	40000	metric tonne	40000
Hotelling Time	132	hrs	132
Hotelling Time (Highest Day)	20.82	hrs	20.82
Transit & Maneuvering Time	6	hours (roundtrip)	6
Transit distance assessed (>3km)	59103.9	metres	59103.9
Transit Distance (within 3km)	1700	metres	1700
Maneurvering Distance	1300	metres	1300

Bulk Emission Details (CARB (2011) Appendix D)			
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuvering Inward speed	5	5.75	2.57
Maneuvering Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auxiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.0	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards

Low Adjustment Factor (5 knots)	5.34 (CO)	Load Factor - 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.93 (CO)	Load Factor - 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061 (POLA (2013))		
Maneuvering	0.275 (POLA (2013))		
Transit	0.104 (POLA (2013))		

Transit			**Time (hrs)**	**Distance (24nm from Golden Gate)**	**Speed (inwards)**	**Speed (outwards)**							**Emission Rate/Source**
Main engine	5513	g/hr	2.66	59103.9	6.17	6.17							
	1.2	g/sec	hrs	m	m/s	m/s							**CO**
							Combined Emission Rate		**AERMOD Volume sources**	**Spacing**	**Distance**	**Spacing**	**Transit Emission Rate**
Auxiliary engine	281	g/hr	2.66	59103.9	6.17	6.17	1.661	g/s	65	50	3250	526.5	0.0036
	0.1	g/sec	hrs	m	m/s	m/s				m	m	sec	g/s
Transit (within 3km of port)			**Time**	**Distance**	**Speed**	**Speed**							
			(hrs)	(3km to port))	(inwards)	(outwards)							
Main engine	2112	g/hr	0.13	1700	3.60	3.60							
	0.59	g/sec	hrs	m	m/s	m/s							**CO**
							Combined Emission Rate		**AERMOD Volume sources**	**Spacing**	**Distance**	**Time**	**Transit Emission Rate**
Auxiliary engine	281	g/hr	0.13	1700	3.60	3.60	0.665	g/s	34	50	1700	472.1	0.0026
	0.08	g/sec	hrs	m	m/s	m/s				m	m	sec	g/s

Maneuvering			Time (hrs)	Distance	Speed (inwards)	Speed (outwards)									
CO															
Main engine (inward)	2130	g/hr	0.39	1300	2.57										
	0.59	g/s	hrs	m	m/s										
Main engine (outward)	1684	g/hr	0.35	1300		3.60									
	0.47	g/s	hrs	m		m/s									
Auxiliary engine	744	g/hr		1300	2.57	3.60									
	0.2	g/s		m	m/s	m/s	**Emission Rate**						**Maneuvering**		
							Inwards		**AERMOD Volume sources**	**Spacing**	**Distance**	**Time**	**Inward**	**Outward**	**Average**
Boiler	22	g/hr		1300	2.57	3.60	0.80	g/s	26	50	1300	1405	0.0121	0.0108	0.0114
	0.006	g/s		m	m/s	m/s	**Outwards**			**m**	**m**	**sec**	**g/s**	**g/s**	**g/s**
							0.80	g/s	26	50	1300	1261			

Hoteling	CO		Hours	Hoteling	AERMOD Point sources
Auxiliary Engine	165	g/hr	132.0	0.046	1
			hrs	g/sec	
Boiler	22	g/hr	132.0	0.0061	1
			hrs	g/sec	

CO Emissions From TUGS - Main Engines

In relation to the main engines likely to be used for the tugs escorting the Handymax bulk carrier (40,000 mtonnes) into port, the following assumptions were made:

- 2172 hp was assumed as the rated horsepower of each of the two main engines.
- The emission factor for a 4344 hp tug is assumed to be as follows in Table 1:

Table 1 Main Engine & Auxiliary Engine Emission Factors – Tug Boat (g/hp-hr)

HP Range	Model Year	ME CO	AE CO
1901 – 3300 hp	**Aggregate**	**4.245**	**4.241**

- Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
- Hours of operation per annum for milestone 5 is 19 trips x 2 hours per trip = 38 hours/annum.
- The fuel correction factor included in emission rate.
- The engine load of the tug boat is assumed to be 0.31 for the propulsion engine.

- The engine deterioration factor for > 251 hp is taken into account in the emission rate.

Thus, for CO:				
Main Engine Emissions	=	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr		
HP (2172 hp x 2)	=	4344		
Fuel Correction Factor	=	1.0		
Main Engine Emissions	=	1.588	g/sec	

CO Emissions From Auxiliary Engine

In relation to the auxiliary engine likely to be used for the tugs escorting the Handymax bulk carrier (40,000 mtonnes) into port, the following assumptions were made:

- 128 hp was assumed as the rated horsepower of the auxiliary engine.
- The emission actor for a 128hp tug is assumed to be as follows in Table 3:

Table 3 Auxiliary Engine Emission Factors – Tug Boat (g/hp-hr)

HP Range	Model Year	AE CO
121 - 175 hp	**Aggregate**	**4.241**

- Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
- Hours of operation per annum for milestone 5 is 19 trips x 2 hours per trip = 38 hours/annum.
- The fuel correction factor included in emission rate.
- The engine load of the tug boat is assumed to be 0.31 for the propulsion engine.
- The engine deterioration factor is taken into account in the emission rate.

Thus, for CO:

Auxiliary Engine Emissions	=	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr
Fuel Correction Factor	=	1.0
HP (256 hp x 2)	=	256
Auxiliary Engine Emissions	=	0.1297 g/s

Tugs – Ship Assist											**Combined CO Emission**		
	Emission Rate	**Time**	**Distance**	**Speed inward**	**Speed outward**	**Combined Emission Rate**	**AERMOD Point sources**	**Spacing**	**Distance**	**Time**	**Inward**	**Outward**	**Average**
	5716	0.390	1300	2.57	3.60	1.717	26	50	1300	1405	0.0258		0.0245

Main Engine	g/hr	hrs	m	m/s	m/s	g/s		m	m	sec	g/s	g/s	g/s
							26	50	1300	1261		0.0231	
Auxiliary	466.9 g/hr	0.390	1300	2.57	3.60								

Barge - Main Engines

In relation to the main engines likely to be used for the barge, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine.
- The emission factor for a 3000 hp tug is assumed to be as follows:

Main Engine & Auxiliary Engine Emission Factors – Tug Boat (g/hp-hr)

HP Range	Model Year	ME CO	AE CO
1901 – 3300 hp	**Aggregate**	**4.215**	**4.231**

- Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
- The fuel correction factor included in emission rate.
- The engine load of the barge is assumed to be 0.68 for the propulsion engine.
- The engine deterioration factor is taken into account in the emission rate.

Thus, for CO:			
Main Engine Emissions	=	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr	
HP (3000 hp)	=	3000	
Fuel Correction Factor	=	1.0	
Main Engine Emissions	=	2.389	g/sec

Auxiliary Engine

In relation to the auxiliary engine likely to be used for the barge, the following assumptions were made:

- 175 hp was assumed as the rated horsepower of the auxiliary engine.
- The emission actor for a 175hp barge auxiliary engine is assumed to be as follows:

Auxiliary Engine Emission Factors – Tug Boat (g/hp-hr)

HP Range	Model Year	AE CO
121 - 175 hp	**aggregate**	**4.231**

- Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
- The fuel correction factor included in emission rate.
- The engine load of the barge is assumed to be 0.68 for the propulsion engine.
- The engine deterioration factor is taken into account in the emission rate.

Thus, for CO:

Auxiliary Engine Emissions	**=**	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr
Fuel Correction Factor	**=**	1.00
HP (256 hp x 2)	**=**	175
Auxiliary Engine Emissions	**=**	0.088 g/s

Barge										**Combined CO Emission**		
	Emission Rate	**Distance**	**Speed inward**	**Speed outward**	**Combined Emission Rate**	**AERMOD Volume sources**	**Spacing**	**Distance**	**Time**	**Inward**	**Outward**	**Average**
Main Engine	8599	6300	2.57	3.60	2.477	126	50	6300	3349	0.0183		0.0164
	g/hr	**m**	**m/s**	**m/s**	**g/s**		**m**	**m**	**sec**	**g/s**	**g/s**	**g/s**
						126	50	6300	2650		0.0145	
Auxiliary	318.4 g/hr	6300	2.57	3.60								

Orcem Inc.			Highest Day	Highest Day				
Shipping			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
Based on 59 kms from site	**tonnage**	**ships per year**	**g/day**	**lbs/day**	**g/2-way trip**	**mtonne/yr**	**tpa**	**lbs/year**
Transit	120000	3.0	15412	34.0	30824	0.09	0.10	204
Transit	240000	6.0	15412	34.0	30824	0.18	0.20	408
Transit	360000	9.0	15412	34.0	30824	0.28	0.31	612
Transit	480000	12.0	15412	34.0	30824	0.37	0.41	815
Transit	760000	19.0	15412	34.0	30824	0.59	0.65	1291
Shipping			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**ships per year**	**g/day**	**lbs/day**	**g/2-way trip**	**mtonne/yr**	**tpa**	**lbs/year**
Transit (<3km from port)	120000	3.0	314	0.7	628	0.00	0.00	4
Transit (<3km from port)	240000	6.0	314	0.7	628	0.00	0.00	8
Transit (<3km from port)	360000	9.0	314	0.7	628	0.01	0.01	12
Transit (<3km from port)	480000	12.0	314	0.7	628	0.01	0.01	17
Transit (<3km from port)	760000	19.0	314	0.7	628	0.01	0.01	26
Shipping					**CO**	**CO**	**CO**	**CO**
(inward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Maneuvering	120000	3.0	1130	2.5	1130	0.00	0.00	7
Maneuvering	240000	6.0	1130	2.5	1130	0.01	0.01	15
Maneuvering	360000	9.0	1130	2.5	1130	0.01	0.01	22
Maneuvering	480000	12.0	1130	2.5	1130	0.01	0.01	30
Maneuvering	760000	19.0	1130	2.5	1130	0.02	0.02	47
Shipping					**CO**	**CO**	**CO**	**CO**
(outward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Maneuvering	120000	3.0	1008	2.2	1008	0.00	0.00	7
Maneuvering	240000	6.0	1008	2.2	1008	0.01	0.01	13
Maneuvering	360000	9.0	1008	2.2	1008	0.01	0.01	20
Maneuvering	480000	12.0	1008	2.2	1008	0.01	0.01	27
Maneuvering	760000	19.0	1008	2.2	1008	0.02	0.02	42
Shipping					**CO**	**CO**	**CO**	**CO**
	tonnage	**ships per year**			**g/trip**	**mtonne/yr**	**tpa**	**lbs/year**
Hoteling	120000	3.0	3889	8.6	24658	0.07	0.08	163
Hoteling	240000	6.0	3889	8.6	24658	0.15	0.16	326
Hoteling	360000	9.0	3889	8.6	24658	0.22	0.24	489
Hoteling	480000	12.0	3889	8.6	24658	0.30	0.33	652
Hoteling	760000	19.0	3889	8.6	24658	0.47	0.52	1033
Shipping					**CO**	**CO**	**CO**	**CO**
(inward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Tugs	120000	3.0	4828	10.6	4828	0.014	0.02	32
Tugs	240000	6.0	4828	10.6	4828	0.03	0.03	64
Tugs	360000	9.0	4828	10.6	4828	0.04	0.05	96
Tugs	480000	12.0	4828	10.6	4828	0.06	0.06	128
Tugs	760000	19.0	4828	10.6	4828	0.09	0.10	202
Shipping					**CO**	**CO**	**CO**	**CO**
(outward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Tugs	120000	3.0	4369	9.6	4369	0.01	0.01	29
Tugs	240000	6.0	4369	9.6	4369	0.03	0.03	58
Tugs	360000	9.0	4369	9.6	4369	0.04	0.04	87
Tugs	480000	12.0	4369	9.6	4369	0.05	0.06	116
Tugs	760000	19.0	4369	9.6	4369	0.08	0.09	183
				lbs/day	**CO**	**mtpa**	**tpa**	**lbs/year**
Combined Shipping				**56.39**	**milestone 1**	**0.20**	**0.22**	**446**
Combined Shipping				**56.39**	**milestone 2**	**0.40**	**0.45**	**892**
Combined Shipping				**56.39**	**milestone 3**	**0.61**	**0.67**	**1338**

Combined Shipping				**56.39**	**milestone 4**	**0.81**	**0.89**	**1784**
Combined Shipping				**56.39**	**milestone 5**	**1.28**	**1.41**	**2825**

VMT			**Highest Day**	**Highest Day**				
Shipping			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
Based on 77 kms from	**tonnage**	**ships per year**	**g/day**	**lbs/day**	**g/2-way trip**	**mtonne/yr**	**tpa**	**lbs/year**
Transit	480000	12.0	15412	34.0	30824	0.37	0.41	815
Transit	720000	18.0	15412	34.0	30824	0.55	0.61	1223
Transit	1350000	29.0	15412	34.0	30824	0.89	0.99	1971
Transit	1160000	29.0	15412	34.0	30824	0.89	0.99	1971
Transit	1160000	29.0	15412	34.0	30824	0.89	0.99	1971
Shipping			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**ships per year**	**g/day**	**lbs/day**	**g/2-way trip**	**mtonne/yr**	**tpa**	**lbs/year**
Transit (<3km from port)	480000	12.0	314	0.7	628	0.01	0.01	17
Transit (<3km from port)	720000	18.0	314	0.7	628	0.01	0.01	25
Transit (<3km from port)	1350000	29.0	314	0.7	628	0.02	0.02	40
Transit (<3km from port)	1160000	29.0	314	0.7	628	0.02	0.02	40
Transit (<3km from port)	1160000	29.0	314	0.7	628	0.02	0.02	40
Shipping					**CO**	**CO**	**CO**	**CO**
(inward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Maneuvering	480000	12.0	1130	2.5	1130	0.01	0.01	30
Maneuvering	720000	18.0	1130	2.5	1130	0.02	0.02	45
Maneuvering	1350000	29.0	1130	2.5	1130	0.03	0.04	72
Maneuvering	1160000	29.0	1130	2.5	1130	0.03	0.04	72
Maneuvering	1160000	29.0	1130	2.5	1130	0.03	0.04	72
Shipping					**CO**	**CO**	**CO**	**CO**
(outward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Maneuvering	480000	12.0	1008	2.2	1008	0.01	0.01	27
Maneuvering	720000	18.0	1008	2.2	1008	0.02	0.02	40
Maneuvering	1350000	29.0	1008	2.2	1008	0.03	0.03	64
Maneuvering	1160000	29.0	1008	2.2	1008	0.03	0.03	64
Maneuvering	1160000	29.0	1008	2.2	1008	0.03	0.03	64
Shipping					**CO**	**CO**	**CO**	**CO**
	tonnage	**ships per year**			**g/trip**	**mtonne/yr**	**tpa**	**lbs/year**
Hoteling	480000	12.0	3889	8.6	24658	0.30	0.33	652
Hoteling	720000	18.0	3889	8.6	24658	0.44	0.49	978
Hoteling	1350000	29.0	3889	8.6	24658	0.72	0.79	1576
Hoteling	1160000	29.0	3889	8.6	24658	0.72	0.79	1576
Hoteling	1160000	29.0	3889	8.6	24658	0.72	0.79	1576
Shipping					**CO**	**CO**	**CO**	**CO**
(inward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Tugs	480000	12.0	4828	10.6	4828	0.058	0.06	128
Tugs	720000	18.0	4828	10.6	4828	0.09	0.10	192
Tugs	1350000	29.0	4828	10.6	4828	0.14	0.15	309
Tugs	1160000	29.0	4828	10.6	4828	0.14	0.15	309
Tugs	1160000	29.0	4828	10.6	4828	0.14	0.15	309
Shipping					**CO**	**CO**	**CO**	**CO**
(outward)	**tonnage**	**ships per year**			**g/trip (one way)**	**mtonne/yr**	**tpa**	**lbs/year**
Tugs	480000	12.0	4369	9.6	4369	0.05	0.06	116
Tugs	720000	18.0	4369	9.6	4369	0.08	0.09	173
Tugs	1350000	29.0	4369	9.6	4369	0.13	0.14	279
Tugs	1160000	29.0	4369	9.6	4369	0.13	0.14	279
Tugs	1160000	29.0	4369	9.6	4369	0.13	0.14	279
				lbs/day	**CO**	**mtpa**	**tpa**	**lbs/year**
Combined Shipping				**56.39**	**Phase 1 Trucks Only**	**0.81**	**0.89**	**1784**
Combined Shipping				**56.39**	**Phase 1 Trucks & Rail**	**1.21**	**1.34**	**2676**
Combined Shipping				**56.39**	**Phase 1 Alternative**	**1.96**	**2.16**	**4312**
Combined Shipping				**56.39**	**Phase 2**	**1.96**	**2.16**	**4312**
Combined Shipping				**56.39**	**Phase 2 Alternative**	**1.96**	**2.16**	**4312**

			Highest Day	Highest Day				
Barges			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
(inward)	**tonnage**	**barges per year**	**g/day**	**lbs/day**	**g/trip (one way)**	**mtpa**	**tpa**	**lbs/annum**
Phase 1 Trucks Only	480000							
Phase 1 Trucks & Rail	720000							
Phase 1 Alternative	1350000							
Phase 2	1160000	41.4	25478	56.2	25478	1.05E+00	1.16E+00	2325
Phase 2 Alternative	1160000	12.0	25478	56.2	25478	3.06E-01	3.37E-01	674
			Highest Day	**Highest Day**				
Barges			**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
(outward)	**tonnage**	**barges per year**	**g/day**	**lbs/day**	**g/trip (one way)**	**mtpa**	**tpa**	**lbs/annum**
Phase 1 Trucks Only	480000							
Phase 1 Trucks & Rail	720000							
Phase 1 Alternative	1350000							
Phase 2	1160000	41.4	25478	56.2	25478	1.05E+00	1.16E+00	2325
Phase 2 Alternative	1160000	12.0	25478	56.2	25478	3.06E-01	3.37E-01	674
				Highest Day	**Barges**	**mtpa**	**tpa**	**lbs/annum**
					Phase 1 Trucks Only			
					Phase 1 Trucks & Rail			
					Phase 1 Alternative			
				56.18	**Phase 2**	**2.110**	**2.325**	**4651**
				56.18	**Phase 2 Alternative**	**0.611**	**0.674**	**1348**

Orcem – Mobile Diesel Hoppers / Conveyors			
OFFROAD2011	**Load Factor**	**HP**	**CO**
Excavator	0.40	201	0.92
			g/(hp-hr)
Deterioration Rate	2.43E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	1		
Emission Rate	86.84	g/hr	
Activity Factor	1		
Emission Rate / Excavator CO	0.0241	g/sec	

Sources	Emission Rate	
Diesel Hopper 1	0.0241	g/s
Diesel Hopper 2	0.0241	g/s
Diesel Conveyor 1	0.0241	g/s
Diesel Conveyor 2	0.0241	g/s
Diesel Conveyor 3	0.0241	g/s
Diesel Conveyor 4	0.0241	g/s
Diesel Conveyor 5	0.0241	g/s
Diesel Conveyor 6	0.0241	g/s
Diesel Conveyor 7	0.0241	g/s

CO							
	tonnage	**hours of operation**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	180	781.59	41.36	0.14	0.16	310.2
milestone 2	240000	360	781.59	41.36	0.28	0.31	620.3
milestone 3	360000	540	781.59	41.36	0.42	0.47	930.5
milestone 4	480000	720	781.59	41.36	0.56	0.62	1240.6
milestone 5	760000	1140	781.59	41.36	0.89	0.98	1964.3

Orcem Excavator - 1 in operation for Milestone 5			
OFFROAD2011	**Load Factor**	**HP**	**CO**
Excavator	0.38	175	2.70
			g/(hp-hr)
Deterioration Rate	7.14E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	1		
Emission Rate	212.7	g/hr	
Activity Factor	0.25		
Emission Rate / Excavator CO	0.0148	g/sec	

CO							
	tonnage	**hours of operation**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1105	53.17	2.81	0.059	0.065	129.6
milestone 2	240000	2211	53.17	2.81	0.118	0.130	259.1
milestone 3	360000	3316	53.17	2.81	0.176	0.194	388.7
milestone 4	480000	4421	53.17	2.81	0.235	0.259	518.3
milestone 5	760000	7000	53.17	2.81	0.372	0.410	820.6

Orcem Front Loader (2 in operation for Milestone 5)			
OFFROAD	**Load Factor**	**HP**	**CO**
Front Loader	0.36	369	0.92
Deterioration Rate	1.82E-05	g/(hr-hr^2)	Diesel
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	133.78	g/hr	
Activity Factor	0.75	Fractional usage per hour	

Orcem Front Loader (2 in operation for Milestone 5)			Combined	
Emission Rate / Front Loader CO	0.028	g/s	0.043	including excavator exhaust emissions
	Maximum 24-hrs			
AERMOD Sources (Slag Heap N)	12			
AERMOD Sources (Slag Heap S)	5			
Maximum 24-Hours	**CO**			
Emission Rate / Front Loader / Source (SHN)	0.0036	g/s		including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	0.0085	g/s		including excavator exhaust emissions

CO	Orcem Front Loader - Gypsum Loading						
Emission Rate	133.8	g/hr					
	0.037	g/sec		**Volume of front loader**		12.2	m3
Speed	16	km/hr	(10 miles/hr)	**Density of Gypsum**		1.10	tonnes/m3
Mass Emission per vehicle	8.36	g/km		**Tonnage / front loader**		13.42	tonnes
Gypsum Storage Sources	12			**Tons / front loader**		14.79	tons
Time per trip	0.015	hrs					
Spacing storage	0.020	km		**Tonnage**	**Hours of operation**	**Trips/annum**	**Trips / hour**
				3,522	1105	262	0.24

Distance Travelled S3	0.480	km	2-way average	**7,044**	2211	525	0.24
	Maximum Day		Annual	**10,566**	3316	787	0.24
Trips / hour	1	two-way	0.24	**14,088**	4421	1050	0.24
				22,306	7000	1662	0.24
Emissions per hour S3	4.01	g/hr	0.953				
Emissions per sec S3	0.0011	g/sec	0.00026				
	CO Maximum Day		CO Annual Mean				
Emissions per sec S3/source	9.29E-05	g/sec	2.21E-05				

Orcem CO Front Loaders Exhaust Emissions								
	tonnage	**hours of operation**	**Maximum Day (g/hr)**	**Annual (g/hr)**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1105	104.3	14.8	5.52	0.130	0.143	286.6
milestone 2	240000	2211	104.3	29.7	5.52	0.260	0.287	573.2
milestone 3	360000	3316	104.3	44.5	5.52	0.390	0.430	859.9
milestone 4	480000	4421	204.7	59.4	10.83	0.520	0.573	1146.5
milestone 5	760000	7000	204.7	94.0	10.83	0.823	0.908	1815.3

CO – VMT Front Loader Emission Factors

Front Loader (2 in operation for Phase 1 Alternative)			
OFFROAD	**Load Factor**	**HP**	**CO**
Front Loader	0.36	369	0.92
Deterioration Rate	1.82E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	
	(capped at 12000 hrs)		
Fuel Correction Factor	1.0		
Emission Rate	133.78	g/hr	
Activity Factor	0.90	Fractional usage per hour	

Unpaved Road - Industrial (Front Loader (2 in operation for Milestone 5)				
Emission Rate / Front Loader CO	0.0334	g/s		
	Maximum 24-hrs			
Truck Loading Sources	**5**			
TransLoading Sources	**4**			
Rail Loading Sources	**5**			
Barge Loading Sources	**5**			
CO	**Maximum Day**		**Hours Of Operation**	
Emission Rate / Front Loader / Truck Loading	0.00669	g/s	**5760**	
Emission Rate / Front Loader / TransLoading	0.00836	g/s	**1392**	
Emission Rate / Front Loader / Rail Loading	0.00669	g/s	**2038**	
Emission Rate / Front Loader / Barge Loading	0.00669	g/s	**288**	

CO Front Loaders Exhaust Emissions							
	tonnage	**hours of operation**	**Maximum Day (g/hr)**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only	480000	5760	120.4	6.4	0.694	0.764	1528.9
Phase 1 Trucks & Rail	720000	5760	120.4	6.4	0.694	0.764	1528.9
Phase 1 Alternative	1350000	4320	240.8	12.7	1.040	1.147	2293.4
Phase 2	1,160,000	5760	240.8	12.7	1.387	1.529	3057.9
Phase 2 Alternative	1,160,000	5760	240.8	12.7	1.387	1.529	3057.9

VMT Forklift Emission Inventory			
OFFROAD2011	**Load Factor**	**HP**	**CO**
Forklift	0.20	100	1.58
			g/(hp-hr)
Deterioration Rate	0.0	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1800	hours/year	
	(capped at 12,000 hrs)		
Fuel Correction Factor	1.0		
Emission Rate	31.6	g/hr	
Activity Factor	0.50	Fractional usage per hour	
Emission Rate / Forklift	15.8	g/s	

CO									
	tonnage	**hours of operation**	**No. of Forklifts (maximum day)**	**No. of Forklifts (annual)**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only	480000	1800	2	2	31.6	1.672	0.114	0.125	250.8
Phase 1 Trucks & Rail	720000	1800	2	2	31.6	1.672	0.114	0.125	250.8
Phase 1 Alternative	1350000	1800	2	2	31.6	1.672	0.114	0.125	250.8
Phase 2	1160000	1800	2	2	31.6	1.672	0.114	0.125	250.8
Phase 2 Alternative	1160000	1800	2	2	31.6	1.672	0.114	0.125	250.8

Orcem CO Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO_run**			
						(gms/mile)			
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	3.33			

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**CO (g/hr-veh)**	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	**g/mile**		
					Assumption - Based On Idling for 7.5% of time
Tailpipe T7 Single (Ann)	g/vkt	2.07	3.33		
Idling T7 Single (Ann)	g/vkt	0.44	0.71	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	1.95	3.13		

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**CO_RUNEX**	**CO_STREX**	**CO_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	1.050	0.231	1.050
2020	Annual	LDA	DSL	Aggregated	10	2.588	0.000	2.588

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**	**Annual**		
Speed	**5**	**miles/hr**	GAS	Aggregated	1.168		
	8.046	**km/hr**	DSL	Aggregated	3.468		

		CO_run	g/mile		
Gas LDA (ann)	g/vkt	0.959	1.544	EMFAC2007	start emissions - one start per day averaged over onsite trip distance (0.756km)
DSL LDA (ann)	g/vkt	1.608	2.588		
Idling Gas LDA	g/vkt	0.726	1.168		
Idling Diesel LDA	g/vkt	2.155	3.468		
Composite Emission Factor Gas (ann)	g/vkt	0.942	1.515	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	1.649	2.654	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.944	1.520	sum	Based on 0.38% Diesel

	HHDT		LDA	
	CO		**CO**	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	1.470	g/hr	0.713	based on annual
Emission Factor/vehicle	0.00041	g/sec	0.00317	includes all trips/shift
Emissions /vehicle/AERMOD Source	4.92E-06	g/sec	3.82E-05	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown				
	CO	CO	CO	CO
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	4.92E-06	5	2.39E-05	6.211E-05
2	4.92E-06	6	3.19E-05	3.191E-05
3	4.92E-06	10	4.79E-05	4.786E-05
4	4.92E-06	11	5.58E-05	5.584E-05
5	4.92E-06	13	6.38E-05	6.381E-05
6	4.92E-06	13	6.38E-05	6.381E-05
7	4.92E-06	13	6.38E-05	6.381E-05
8	4.92E-06	13	6.38E-05	6.381E-05
9	4.92E-06	13	6.38E-05	1.402E-04
10	4.92E-06	13	6.38E-05	6.381E-05
11	4.92E-06	15	7.37E-05	7.365E-05
12	4.92E-06	13	6.38E-05	6.381E-05
13	4.92E-06	11	5.58E-05	5.584E-05
14	4.92E-06	5	2.39E-05	2.393E-05
15	4.92E-06	7	3.38E-05	3.377E-05
16	4.92E-06	0	0.00E+00	0.000E+00
17	4.92E-06	0	0.00E+00	3.818E-05
18	4.92E-06	0	0.00E+00	0.000E+00
19	4.92E-06	0	0.00E+00	0.000E+00
20	4.92E-06	0	0.00E+00	0.000E+00
21	4.92E-06	0	0.00E+00	0.000E+00
22	4.92E-06	0	0.00E+00	0.000E+00
23	4.92E-06	2	7.98E-06	7.977E-06
24	4.92E-06	3	1.60E-05	1.595E-05
	Total HHDT/Day	**166.1**		
		including deliveries (2 per day, 10am, 2pm)		

Diurnal Emission Factors Based On Truck Movement Breakdown				
Including Rail Loading - 16 wagons in 10 hours				
	CO	**Milestone5**	**CO**	**CO**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	4.92E-06	5	2.39E-05	6.21E-05
2	4.92E-06	6	3.19E-05	3.19E-05
3	4.92E-06	10	4.79E-05	4.79E-05
4	4.92E-06	11	5.58E-05	5.58E-05
5	4.92E-06	13	6.38E-05	6.38E-05
6	4.92E-06	13	6.38E-05	6.38E-05
7	4.92E-06	13	6.38E-05	6.38E-05
8	4.92E-06	19	9.33E-05	9.33E-05
9	4.92E-06	19	9.33E-05	1.70E-04
10	4.92E-06	19	9.33E-05	9.33E-05
11	4.92E-06	21	1.03E-04	1.03E-04
12	4.92E-06	19	9.33E-05	9.33E-05
13	4.92E-06	17	8.54E-05	8.54E-05
14	4.92E-06	11	5.34E-05	5.34E-05
15	4.92E-06	13	6.33E-05	6.33E-05
16	4.92E-06	6	2.95E-05	2.95E-05
17	4.92E-06	6	2.95E-05	6.77E-05
18	4.92E-06	0	0.00E+00	0.00E+00
19	4.92E-06	0	0.00E+00	0.00E+00
20	4.92E-06	0	0.00E+00	0.00E+00
21	4.92E-06	0	0.00E+00	0.00E+00
22	4.92E-06	0	0.00E+00	0.00E+00
23	4.92E-06	2	7.98E-06	7.98E-06
24	4.92E-06	3	1.60E-05	1.60E-05
	Total HHDT/Day	**226.1**		
		including deliveries (2 per day, 10am, 2pm)		

Annual					Maximum Day	Annual Mean				
HGV Traffic					CO	CO	CO	CO	CO	CO
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	1.470	1.470	0.733	0.0125	0.0137	27.49
milestone 2	240000		14578	0.755	1.470	1.470	0.733	0.0214	0.0236	47.25
milestone 3	360000		20676	0.755	1.470	1.470	0.733	0.0304	0.0335	67.01
milestone 4	480000		22723	0.755	1.470	1.470	0.733	0.0334	0.0368	73.64
milestone 5	760000		32534	0.755	1.470	1.470	0.733	0.0478	0.0527	105.44
LDA Traffic					CO	CO	CO	CO	CO	CO
	tonnage	Movements / day	Movements per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	0.755	0.713	0.713	0.022	0.0016	0.0017	3.43
milestone 2	240000	24	4992	0.755	0.713	0.713	0.038	0.0036	0.0039	7.85
milestone 3	360000	24	6240	0.755	0.713	0.713	0.038	0.0044	0.0049	9.81
milestone 4	480000	64	16640	0.755	0.713	0.713	0.101	0.0119	0.0131	26.16
milestone 5	760000	64	19968	0.755	0.713	0.713	0.101	0.0142	0.0157	31.39
							CO			
							lbs/day	MTPA	tpa	lbs/year
					Combined	milestone 1	0.75	0.0140	0.0155	30.9
						milestone 2	0.77	0.0250	0.0275	55.1
						milestone 3	0.77	0.0348	0.0384	76.8
						milestone 4	0.83	0.0453	0.0499	99.8
						milestone 5	0.83	0.0621	0.0684	136.8

VMT CO Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO_run**			
						(gms/mile)			
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	3.33			

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**CO (g/hr-veh)**	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	**g/mile**		
					Assumption - Based On Idling for 7.5% of time
Tailpipe T7 Single (Ann)	g/vkt	2.07	3.33		
Idling T7 Single (Ann)	g/vkt	0.44	0.71	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	1.95	3.13		

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**CO_RUNEX**	**CO_STREX**	**CO_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	1.050	0.231	1.050
2020	Annual	LDA	DSL	Aggregated	10	2.588	0.000	2.588

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**	**Annual**		
Speed	**5**	**miles/hr**	GAS	Aggregated	1.168		
	8.046	**km/hr**	DSL	Aggregated	3.468		

		CO_run	g/mile		
Gas LDA (ann)	g/vkt	0.972	1.564	EMFAC2007	start emissions - one start per day averaged over onsite trip distance (0.756km)
DSL LDA (ann)	g/vkt	1.608	2.588		
Idling Gas LDA	g/vkt	0.726	1.168		
Idling Diesel LDA	g/vkt	2.155	3.468		
Composite Emission Factor Gas (ann)	g/vkt	0.953	1.534	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	1.649	2.654	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.956	1.539	sum	Based on 0.38% Diesel

	HHDT		LDA	
	CO		**CO**	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	1.412	g/hr	0.693	based on annual
Emission Factor/vehicle	0.00039	g/sec	0.00385	includes all trips/shift
Emissions /vehicle/AERMOD Source	4.90E-06	g/sec	4.81E-05	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown				
	CO	CO	CO	CO
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	4.90E-06	0	0.00E+00	4.81E-05
2	4.90E-06	0	0.00E+00	0.00E+00
3	4.90E-06	0	0.00E+00	0.00E+00
4	4.90E-06	3	1.47E-05	1.47E-05
5	4.90E-06	4	1.96E-05	1.96E-05
6	4.90E-06	4	1.96E-05	1.96E-05
7	4.90E-06	4	1.96E-05	1.96E-05
8	4.90E-06	4	1.96E-05	1.96E-05
9	4.90E-06	4	1.96E-05	1.16E-04
10	4.90E-06	6	2.94E-05	2.94E-05
11	4.90E-06	4	1.96E-05	1.96E-05
12	4.90E-06	4	1.96E-05	1.96E-05
13	4.90E-06	4	1.96E-05	1.96E-05
14	4.90E-06	6	2.94E-05	2.94E-05
15	4.90E-06	4	1.96E-05	1.96E-05
16	4.90E-06	4	1.96E-05	1.96E-05
17	4.90E-06	4	1.96E-05	6.77E-05
18	4.90E-06	4	1.96E-05	1.96E-05
19	4.90E-06	4	1.96E-05	1.96E-05
20	4.90E-06	4	1.96E-05	1.96E-05
21	4.90E-06	4	1.96E-05	1.96E-05
22	4.90E-06	4	1.96E-05	1.96E-05
23	4.90E-06	4	1.96E-05	1.96E-05
24	4.90E-06	4	1.96E-05	1.96E-05
	Total HHDT/Day	87		

Annual					Maximum Day	Annual Mean				
HGV Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage		**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only	480,000	480000	26445	0.725	1.412	1.412	0.271	0.0373	0.0411	82.30
Phase 1 Trucks & Rail	720,000	240000	13846	0.725	1.412	1.412	0.271	0.0195	0.0215	43.09
Phase 1 Alternative	1,350,000	480000	26445	0.725	1.412	1.412	0.271	0.0373	0.0411	82.30
Phase 2	1,160,000	214400	12503	0.725	1.412	1.412	0.271	0.0176	0.0195	38.91
Phase 2 Alternative	1,160,000	310400	17542	0.725	1.412	1.412	0.271	0.0248	0.0273	54.59
LDA Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**Movements / day**	**Movements per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only	480000	24	3744	0.725	0.693	0.693	0.037	0.002595	0.002861	5.72
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.693	0.693	0.037	0.003460	0.003814	7.63
Phase 1 Alternative	1350000	40	10400	0.725	0.693	0.693	0.061	0.007209	0.007946	15.89
Phase 2	1,160,000	80	20800	0.725	0.693	0.693	0.122	0.014417	0.015892	31.78
Phase 2 Alternative	1,160,000	80	20800	0.725	0.693	0.693	0.122	0.014417	0.015892	31.78
							CO			
							lbs/day	**MTPA**	**tpa**	**lbs/year**
					Combined	**Phase 1 Trucks Only**	0.3075	0.0399	0.0440	88.0
						Phase 1 Trucks & Rail	0.3075	0.0230	0.0254	50.7
						Phase 1 Alternative	0.3319	0.0445	0.0491	98.2
						Phase 2	0.3931	0.0321	0.0353	70.7
						Phase 2 Alternative	0.3931	0.0392	0.0432	86.4

Orcem - CO Public Paved Road (Exhaust Emissions) Along Lemon Street West Of Sonoma Boulevard - Assumed 20 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO_run**			
						(gms/mile)			
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	1.69			

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**CO (g/hr-veh)**	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	**g/mile**		
Tailpipe T7 Single (ann)	g/vkt	1.05	1.69	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.44	0.71	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	1.01	1.62	Sum	

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**CO_RUNEX**	**CO_STREX**	**CO_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.865		0.865
2016	Annual	LDA	DSL	Aggregated	20	0.550		0.550

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**	**Annual**		
Speed	**5**	**miles/hr**	GAS	Aggregated	1.168		
	8.046	**km/hr**	DSL	Aggregated	3.468		

		CO_run	g/mile		
Gas LDA (ann)	g/vkt	0.538	0.865	EMFAC2007	no start emission (applied to onsite only)
DSL LDA (ann)	g/vkt	0.342	0.550		
Idling Gas LDA (ann)	g/vkt	0.726	1.168		
Idling Diesel LDA (ann)	g/vkt	2.155	3.468		
Composite Emission Factor Gas (ann)	g/vkt	0.552	0.888	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.478	0.769	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.551	0.888	sum	Based on 0.38% Diesel

	HHDT		LDA	
	CO		**CO**	
Spacing of volume sources	14	m	14	
AERMOD Volume Sources	51		51	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	0.725	g/hr	0.397	based on annual
Emission Factor/vehicle	0.00020	g/sec	0.00177	includes shift trips/day
Emission Factor/vehicle/AERMOD Source	3.95E-06	g/sec	3.46E-05	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown				
	CO	**CO**	**CO**	**CO**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	3.95E-06	4.86	3.84E-05	7.30E-05
2	3.95E-06	6.49	5.12E-05	5.12E-05
3	3.95E-06	9.73	7.68E-05	7.68E-05
4	3.95E-06	11.35	8.96E-05	8.96E-05
5	3.95E-06	12.97	1.02E-04	1.02E-04
6	3.95E-06	12.97	1.02E-04	1.02E-04
7	3.95E-06	12.97	1.02E-04	1.02E-04
8	3.95E-06	12.97	1.02E-04	1.02E-04
9	3.95E-06	12.97	1.02E-04	1.72E-04
10	3.95E-06	12.97	1.02E-04	1.02E-04
11	3.95E-06	14.97	1.18E-04	1.18E-04
12	3.95E-06	12.97	1.02E-04	1.02E-04
13	3.95E-06	11.35	8.96E-05	8.96E-05
14	3.95E-06	4.86	3.84E-05	3.84E-05
15	3.95E-06	6.86	5.42E-05	5.42E-05
16	3.95E-06	0.00	0.00E+00	0.00E+00
17	3.95E-06	0.00	0.00E+00	3.46E-05
18	3.95E-06	0.00	0.00E+00	0.00E+00
19	3.95E-06	0.00	0.00E+00	0.00E+00
20	3.95E-06	0.00	0.00E+00	0.00E+00
21	3.95E-06	0.00	0.00E+00	0.00E+00
22	3.95E-06	0.00	0.00E+00	0.00E+00
23	3.95E-06	1.62	1.28E-05	1.28E-05
24	3.95E-06	3.24	2.56E-05	2.56E-05
	Total HHDT/Day	**166.1**		
		including deliveries (2 per day, 10am, 2pm)		

CO Public Paved Road (Exhaust Emissions)							Length (m)	Width (m)
		HHDT	LDA			Sonoma South of Lemon	735	24
Emission factor, E	g/VKT	1.007	0.551	Lemon		Sonoma North of Lemon	525	24
Emission factor, E	g/VKT	0.320	0.411	Sonoma Blvd		Lemon East of Sonoma	820	16
						Sonoma South of Magazine	698	24

Sonoma North of Lemon	HHDT		LDA	
	CO		CO	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	22		22	
Distance Travelled	0.525	km	0.525	
Distance Travelled	0.326	miles	0.326	
Emission Factor/vehicle	0.168	g/hr	0.216	based on annual
Emission Factor/vehicle	0.000047	g/sec	0.000958	includes all trips/day
Emissions /vehicle/AERMOD Source	2.12E-06	g/sec	4.36E-05	

Sonoma South of Lemon	HHDT		LDA	
	CO		CO	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	31		31	
Distance Travelled	0.735	km	0.735	
Distance Travelled	0.457	miles	0.457	
Emission Factor/vehicle	0.24	g/hr	0.302	based on annual
Emission Factor/vehicle	0.00007	g/sec	0.00134	includes all trips/day
Emissions /vehicle/AERMOD Source	2.11E-06	g/sec	4.33E-05	

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma North of Lemon	**CO**	**CO**	**CO**	**CO (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	2.12E-06	0.24	1.03E-06	3.21E-06
2	2.12E-06	0.32	1.38E-06	1.38E-06
3	2.12E-06	0.49	2.07E-06	2.07E-06
4	2.12E-06	0.57	2.41E-06	2.41E-06
5	2.12E-06	0.65	2.75E-06	2.75E-06
6	2.12E-06	0.65	2.75E-06	2.75E-06
7	2.12E-06	0.65	2.75E-06	2.75E-06
8	2.12E-06	0.65	2.75E-06	2.75E-06
9	2.12E-06	0.65	2.75E-06	7.11E-06
10	2.12E-06	0.65	2.75E-06	2.75E-06
11	2.12E-06	0.75	3.18E-06	3.18E-06
12	2.12E-06	0.65	2.75E-06	2.75E-06
13	2.12E-06	0.57	2.41E-06	2.41E-06
14	2.12E-06	0.24	1.03E-06	1.03E-06
15	2.12E-06	0.34	1.46E-06	1.46E-06
16	2.12E-06	0.00	0.00E+00	0.00E+00
17	2.12E-06	0.00	0.00E+00	2.18E-06
18	2.12E-06	0.00	0.00E+00	0.00E+00
19	2.12E-06	0.00	0.00E+00	0.00E+00
20	2.12E-06	0.00	0.00E+00	0.00E+00
21	2.12E-06	0.00	0.00E+00	0.00E+00
22	2.12E-06	0.00	0.00E+00	0.00E+00
23	2.12E-06	0.08	3.44E-07	3.44E-07
24	2.12E-06	0.16	6.89E-07	6.89E-07
	Total HHDT/Day	**8.3**		
		including deliveries (2 per day, 10am, 2pm)		

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma South of Lemon	CO	CO	CO	CO (g/s)
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	2.11E-06	2	8.01E-06	2.49E-05
2	2.11E-06	3	1.07E-05	1.07E-05
3	2.11E-06	4	1.60E-05	1.60E-05
4	2.11E-06	4	1.87E-05	1.87E-05
5	2.11E-06	5	2.13E-05	2.13E-05
6	2.11E-06	5	2.13E-05	2.13E-05
7	2.11E-06	5	2.13E-05	2.13E-05
8	2.11E-06	5	2.13E-05	2.13E-05
9	2.11E-06	5	2.13E-05	5.51E-05
10	2.11E-06	5	2.13E-05	2.13E-05
11	2.11E-06	6	2.46E-05	2.46E-05
12	2.11E-06	5	2.13E-05	2.13E-05
13	2.11E-06	4	1.87E-05	1.87E-05
14	2.11E-06	2	8.01E-06	8.01E-06
15	2.11E-06	3	1.13E-05	1.13E-05
16	2.11E-06	0	0.00E+00	0.00E+00
17	2.11E-06	0	0.00E+00	1.69E-05
18	2.11E-06	0	0.00E+00	0.00E+00
19	2.11E-06	0	0.00E+00	0.00E+00
20	2.11E-06	0	0.00E+00	0.00E+00
21	2.11E-06	0	0.00E+00	0.00E+00
22	2.11E-06	0	0.00E+00	0.00E+00
23	2.11E-06	1	2.67E-06	2.67E-06
24	2.11E-06	1	5.34E-06	5.34E-06
	Total HHDT/Day	64.8		
		including deliveries (2 per day, 10am, 2pm)		

Lemon East Of Sonoma Boulevard	HHDT		LDA	

	CO		CO	
Spacing of volume sources	16	m	16	
AERMOD Volume Sources	51		51	
Distance Travelled	0.820	km	0.820	
Distance Travelled	0.510	miles	0.510	
Emission Factor/vehicle	0.826	g/hr	0.452	based on annual
Emission Factor/vehicle	0.00023	g/sec	0.00201	includes all trips/day
Emissions /vehicle/AERMOD Source	4.50E-06	g/sec	3.94E-05	

Sonoma Boulevard South Of Magazine St	**HHDT**		**LDA**	
	CO		**CO**	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	29		29	
Distance Travelled	0.698	km	0.698	
Distance Travelled	0.434	miles	0.434	
Emission Factor/vehicle	0.224	g/hr	0.287	based on annual
Emission Factor/vehicle	0.00006	g/sec	0.00127	includes all trips/day
Emissions /vehicle/AERMOD Source	2.14E-06	g/sec	4.39E-05	

Diurnal Emission Factors Based On Truck Movement Breakdown				
Lemon East Of Sonoma Boulevard	**CO**	**CO**	**CO**	**CO (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	4.50E-06	3	2.45E-05	4.66E-05
2	4.50E-06	4	3.27E-05	3.27E-05
3	4.50E-06	5	4.90E-05	4.90E-05
4	4.50E-06	6	5.72E-05	5.72E-05
5	4.50E-06	7	6.53E-05	6.53E-05
6	4.50E-06	7	6.53E-05	6.53E-05
7	4.50E-06	7	6.53E-05	6.53E-05
8	4.50E-06	7	6.53E-05	6.53E-05
9	4.50E-06	7	6.53E-05	1.09E-04
10	4.50E-06	7	6.53E-05	6.53E-05
11	4.50E-06	8	7.54E-05	7.54E-05
12	4.50E-06	7	6.53E-05	6.53E-05
13	4.50E-06	6	5.72E-05	5.72E-05
14	4.50E-06	3	2.45E-05	2.45E-05
15	4.50E-06	4	3.46E-05	3.46E-05
16	4.50E-06	0	0.00E+00	0.00E+00
17	4.50E-06	0	0.00E+00	2.21E-05
18	4.50E-06	0	0.00E+00	0.00E+00
19	4.50E-06	0	0.00E+00	0.00E+00
20	4.50E-06	0	0.00E+00	0.00E+00
21	4.50E-06	0	0.00E+00	0.00E+00
22	4.50E-06	0	0.00E+00	0.00E+00
23	4.50E-06	1	8.16E-06	8.16E-06
24	4.50E-06	2	1.63E-05	1.63E-05
	Total HHDT/Day	93.0		
		including deliveries (2 per day, 10am, 2pm)		

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma Boulevard South Of Magazine St	CO	CO	CO	CO (g/s)
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	2.14E-06	2	8.13E-06	2.53E-05
2	2.14E-06	3	1.08E-05	1.08E-05
3	2.14E-06	4	1.63E-05	1.63E-05
4	2.14E-06	4	1.90E-05	1.90E-05
5	2.14E-06	5	2.17E-05	2.17E-05
6	2.14E-06	5	2.17E-05	2.17E-05
7	2.14E-06	5	2.17E-05	2.17E-05
8	2.14E-06	5	2.17E-05	2.17E-05
9	2.14E-06	5	2.17E-05	5.59E-05
10	2.14E-06	5	2.17E-05	2.17E-05
11	2.14E-06	6	2.50E-05	2.50E-05
12	2.14E-06	5	2.17E-05	2.17E-05
13	2.14E-06	4	1.90E-05	1.90E-05
14	2.14E-06	2	8.13E-06	8.13E-06
15	2.14E-06	3	1.15E-05	1.15E-05
16	2.14E-06	0	0.00E+00	0.00E+00
17	2.14E-06	0	0.00E+00	1.71E-05
18	2.14E-06	0	0.00E+00	0.00E+00
19	2.14E-06	0	0.00E+00	0.00E+00
20	2.14E-06	0	0.00E+00	0.00E+00
21	2.14E-06	0	0.00E+00	0.00E+00
22	2.14E-06	0	0.00E+00	0.00E+00
23	2.14E-06	1	2.71E-06	2.71E-06
24	2.14E-06	1	5.42E-06	5.42E-06
	Total HHDT/Day	64.8		
		including deliveries (2 per day, 10am, 2pm)		

	Deliveries	Staff Commute
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					**Maximum Day**	**Annual Mean**				
HGV Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage		**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000		8481	80.47	81.01	81.01	29.7	0.7	0.8	1514.7
milestone 2	240000		14578	80.47	81.01	81.01	29.7	1.2	1.3	2603.6
milestone 3	360000		20676	80.47	81.01	81.01	29.7	1.7	1.8	3692.6
milestone 4	480000		22723	80.47	81.01	81.01	29.7	1.8	2.0	4058.2
milestone 5	760000		32534	80.47	81.01	81.01	29.7	2.6	2.9	5810.4
LDA Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**Movements / day**	**Movements per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	14	2184	39.91	22.01	22.01	0.679	0.048	0.053	106.0
milestone 2	240000	24	4992	39.91	22.01	22.01	1.165	0.110	0.121	242.2
milestone 3	360000	24	6240	39.91	22.01	22.01	1.165	0.137	0.151	302.8
milestone 4	480000	64	16640	39.91	22.01	22.01	3.106	0.366	0.404	807.4
milestone 5	760000	64	19968	39.91	22.01	22.01	3.106	0.440	0.484	968.9
							CO			
							lbs/day	**MTPA**	**tpa**	**lbs/year**
					Combined	**milestone 1**	30.4	0.7	0.81	1621
						milestone 2	30.8	1.3	1.42	2846
						milestone 3	30.8	1.8	2.00	3995
						milestone 4	32.8	2.2	2.43	4866
						milestone 5	32.8	3.1	3.39	6779

VMT - CO Public Paved Road (Exhaust Emissions) Along Lemon Street West Of Sonoma Boulevard - Assumed 20 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO_run**			
						(gms/mile)			
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	1.69			

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**CO (g/hr-veh)**	
2020	HHDT	D	SV	A		
					3.85	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	**g/mile**		
Tailpipe T7 Single (ann)	g/vkt	1.05	1.69	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.48	0.77	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	1.01	1.62	Sum	

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**CO_RUNEX**	**CO_STREX**	**CO_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.865		0.865
2016	Annual	LDA	DSL	Aggregated	20	0.550		0.550

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**	**Annual**		
Speed	**5**	**miles/hr**	GAS	Aggregated	1.168		
	8.046	**km/hr**	DSL	Aggregated	3.468		

		CO_run	g/mile		
Gas LDA (ann)	g/vkt	0.538	0.865	EMFAC2007	no start emission (applied to onsite only)
DSL LDA (ann)	g/vkt	0.342	0.550		
Idling Gas LDA (ann)	g/vkt	0.726	1.168		
Idling Diesel LDA (ann)	g/vkt	2.155	3.468		
Composite Emission Factor Gas (ann)	g/vkt	0.552	0.888	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.478	0.769	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.551	0.888	sum	Based on 0.38% Diesel

	HHDT		LDA	
	CO		**CO**	
Spacing of volume sources	14	m	14	
AERMOD Volume Sources	51		51	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	0.727	g/hr	0.397	based on annual
Emission Factor/vehicle	0.00020	g/sec	0.002206	includes shift trips/day
Emission Factor/vehicle/AERMOD Source	3.96E-06	g/sec	4.33E-05	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown				
	CO	CO	CO	CO
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	3.96E-06	0.00	0.00E+00	4.33E-05
2	3.96E-06	0.00	0.00E+00	0.00E+00
3	3.96E-06	0.00	0.00E+00	0.00E+00
4	3.96E-06	3.00	2.37E-05	2.37E-05
5	3.96E-06	4.00	3.17E-05	3.17E-05
6	3.96E-06	4.00	3.17E-05	3.17E-05
7	3.96E-06	4.00	3.17E-05	3.17E-05
8	3.96E-06	4.00	3.17E-05	3.17E-05
9	3.96E-06	4.00	3.17E-05	1.18E-04
10	3.96E-06	6.00	4.75E-05	4.75E-05
11	3.96E-06	4.00	3.17E-05	3.17E-05
12	3.96E-06	4.00	3.17E-05	3.17E-05
13	3.96E-06	4.00	3.17E-05	3.17E-05
14	3.96E-06	6.00	4.75E-05	4.75E-05
15	3.96E-06	4.00	3.17E-05	3.17E-05
16	3.96E-06	4.00	3.17E-05	3.17E-05
17	3.96E-06	4.00	3.17E-05	7.49E-05
18	3.96E-06	4.00	3.17E-05	3.17E-05
19	3.96E-06	4.00	3.17E-05	3.17E-05
20	3.96E-06	4.00	3.17E-05	3.17E-05
21	3.96E-06	4.00	3.17E-05	3.17E-05
22	3.96E-06	4.00	3.17E-05	3.17E-05
23	3.96E-06	4.00	3.17E-05	3.17E-05
24	3.96E-06	4.00	3.17E-05	3.17E-05
	Total HHDT/Day	**87.0**		

CO Public Paved Road (Exhaust Emissions)							Length (m)	Width (m)
		HHDT	LDA			Sonoma South of Lemon	735	24
Emission factor, E	g/VKT	1.009	0.552	Lemon		Sonoma North of Lemon	525	24
Emission factor, E	g/VKT	0.320	0.411	Sonoma Blvd		Lemon East of Sonoma	820	16
						Sonoma South of Magazine	698	24

Sonoma North of Lemon	HHDT		LDA	
	CO		CO	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	22		22	
Distance Travelled	0.525	km	0.525	
Distance Travelled	0.326	miles	0.326	
Emission Factor/vehicle	0.168	g/hr	0.216	based on annual
Emission Factor/vehicle	0.0000467	g/sec	0.00120	includes all trips/day
Emissions /vehicle/AERMOD Source	2.12E-06	g/sec	5.44E-05	

Sonoma South of Lemon	HHDT		LDA	
	CO		CO	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	31		31	
Distance Travelled	0.735	km	0.735	
Distance Travelled	0.457	miles	0.457	
Emission Factor/vehicle	0.24	g/hr	0.302	based on annual
Emission Factor/vehicle	0.000065	g/sec	0.00168	includes all trips/day
Emissions /vehicle/AERMOD Source	2.11E-06	g/sec	5.41E-05	

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma North of Lemon	CO	CO	CO	CO (g/s)
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	2.12E-06	0.00	0.00E+00	2.72E-06
2	2.12E-06	0.00	0.00E+00	0.00E+00
3	2.12E-06	0.00	0.00E+00	0.00E+00
4	2.12E-06	0.15	6.37E-07	6.37E-07
5	2.12E-06	0.20	8.50E-07	8.50E-07
6	2.12E-06	0.20	8.50E-07	8.50E-07
7	2.12E-06	0.20	8.50E-07	8.50E-07
8	2.12E-06	0.20	8.50E-07	8.50E-07
9	2.12E-06	0.20	8.50E-07	6.29E-06
10	2.12E-06	0.30	1.27E-06	1.27E-06
11	2.12E-06	0.20	8.50E-07	8.50E-07
12	2.12E-06	0.20	8.50E-07	8.50E-07
13	2.12E-06	0.20	8.50E-07	8.50E-07
14	2.12E-06	0.30	1.27E-06	1.27E-06
15	2.12E-06	0.20	8.50E-07	8.50E-07
16	2.12E-06	0.20	8.50E-07	8.50E-07
17	2.12E-06	0.20	8.50E-07	3.57E-06
18	2.12E-06	0.20	8.50E-07	8.50E-07
19	2.12E-06	0.20	8.50E-07	8.50E-07
20	2.12E-06	0.20	8.50E-07	8.50E-07
21	2.12E-06	0.20	8.50E-07	8.50E-07
22	2.12E-06	0.20	8.50E-07	8.50E-07
23	2.12E-06	0.20	8.50E-07	8.50E-07
24	2.12E-06	0.20	8.50E-07	8.50E-07
	Total HHDT/Day	**4.4**		

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma South of Lemon	**CO**	**CO**	**CO**	**CO (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	2.11E-06	0.00	0.00E+00	2.11E-05
2	2.11E-06	0.00	0.00E+00	0.00E+00
3	2.11E-06	0.00	0.00E+00	0.00E+00
4	2.11E-06	1.17	4.94E-06	4.94E-06
5	2.11E-06	1.56	6.58E-06	6.58E-06
6	2.11E-06	1.56	6.58E-06	6.58E-06
7	2.11E-06	1.56	6.58E-06	6.58E-06
8	2.11E-06	1.56	6.58E-06	6.58E-06
9	2.11E-06	1.56	6.58E-06	4.88E-05
10	2.11E-06	2.34	9.88E-06	9.88E-06
11	2.11E-06	1.56	6.58E-06	6.58E-06
12	2.11E-06	1.56	6.58E-06	6.58E-06
13	2.11E-06	1.56	6.58E-06	6.58E-06
14	2.11E-06	2.34	9.88E-06	9.88E-06
15	2.11E-06	1.56	6.58E-06	6.58E-06
16	2.11E-06	1.56	6.58E-06	6.58E-06
17	2.11E-06	1.56	6.58E-06	2.77E-05
18	2.11E-06	1.56	6.58E-06	6.58E-06
19	2.11E-06	1.56	6.58E-06	6.58E-06
20	2.11E-06	1.56	6.58E-06	6.58E-06
21	2.11E-06	1.56	6.58E-06	6.58E-06
22	2.11E-06	1.56	6.58E-06	6.58E-06
23	2.11E-06	1.56	6.58E-06	6.58E-06
24	2.11E-06	1.56	6.58E-06	6.58E-06
	Total HHDT/Day	33.9		

Lemon East Of Sonoma Boulevard	HHDT		LDA	
	CO		CO	
Spacing of volume sources	16	m	16	
AERMOD Volume Sources	51		51	
Distance Travelled	0.820	km	0.820	
Distance Travelled	0.510	miles	0.510	
Emission Factor/vehicle	0.828	g/hr	0.452	based on annual
Emission Factor/vehicle	0.00023	g/sec	0.00251	includes all trips/day
Emissions /vehicle/AERMOD Source	4.51E-06	g/sec	4.93E-05	

Sonoma Boulevard South Of Magazine St	HHDT		LDA	
	CO		CO	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	29		29	
Distance Travelled	0.698	km	0.698	
Distance Travelled	0.434	miles	0.434	
Emission Factor/vehicle	0.224	g/hr	0.287	based on annual
Emission Factor/vehicle	0.000062	g/sec	0.00159	includes all trips/day
Emissions /vehicle/AERMOD Source	2.14E-06	g/sec	5.49E-05	

Diurnal Emission Factors Based On Truck Movement Breakdown				
Lemon East Of Sonoma Boulevard	**CO**	**CO**	**CO**	**CO (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	4.51E-06	0	0.00E+00	2.76E-05
2	4.51E-06	0	0.00E+00	0.00E+00
3	4.51E-06	0	0.00E+00	0.00E+00
4	4.51E-06	2	1.51E-05	1.51E-05
5	4.51E-06	2	2.02E-05	2.02E-05
6	4.51E-06	2	2.02E-05	2.02E-05
7	4.51E-06	2	2.02E-05	2.02E-05
8	4.51E-06	2	2.02E-05	2.02E-05
9	4.51E-06	2	2.02E-05	7.54E-05
10	4.51E-06	3	3.03E-05	3.03E-05
11	4.51E-06	2	2.02E-05	2.02E-05
12	4.51E-06	2	2.02E-05	2.02E-05
13	4.51E-06	2	2.02E-05	2.02E-05
14	4.51E-06	3	3.03E-05	3.03E-05
15	4.51E-06	2	2.02E-05	2.02E-05
16	4.51E-06	2	2.02E-05	2.02E-05
17	4.51E-06	2	2.02E-05	4.78E-05
18	4.51E-06	2	2.02E-05	2.02E-05
19	4.51E-06	2	2.02E-05	2.02E-05
20	4.51E-06	2	2.02E-05	2.02E-05
21	4.51E-06	2	2.02E-05	2.02E-05
22	4.51E-06	2	2.02E-05	2.02E-05
23	4.51E-06	2	2.02E-05	2.02E-05
24	4.51E-06	2	2.02E-05	2.02E-05
	Total HHDT/Day	48.7		

Diurnal Emission Factors Based On Truck Movement Breakdown				
Sonoma Boulevard South Of Magazine St	**CO**	**CO**	**CO**	**CO (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**
1	2.14E-06	0	0.00E+00	2.14E-05
2	2.14E-06	0	0.00E+00	0.00E+00
3	2.14E-06	0	0.00E+00	0.00E+00
4	2.14E-06	1	5.01E-06	5.01E-06
5	2.14E-06	2	6.68E-06	6.68E-06
6	2.14E-06	2	6.68E-06	6.68E-06
7	2.14E-06	2	6.68E-06	6.68E-06
8	2.14E-06	2	6.68E-06	6.68E-06
9	2.14E-06	2	6.68E-06	4.95E-05
10	2.14E-06	2	1.00E-05	1.00E-05
11	2.14E-06	2	6.68E-06	6.68E-06
12	2.14E-06	2	6.68E-06	6.68E-06
13	2.14E-06	2	6.68E-06	6.68E-06
14	2.14E-06	2	1.00E-05	1.00E-05
15	2.14E-06	2	6.68E-06	6.68E-06
16	2.14E-06	2	6.68E-06	6.68E-06
17	2.14E-06	2	6.68E-06	2.81E-05
18	2.14E-06	2	6.68E-06	6.68E-06
19	2.14E-06	2	6.68E-06	6.68E-06
20	2.14E-06	2	6.68E-06	6.68E-06
21	2.14E-06	2	6.68E-06	6.68E-06
22	2.14E-06	2	6.68E-06	6.68E-06
23	2.14E-06	2	6.68E-06	6.68E-06
24	2.14E-06	2	6.68E-06	6.68E-06
	Total HHDT/Day	33.9		

	Deliveries	Staff Commute
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					**Maximum Day**	**Annual Mean**				
HGV Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
		trucks tonnage per year	**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only		480,000	26,445	80.467	81.22	81.22	15.581	2.1479	2.3676	4735.19
Phase 1 Trucks & Rail		240,000	13,846	80.467	81.22	81.22	15.581	1.1246	1.2397	2479.33
Phase 1 Alternative		480,000	26,445	80.467	81.22	81.22	15.581	2.1479	2.3676	4735.19
Phase 2		214,400	12,503	80.467	81.22	81.22	15.581	1.0155	1.1194	2238.70
Phase 2 Alternative		310,400	17,542	80.467	81.22	81.22	15.581	1.4248	1.5705	3141.05
LDA Traffic					**CO**	**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**Movements / day**	**Movements per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only	480000	24	3744	39.910	22.01	22.01	1.165	0.082407	0.090837	181.67
Phase 1 Trucks & Rail	720000	24	4992	39.910	22.01	22.01	1.165	0.109876	0.121116	242.23
Phase 1 Alternative	1350000	40	10400	39.910	22.01	22.01	1.941	0.228907	0.252325	504.65
Phase 2	1160000	80	20800	39.910	22.01	22.01	3.883	0.457815	0.504649	1009.30
Phase 2 Alternative	1160000	80	20800	39.910	22.01	22.01	3.883	0.457815	0.504649	1009.30
							CO			
							lbs/day	**MTPA**	**tpa**	**lbs/year**
					Combined	**Phase 1 Trucks Only**	16.746	2.2303	2.4584	4917
						Phase 1 Trucks & Rail	16.746	1.2345	1.3608	2722
						Phase 1 Alternative	17.522	2.3768	2.6199	5240
						Phase 2	19.464	1.4733	1.6240	3248
						Phase 2 Alternative	19.464	1.8826	2.0752	4150

Orcem / VMT Rail Emission Inventory

Switcher When Empty	% of full power	BHP	Duty Cycle	BHP	Switcher	Switcher
Notch Position			%	Weighted	CO (g/hr)	CO (g/sec)
			(based on Davis Yard Trim operations)			
Idle	0.81%	5.67	44.20%	2.51	3.78	0.001051
1	4.76%	33.32	5.00%	1.67	2.52	0.000699
2	14.18%	99.26	25.00%	24.82	37.47	0.010409
3	27.80%	194.6	2.30%	4.48	6.76	0.001877
4	42.07%	294.49	21.50%	63.32	95.61	0.026557
5	57.30%	401.1	1.50%	6.02	9.08	0.002524
6	72.51%	507.57	1.60%	8.12	12.26	0.003406
7	89.76%	628.32	0.00%	0.00	0.00	0.000000
8	105.31%	737.17	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**1.0**				167.48	0.04652
HP	**700**			111	CO (g/hr)	CO (g/sec)
Average Load (HP)				**16%**		

Switcher When Full	% of full power	BHP	Duty Cycle	BHP	Switcher	Switcher
Notch Position			%	Weighted	CO (g/hr)	CO (g/sec)
			(based on Davis Yard Trim operations)			
Idle	0.81%	17.01	44.20%	7.52	11.35	0.003154
1	4.76%	99.96	5.00%	5.00	7.55	0.002096
2	14.18%	297.78	25.00%	74.45	112.41	0.031226
3	27.80%	583.8	2.30%	13.43	20.28	0.005632
4	42.07%	883.47	21.50%	189.95	286.82	0.079672
5	57.30%	1203.3	1.50%	18.05	27.25	0.007571
6	72.51%	1522.71	1.60%	24.36	36.79	0.010219
7	89.76%	1884.96	0.00%	0.00	0.00	0.000000
8	105.31%	2211.51	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**1.0**				502.45	0.13957
HP	**2100**			333	CO (g/hr)	CO (g/sec)
Average Load (HP)				**16%**		

Line Haul	% of full power	BHP	EPA Duty Cycle	Orcem Duty Cycle	BHP	Line Haul	Line Haul
Notch Position					Weighted	CO (g/hr)	CO (g/sec)
Idle	0.4	8	38.00%	47.03%	3.76	3.50	0.000972
DB	2.1	42	12.50%	15.47%	6.50	6.04	0.001679
1	5	100	6.50%	8.04%	8.04	7.48	0.002078
2	11.4	228	6.50%	8.04%	18.34	17.06	0.004738
3	23.5	470	5.20%	6.44%	30.25	28.13	0.007814
4	34.3	686	4.40%	5.45%	37.36	34.74	0.009650
5	48.1	962	3.80%	4.70%	45.24	42.08	0.011688
6	64.3	1286	3.90%	4.83%	62.07	57.73	0.016035
7	86.6	1732	3.00%	0.00%	0.00	0.00	0.000000
8	102.5	2050	16.20%	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**1.0**						
HP	**2000**	(One locomotive)			212	196.75	0.05465
Average Load (HP)				**11%**		CO (g/hr)	CO (g/sec)

Line Haul	% of full power	BHP	EPA Duty Cycle	BHP	Line Haul	Line Haul
Notch Position				Weighted	CO (g/hr)	CO (g/sec)
Idle	0.4	8	38.0%	3.04	8.8	**0.0008**
DB	2.1	42	12.5%	5.25	15.1	**0.0014**
1	5	100	6.5%	6.50	18.7	**0.0017**
2	11.4	228	6.5%	14.82	42.7	**0.0038**
3	23.5	470	5.2%	24.44	70.4	**0.0063**
4	34.3	686	4.4%	30.18	86.9	**0.0078**
5	48.1	962	3.8%	36.56	105.3	**0.0094**
6	64.3	1286	3.9%	50.15	144.4	**0.0130**
7	86.6	1732	3.0%	51.96	149.6	**0.0134**
8	102.5	2050	16.2%	332.10	956.4	**0.0858**
Fuel Correction Factor	**1.0**					
HP	**2000**	(One locomotive)		555	516.2	0.143
Average Load (HP)					CO (g/hr)	CO (g/sec)

Orcem - Switchers When Empty

Hours To Load 16 Wagon Train	0.333	hours	
AERMOD sources	75		
Spacing	10	m	
	CO		
Emission rate	**2.07E-04**	g/(s*source)	
Orcem - Switchers When Full			
Hours To Load 16 Wagon Train	0.333	hours	
AERMOD sources	75		
Spacing	10	m	
	CO		
Emission rate	**6.20E-04**	g/(s*source)	
Orcem - Idling While Loading			
AERMOD sources	1	**idling**	
Time	1800	sec	
Idling Events	2	arrival & departure	
Emission rate	3.72	g/hr per train	
Locomotives	1		
Emission rate	1.03E-03	g/sec	
	CO		
Idling Emission rate	**1.03E-03**	g/(s*source)	

Orcem - Line Haul In Operation			
AERMOD sources	41	within 0.41km of facility	
Spacing	10	m	
Distance	0.41	km	
Speed	10	kph	
Time	147.6	sec	
Emission rate	8.07	g/hr per train	
Locomotives	1		
Emission rate	0.00224	g/sec	

	CO			
Emission rate	5.47E-05	g/(s*source)		
Orcem - Line Haul In Operation				
AERMOD sources	24	0.41km – 1.61km from facility		
Spacing	50	m		
Distance	1.2	km		
Speed	15	kph		
Time	288	sec		
Emission rate	15.74	g/hr per train		
Locomotives	1			
Emission rate	0.00437	g/sec		
	CO			
Emission rate	1.82E-04	g/(s*source)		
Distance	60.0	miles	(Distance south - 100miles, distance east - 20 miles)	
	96.6	km		
Line Haul	**Average Distance**			
Distance	94.9	km		
Speed	50	kph	Hours	
Time	6836	sec	1.899	
	CO			
Emission rate	**980.1**	g per train		

Orcem - Switching When Empty				CO	CO	CO	CO	CO
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	55.8	167.48	0.123	0.0002	0.0002	0.486
milestone 2	23010	16	55.8	167.48	0.123	0.0009	0.0010	1.945
milestone 3	51773	36	55.8	167.48	0.123	0.0020	0.0022	4.376
milestone 4	92041	63	55.8	167.48	0.123	0.0035	0.0039	7.780
milestone 5	145732	100	55.8	167.48	0.123	0.0056	0.0062	12.318
Orcem - Switching When Full				CO	CO	CO	CO	CO
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	167.5	502.45	0.369	0.0007	0.0007	1.459
milestone 2	23010	16	167.5	502.45	0.369	0.0026	0.0029	5.835
milestone 3	51773	36	167.5	502.45	0.369	0.0060	0.0066	13.128
milestone 4	92041	63	167.5	502.45	0.369	0.0106	0.0117	23.339
milestone 5	145732	100	167.5	502.45	0.369	0.0168	0.0185	36.953
Orcem - Line Haul idling				CO	CO	CO	CO	CO
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	7.44	3.720	0.01641	2.94E-05	3.24E-05	0.0648
milestone 2	23010	16	7.44	3.720	0.01641	1.18E-04	1.30E-04	0.2592
milestone 3	51773	36	7.44	3.720	0.01641	2.65E-04	2.92E-04	0.5832
milestone 4	92041	63	7.44	3.720	0.01641	4.70E-04	5.18E-04	1.0369
milestone 5	145732	100	7.44	3.720	0.01641	7.45E-04	8.21E-04	1.6417
Orcem - Line Haul (10 kph)				CO	CO	CO	CO	CO
	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	16.13	8.067	0.01779	6.37E-05	7.03E-05	0.141
milestone 2	23010	16	16.13	8.067	0.01779	2.55E-04	2.81E-04	0.562
milestone 3	51773	36	16.13	8.067	0.01779	5.74E-04	6.32E-04	1.265
milestone 4	92041	63	16.13	8.067	0.01779	1.02E-03	1.12E-03	2.248
milestone 5	145732	100	16.13	8.067	0.01779	1.61E-03	1.78E-03	3.560
Orcem - Line Haul (15 kph)				CO	CO	CO	CO	CO
(air model)	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	31.48	15.740	0.03471	1.24E-04	1.37E-04	0.274
milestone 2	23010	16	31.48	15.740	0.03471	4.98E-04	5.48E-04	1.097
milestone 3	51773	36	31.48	15.740	0.03471	1.12E-03	1.23E-03	2.468
milestone 4	92041	63	31.48	15.740	0.03471	1.99E-03	2.19E-03	4.387
milestone 5	145732	100	31.48	15.740	0.03471	3.15E-03	3.47E-03	6.947
Orcem - Line Haul (50 kph)				CO	CO	CO	CO	CO
(average 60 miles)	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
milestone 1	5753	4	1960.3	516.15	2.1612	7.75E-03	8.54E-03	17.076
milestone 2	23010	16	1960.3	516.15	2.1612	3.10E-02	3.41E-02	68.297
milestone 3	51773	36	1960.3	516.15	2.1612	6.97E-02	7.68E-02	153.670
milestone 4	92041	63	1960.3	516.15	2.1612	1.24E-01	1.37E-01	273.191
milestone 5	145732	100	1960.3	516.15	2.1612	1.96E-01	2.16E-01	432.553
			CO		lbs/day	MTPA	tpa	lbs/year

	Orcem - Combined	**milestone 1**	2.722	0.0088	0.0098	19.50
		milestone 2	2.722	0.0354	0.0390	77.99
		milestone 3	2.722	0.0796	0.0877	175.49
		milestone 4	2.722	0.1415	0.1560	311.98
		milestone 5	2.722	0.2241	0.2470	493.97

VMT - Switchers When Empty			
Hours To Load 16 Wagon Train	2.333	hours	
AERMOD sources	75		
Spacing	10	m	
	CO		
Emission rate	**6.20E-04**	g/(s*source)	
VMT - Switchers When Full			
Hours To Load 16 Wagon Train	2.333	hours	
AERMOD sources	75		
Spacing	10	m	
	CO		
Emission rate	**1.86E-03**	g/(s*source)	
VMT - Idling While Loading			
AERMOD sources	3	**idling**	
Time	1800	sec	
Idling Events	2	arrival & departure	
Emission rate	3.72	g/hr per train	
Locomotives	3		
Emission rate	1.03E-03	g/sec	
	CO		
Idling Emission rate	**1.03E-03**	g/(s*source)	

VMT - Line Haul In Operation		
AERMOD sources	41	within 0.41km of facility

Spacing	10	m		
Distance	0.41	km		
Speed	10	kph		
Time	147.6	sec		
Emission rate	8.07	g/hr per train		
Locomotives	3			
Emission rate	0.00224	g/sec		
	CO			
Emission rate	1.64E-04	g/(s*source)		
VMT - Line Haul In Operation				
AERMOD sources	24	0.41km – 1.61km from facility		
Spacing	50	m		
Distance	1.2	km		
Speed	15	kph		
Time	288	sec		
Emission rate	15.74	g/hr per train		
Locomotives	3			
Emission rate	0.00437	g/sec		
	CO			
Emission rate	5.47E-04	g/(s*source)		
Distance	60.0	miles	(Distance south - 100miles, distance east - 20 miles)	
	96.6	km		
Line Haul	**Average Distance**			
Distance	94.9	km		
Speed	50	kph	Hours	
Time	6836	sec	1.90	
	CO			
Emission rate	**980.1**	g per train		

VMT - Switching When Empty				CO	CO	CO	CO	CO
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	390.8	167.483	0.86169	0.0207	0.0228	45.584
Phase 1 Alternative	870000	96	390.8	167.483	0.86169	0.0375	0.0413	82.620
Phase 2	366000	40	390.8	167.483	0.86169	0.0158	0.0174	34.758
Phase 2 Alternative	770400	85	390.8	167.483	0.86169	0.0332	0.0366	73.162
VMT - Switching When Full				**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**rail**	**g/train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	1172.4	502.449	2.58506	0.0620	0.0684	136.751
Phase 1 Alternative	870000	96	1172.4	502.449	2.58506	0.1124	0.1239	247.861
Phase 2	366000	40	1172.4	502.449	2.58506	0.0473	0.0521	104.273
Phase 2 Alternative	770400	85	1172.4	502.449	2.58506	0.0996	0.1097	219.485
VMT - Line Haul idling				**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**rail**	**g/train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	22.32	11.160	0.04922	1.18E-03	1.30E-03	2.6035
Phase 1 Alternative	870000	96	22.32	11.160	0.04922	2.14E-03	2.36E-03	4.7189
Phase 2	366000	40	22.32	11.160	0.04922	9.00E-04	9.93E-04	1.9852
Phase 2 Alternative	770400	85	22.32	11.160	0.04922	1.90E-03	2.09E-03	4.1787
VMT - Line Haul (10 kph)				**CO**	**CO**	**CO**	**CO**	**CO**
	tonnage	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	48.402	24.201	0.10673	2.56E-03	2.82E-03	5.646
Phase 1 Alternative	870000	96	48.402	24.201	0.10673	4.64E-03	5.12E-03	10.233
Phase 2	366000	40	48.402	24.201	0.10673	1.95E-03	2.15E-03	4.305
Phase 2 Alternative	770400	85	48.402	24.201	0.10673	4.11E-03	4.53E-03	9.062
VMT - Line Haul (15 kph)				**CO**	**CO**	**CO**	**CO**	**CO**
(air model)	**tonnage**	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	94.442	47.221	0.20825	5.00E-03	5.51E-03	11.016
Phase 1 Alternative	870000	96	94.442	47.221	0.20825	9.06E-03	9.98E-03	19.967
Phase 2	366000	40	94.442	47.221	0.20825	3.81E-03	4.20E-03	8.400
Phase 2 Alternative	770400	85	94.442	47.221	0.20825	8.02E-03	8.84E-03	17.681
VMT - Line Haul (50 kph)				**CO**	**CO**	**CO**	**CO**	**CO**
(average 60 miles)	**tonnage**	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	53	5880.82	1548.46	12.96720	3.11E-01	3.43E-01	685.971
Phase 1 Alternative	870000	96	5880.82	1548.46	12.96720	5.64E-01	6.22E-01	1243.322
Phase 2	366000	40	5880.82	1548.46	12.96720	2.37E-01	2.62E-01	523.053
Phase 2 Alternative	770400	85	5880.82	1548.46	12.96720	4.99E-01	5.50E-01	1100.983
			CO		**lbs/day**	**MTPA**	**tpa**	**lbs/year**

	VMT - Combined	**Phase 1 Trucks**				
		Phase 1 Trucks &	16.778	0.4026	0.4438	887.57
		Phase 1	16.778	0.7297	0.8044	1608.72
		Phase 2	16.778	0.3070	0.3384	676.77
		Phase 2	16.778	0.6462	0.7123	1424.55

$PM_{2.5}$ Emission Inventory Calculations

Orcem Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
$E = k(0.0016)*(U/2.2)^{1.3}/(M/2)^{1.4}$ kg/Mg				
Parameter	**Units**	**PM_{10}**	**$PM_{2.5}$**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837,748	tons/annum
Ships	40,000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Ship Unloading 1 (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Ship Unloading 1 (g/sec) = 0.0000012 (kg/Mg) x 151.5 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Ship Unloading 1 (g/sec) = 0.0000519 g/sec

PM2.5		tonnage / shipment	tonnage per hour	PM10 emission rate	Hours Per Shipment	Emissions Per Day (g/day)	Emissions Per Shipment (g)	GBFS Emissions per day (g/day)	GBFS Emissions per day (Lbs/day)
Drop Points	ship upload 1	20,000	151.5	5.19E-05	132	4.49	24.67	4.49	0.010
	ship upload 2	20,000	151.5	5.19E-05	132	4.49	24.67	4.49	0.010
	mobile hopper 1	20,000	151.5	5.19E-05	132	4.49	24.67	4.49	0.010
	mobile hopper 2	20,000	151.5	5.19E-05	132	4.49	24.67	4.49	0.010
	mobile conveyor drop point	40,000	303	1.04E-04	132	8.97	49.34	8.97	0.020
		Sum	909	g/sec		26.9	148.0	26.9	**0.059**
			tonnes/hour			**g/day**	**g/shipment**	**g/day**	**Lbs/day**

Ship Unloading 1 (tons/yr) = ship unloading emission rate (g/sec) x 3600 sec/hr x hours per shipment (hr) x ships per year
Ship Unloading 1 (tons/yr) = (0.0000519 g/sec x 3600 sec/hr x 132 hr x 19 ships/yr / 1000000 (g/tonnes)) * 1.10223 (tons/tonne)
Ship Unloading 1 (tons/yr) = (468.7 g/yr) / 1000000 (g/tonnes)) * 1.10223 (tons/tonne)
Ship Unloading 1 (tons/yr) = 0.00052 tons / annum

PM2.5	GBFS	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
ship upload 1	468.7	0.00052
ship upload 2	468.7	0.00052
mobile hopper 1	468.7	0.00052
mobile hopper 2	468.7	0.00052
mobile conveyor drop point	937.5	0.00103
Total S-1	2,812.5	**0.0031**

S-1 Ship Unloading Operation with associated 2 mobile hoppers & conveyors

Modes: Mode 2

The emission calculations for S-1 (Mode 2) are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for aspirated hoppers and conveyors is based on the data supplied with the potential supplier (based on a volume flow of 8000 Nm^3/hr for hoppers and 1500 Nm^3/hr for conveyors and a maximum emission concentration of 5 mg/Nm^3).

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
E= k(0.0016)*(U/2.2)$^{1.3}$/(M/2)$^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	1	1	Analysis of material (clinker)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.002484	0.000376	Calculation
Control Efficiency for Ship Unloading	Factor	0.90	0.90	A control factor of 90%, relative to the AP42 uncontrolled batch drop emission factor, has been applied to account for the shielding effect of the uploading material in the ship's hull and the absence of any dropping motion / impaction as the material is collected using the grab crane.
Controlled Emission factor, E (Ship Unloading)	**kg/Mg**	**0.000248**	**0.0000376**	
Control Efficiency for Aspirated Hopper	Factor	0.894	0.300	Based on a volume flow of 8000 Nm^3/hr and an emission concentration of maximum 5 mg/Nm^3 (as provided by the suppliers). Tonnage = 151.5 Tonnes/hr per hopper: Emission Rate = 8000 Nm^3/hr x 5 mg/Nm^3 / 151.5 Tonnes/hr Emission Rate = 40000 mg/hr / 151.5 Tonnes/hr Emission Rate = 264.0 mg / Tonnes Emission Rate = 0.000264 kg / Mg
Controlled Emission factor, E (Aspirated Hopper)	**kg/Mg**	**0.000264**	**0.000264**	

Control Efficiency for Aspirated Conveyor	Factor	0.990	0.934	Based on a volume flow of 1500 Nm^3/hr and an emission concentration of maximum 5 mg/Nm^3 (as provided by the suppliers). Tonnage = 303 Tonnes/hr for conveyor: Emission Rate = 1500 Nm^3/hr x 5 mg/Nm^3 / 303 Tonnes/hr Emission Rate = 7500 mg/hr / 303 Tonnes/hr Emission Rate = 24.75 mg / Tonnes Emission Rate = 0.000025 kg / Mg
Controlled Emission factor, E Aspirated Conveyor	**kg/Mg**	**0.0000248**	**0.0000248**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837,748	tons/annum
Ships	40,000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

S-2 GBFS and Limestone Conveyors

Modes:	Mode 1 and Mode 3

The emission calculations for S-2 (Modes 1 & 3) are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for watering is based on the SCAQMD publication SCAQMD (2007) "*Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*".

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
E= k(0.0016)*(U/2.2)$^{1.3}$/(M/2)$^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837748	tons/annum
Ships	40000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Intake Hopper (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Intake Hopper (g/sec) = 0.0000012 (kg/Mg) x 303 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Intake Hopper (g/sec) = 0.0001038 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Shipment	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	intake hopper	40000	303.0	0.0001038	132.0	8.97	0.0198
	conveyor drop 1	n/a	151.5	0.0000519	132.0	4.49	0.0099
	conveyor drop 2	n/a	151.5	0.0000519	132.0	4.49	0.0099
		Sum	606.0	g/sec		17.9	0.0395
			tonnes/hour			**g/day**	**lbs/day**

Intake Hopper (tons/yr) = intake hopper emission rate (g/sec) x 3600 sec/hr x hours per shipment (hr) x ships per year
Intake Hopper (tons/yr) = (0.0001038 g/sec x 3600 sec/hr x 132 hr x 19 ships/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Intake Hopper (tons/yr) = (937.5 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Intake Hopper (tons/yr) = 0.00103 tons / annum

PM2.5	PM2.5	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
intake hopper	937.5	0.00103
conveyor drop 1	468.7	0.00052
conveyor drop 2	468.7	0.00052
Sum (S-2)	1,875	0.00207

S-3 Cement, Pozzolan, and Gypsum Conveyors

Modes:	Mode 2

Under Mode 2, clinker will be transferred from the ships to the raw material storage building (RMSB) using covered and aspirated conveyors. Cement, pozzolan and gypsum will not be imported by ships and thus there will be no associated unloading conveyor movements. The control efficiency applied for aspirated conveyors is based on the data supplied with the potential supplier (based on a volume flow of 1500 Nm^3/hr and a maximum emission concentration of 5 mg/Nm^3).

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
E= $k(0.0016)*(U/2.2)^{1.3}/(M/2)^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	1.0	1.0	Analysis of material (clinker)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.002484	0.000376	Calculation
Control Efficiency for Aspirated Conveyors	Factor	0.99	0.934	Based on a volume flow of 1500 Nm^3/hr and an emission concentration of maximum 5 mg/Nm^3 (as provided by the suppliers). Tonnage = 303 Tonnes/hr: Emission Rate = 1500 Nm^3/hr x 5 mg/Nm^3 / 303 Tonnes/hr Emission Rate = 7500 mg/hr / 303 Tonnes/hr Emission Rate = 24.75 mg / Tonnes Emission Rate = 0.0000248 kg / Mg
Controlled Emission factor, E	**kg/Mg**	**0.0000248**	**0.0000248**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837748	tons/annum
Ships	40000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours

Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Intake Hopper (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Intake Hopper (g/sec) = 0.0000248 (kg/Mg) x 303 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Intake Hopper (g/sec) = 0.02216 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Shipment	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	intake hopper	40000	303.0	0.02216	132	1914.8	4.22
	conveyor drop 1	n/a	151.5	0.00105	132	90.3	0.20
	conveyor drop 2	n/a	151.5	0.00105	132	90.3	0.20
		Sum	606.0	g/sec		2095.4	4.62
			tonnes/hour			**g/day**	**lbs/day**

Intake Hopper (tons/yr) = intake hopper emission rate (g/sec) x 3600 sec/hr x hours per shipment (hr) x ships per year
Intake Hopper (tons/yr) = (0.02216 g/sec x 3600 sec/hr x 132 hr x 19 ships/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Intake Hopper (tons/yr) = (200,094.9 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Intake Hopper (tons/yr) = 0.221 tons / annum

PM2.5	PM2.5	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
intake hopper	200,094.9	0.221
conveyor drop 1	9437.5	0.010
conveyor drop 2	9437.5	0.010
Sum (S-2)	218,969.9	0.241

S-4 GBFS and Limestone Stockpiles
S-5 Cement, Pozzolan, and Gypsum Stockpiles

The emission calculations for S-4 (GBFS and limestone stockpiles) and S-5 (gypsum / pozzolan stockpiles only (clinker / cement will not be stored / stockpiled outside)) have been undertaken using the methodology outlined in AP-42 Section 13.2.5 (Industrial Wind Erosion). Fastest mile data taken from Concord (Year 2012) and using a threshold friction velocity (u^*_t) of 1.12m/s (uncrusted coal pile).

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
1/1/12	1	6.26	0.125	0.376	0.563	0.688	0	0	0	0
1/2/12	2	5.81	0.116	0.349	0.523	0.639	0	0	0	0
1/3/12	3	3.58	0.072	0.215	0.322	0.393	0	0	0	0
1/4/12	4	3.58	0.072	0.215	0.322	0.393	0	0	0	0
1/5/12	5	6.26	0.125	0.376	0.563	0.688	0	0	0	0
1/6/12	6	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/7/12	7	9.83	0.197	0.590	0.885	1.082	0	0	0	0
1/8/12	8	6.71	0.134	0.402	0.604	0.738	0	0	0	0
1/9/12	9	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/10/12	10	4.02	0.080	0.241	0.362	0.443	0	0	0	0
1/11/12	11	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/12/12	12	5.36	0.107	0.322	0.483	0.590	0	0	0	0
1/13/12	13	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/14/12	14	4.02	0.080	0.241	0.362	0.443	0	0	0	0
1/15/12	15	9.83	0.197	0.590	0.885	1.082	0	0	0	0
1/16/12	16	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/17/12	17	5.36	0.107	0.322	0.483	0.590	0	0	0	0
1/18/12	18	5.36	0.107	0.322	0.483	0.590	0	0	0	0
1/19/12	19	5.81	0.116	0.349	0.523	0.639	0	0	0	0
1/20/12	20	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
1/21/12	21	12.52	0.250	0.751	1.127	1.377	0	0	0.166	10.249
1/22/12	22	8.94	0.179	0.536	0.805	0.983	0	0	0	0
1/23/12	23	9.83	0.197	0.590	0.885	1.082	0	0	0	0
1/24/12	24	3.58	0.072	0.215	0.322	0.393	0	0	0	0
1/25/12	25	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/26/12	26	7.60	0.152	0.456	0.684	0.836	0	0	0	0
1/27/12	27	5.36	0.107	0.322	0.483	0.590	0	0	0	0
1/28/12	28	7.15	0.143	0.429	0.644	0.787	0	0	0	0
1/29/12	29	4.47	0.089	0.268	0.402	0.492	0	0	0	0
1/30/12	30	4.47	0.089	0.268	0.402	0.492	0	0	0	0

1/31/12	31	6.71	0.134	0.402	0.604	0.738	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
2/1/12	32	7.15	0.143	0.429	0.644	0.787	0	0	0	0
2/2/12	33	4.47	0.089	0.268	0.402	0.492	0	0	0	0
2/3/12	34	5.81	0.116	0.349	0.523	0.639	0	0	0	0
2/4/12	35	5.36	0.107	0.322	0.483	0.590	0	0	0	0
2/5/12	36	7.15	0.143	0.429	0.644	0.787	0	0	0	0
2/6/12	37	5.81	0.116	0.349	0.523	0.639	0	0	0	0
2/7/12	38	4.47	0.089	0.268	0.402	0.492	0	0	0	0
2/8/12	39	4.47	0.089	0.268	0.402	0.492	0	0	0	0
2/9/12	40	5.36	0.107	0.322	0.483	0.590	0	0	0	0
2/10/12	41	7.60	0.152	0.456	0.684	0.836	0	0	0	0
2/11/12	42	5.81	0.116	0.349	0.523	0.639	0	0	0	0
2/12/12	43	9.83	0.197	0.590	0.885	1.082	0	0	0	0
2/13/12	44	9.83	0.197	0.590	0.885	1.082	0	0	0	0
2/14/12	45	7.15	0.143	0.429	0.644	0.787	0	0	0	0
2/15/12	46	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
2/16/12	47	6.71	0.134	0.402	0.604	0.738	0	0	0	0
2/17/12	48	5.81	0.116	0.349	0.523	0.639	0	0	0	0
2/18/12	49	7.60	0.152	0.456	0.684	0.836	0	0	0	0
2/19/12	50	6.71	0.134	0.402	0.604	0.738	0	0	0	0
2/20/12	51	4.02	0.080	0.241	0.362	0.443	0	0	0	0
2/21/12	52	9.39	0.188	0.563	0.845	1.033	0	0	0	0
2/22/12	53	6.26	0.125	0.376	0.563	0.688	0	0	0	0
2/23/12	54	9.83	0.197	0.590	0.885	1.082	0	0	0	0
2/24/12	55	9.39	0.188	0.563	0.845	1.033	0	0	0	0
2/25/12	56	9.39	0.188	0.563	0.845	1.033	0	0	0	0
2/26/12	57	6.71	0.134	0.402	0.604	0.738	0	0	0	0
2/27/12	58	6.26	0.125	0.376	0.563	0.688	0	0	0	0
2/28/12	59	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
2/29/12	60	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
3/1/12	61	0.179	0.536	0.805	0.983	0.179	0	0	0	0
3/2/12	62	0.125	0.376	0.563	0.688	0.125	0	0	0	0
3/3/12	63	0.107	0.322	0.483	0.590	0.107	0	0	0	0
3/4/12	64	0.107	0.322	0.483	0.590	0.107	0	0	0	0
3/5/12	65	0.179	0.536	0.805	0.983	0.179	0	0	0	0
3/6/12	66	0.250	0.751	1.127	1.377	0.250	0	0	0.166	10.249
3/7/12	67	0.143	0.429	0.644	0.787	0.143	0	0	0	0
3/8/12	68	0.080	0.241	0.362	0.443	0.080	0	0	0	0
3/9/12	69	0.143	0.429	0.644	0.787	0.143	0	0	0	0
3/10/12	70	0.161	0.483	0.724	0.885	0.161	0	0	0	0
3/11/12	71	0.161	0.483	0.724	0.885	0.161	0	0	0	0
3/12/12	72	0.197	0.590	0.885	1.082	0.197	0	0	0	0
3/13/12	73	0.206	0.617	0.925	1.131	0.206	0	0	0	0.282
3/14/12	74	0.125	0.376	0.563	0.688	0.125	0	0	0	0
3/15/12	75	0.152	0.456	0.684	0.836	0.152	0	0	0	0
3/16/12	76	0.188	0.563	0.845	1.033	0.188	0	0	0	0
3/17/12	77	0.179	0.536	0.805	0.983	0.179	0	0	0	0
3/18/12	78	0.250	0.751	1.127	1.377	0.250	0	0	0.166	10.249
3/19/12	79	0.089	0.268	0.402	0.492	0.089	0	0	0	0
3/20/12	80	0.080	0.241	0.362	0.443	0.080	0	0	0	0
3/21/12	81	0.134	0.402	0.604	0.738	0.134	0	0	0	0
3/22/12	82	0.197	0.590	0.885	1.082	0.197	0	0	0	0
3/23/12	83	0.134	0.402	0.604	0.738	0.134	0	0	0	0
3/24/12	84	0.197	0.590	0.885	1.082	0.197	0	0	0	0
3/25/12	85	0.089	0.268	0.402	0.492	0.089	0	0	0	0
3/26/12	86	0.152	0.456	0.684	0.836	0.152	0	0	0	0
3/27/12	87	0.250	0.751	1.127	1.377	0.250	0	0	0.166	10.249
3/28/12	88	0.179	0.536	0.805	0.983	0.179	0	0	0	0
3/29/12	89	0.125	0.376	0.563	0.688	0.125	0	0	0	0
3/30/12	90	0.143	0.429	0.644	0.787	0.143	0	0	0	0
3/31/12	91	0.268	0.805	1.207	1.475	0.268	0	0	2.614	16.200

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
4/1/12	92	10.73	0.215	0.644	0.966	1.180	0	0	0	0
4/2/12	93	7.60	0.152	0.456	0.684	0.836	0	0	0	0
4/3/12	94	11.18	0.224	0.671	1.006	1.229	0	0	0	3.428
4/4/12	95	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
4/5/12	96	8.94	0.179	0.536	0.805	0.983	0	0	0	0
4/6/12	97	5.36	0.107	0.322	0.483	0.590	0	0	0	0
4/7/12	98	5.81	0.116	0.349	0.523	0.639	0	0	0	0
4/8/12	99	8.94	0.179	0.536	0.805	0.983	0	0	0	0
4/9/12	100	7.60	0.152	0.456	0.684	0.836	0	0	0	0
4/10/12	101	4.47	0.089	0.268	0.402	0.492	0	0	0	0
4/11/12	102	9.83	0.197	0.590	0.885	1.082	0	0	0	0
4/12/12	103	11.18	0.224	0.671	1.006	1.229	0	0	0	3.428
4/13/12	104	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
4/14/12	105	7.60	0.152	0.456	0.684	0.836	0	0	0	0
4/15/12	106	6.26	0.125	0.376	0.563	0.688	0	0	0	0
4/16/12	107	7.15	0.143	0.429	0.644	0.787	0	0	0	0
4/17/12	108	7.15	0.143	0.429	0.644	0.787	0	0	0	0
4/18/12	109	8.05	0.161	0.483	0.724	0.885	0	0	0	0
4/19/12	110	6.71	0.134	0.402	0.604	0.738	0	0	0	0
4/20/12	111	5.81	0.116	0.349	0.523	0.639	0	0	0	0
4/21/12	112	4.02	0.080	0.241	0.362	0.443	0	0	0	0
4/22/12	113	7.60	0.152	0.456	0.684	0.836	0	0	0	0
4/23/12	114	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
4/24/12	115	6.71	0.134	0.402	0.604	0.738	0	0	0	0
4/25/12	116	6.71	0.134	0.402	0.604	0.738	0	0	0	0
4/26/12	117	9.83	0.197	0.590	0.885	1.082	0	0	0	0
4/27/12	118	5.81	0.116	0.349	0.523	0.639	0	0	0	0
4/28/12	119	5.81	0.116	0.349	0.523	0.639	0	0	0	0
4/29/12	120	7.15	0.143	0.429	0.644	0.787	0	0	0	0
4/30/12	121	9.83	0.197	0.590	0.885	1.082	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
5/1/12	122	9.39	0.188	0.563	0.845	1.033	0	0	0	0
5/2/12	123	9.83	0.197	0.590	0.885	1.082	0	0	0	0
5/3/12	124	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/4/12	125	7.15	0.143	0.429	0.644	0.787	0	0	0	0
5/5/12	126	6.71	0.134	0.402	0.604	0.738	0	0	0	0
5/6/12	127	8.94	0.179	0.536	0.805	0.983	0	0	0	0
5/7/12	128	7.15	0.143	0.429	0.644	0.787	0	0	0	0
5/8/12	129	6.71	0.134	0.402	0.604	0.738	0	0	0	0
5/9/12	130	6.71	0.134	0.402	0.604	0.738	0	0	0	0
5/10/12	131	6.71	0.134	0.402	0.604	0.738	0	0	0	0
5/11/12	132	6.71	0.134	0.402	0.604	0.738	0	0	0	0
5/12/12	133	6.26	0.125	0.376	0.563	0.688	0	0	0	0
5/13/12	134	8.94	0.179	0.536	0.805	0.983	0	0	0	0
5/14/12	135	7.60	0.152	0.456	0.684	0.836	0	0	0	0
5/15/12	136	7.15	0.143	0.429	0.644	0.787	0	0	0	0
5/16/12	137	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/17/12	138	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
5/18/12	139	7.60	0.152	0.456	0.684	0.836	0	0	0	0
5/19/12	140	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/20/12	141	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/21/12	142	9.83	0.197	0.590	0.885	1.082	0	0	0	0
5/22/12	143	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
5/23/12	144	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/24/12	145	13.41	0.268	0.805	1.207	1.475	0	0	2.614	16.200
5/25/12	146	9.39	0.188	0.563	0.845	1.033	0	0	0	0
5/26/12	147	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
5/27/12	148	8.05	0.161	0.483	0.724	0.885	0	0	0	0
5/28/12	149	9.39	0.188	0.563	0.845	1.033	0	0	0	0
5/29/12	150	9.39	0.188	0.563	0.845	1.033	0	0	0	0
5/30/12	151	7.15	0.143	0.429	0.644	0.787	0	0	0	0
5/31/12	152	7.15	0.143	0.429	0.644	0.787	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m²)	(g/m²)	(g/m²)	(g/m²)
6/1/12	153	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
6/2/12	154	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
6/3/12	155	8.94	0.179	0.536	0.805	0.983	0	0	0	0
6/4/12	156	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
6/5/12	157	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/6/12	158	7.15	0.143	0.429	0.644	0.787	0	0	0	0
6/7/12	159	8.94	0.179	0.536	0.805	0.983	0	0	0	0
6/8/12	160	8.94	0.179	0.536	0.805	0.983	0	0	0	0
6/9/12	161	7.15	0.143	0.429	0.644	0.787	0	0	0	0
6/10/12	162	6.71	0.134	0.402	0.604	0.738	0	0	0	0
6/11/12	163	6.26	0.125	0.376	0.563	0.688	0	0	0	0
6/12/12	164	9.39	0.188	0.563	0.845	1.033	0	0	0	0
6/13/12	165	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
6/14/12	166	9.39	0.188	0.563	0.845	1.033	0	0	0	0
6/15/12	167	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/16/12	168	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/17/12	169	9.83	0.197	0.590	0.885	1.082	0	0	0	0
6/18/12	170	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
6/19/12	171	7.15	0.143	0.429	0.644	0.787	0	0	0	0
6/20/12	172	7.60	0.152	0.456	0.684	0.836	0	0	0	0
6/21/12	173	12.96	0.259	0.778	1.167	1.426	0	0	1.296	13.084
6/22/12	174	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/23/12	175	9.39	0.188	0.563	0.845	1.033	0	0	0	0
6/24/12	176	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/25/12	177	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/26/12	178	7.15	0.143	0.429	0.644	0.787	0	0	0	0
6/27/12	179	9.39	0.188	0.563	0.845	1.033	0	0	0	0
6/28/12	180	8.05	0.161	0.483	0.724	0.885	0	0	0	0
6/29/12	181	7.15	0.143	0.429	0.644	0.787	0	0	0	0
6/30/12	182	8.05	0.161	0.483	0.724	0.885	0	0	0	0

Date	N	u_S/u_r :	Pile Subarea				Pile Subarea			
			0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
7/1/12	183	8.05	0.161	0.483	0.724	0.885	0	0	0	0
7/2/12	184	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
7/3/12	185	9.83	0.197	0.590	0.885	1.082	0	0	0	0
7/4/12	186	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
7/5/12	187	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
7/6/12	188	8.94	0.179	0.536	0.805	0.983	0	0	0	0
7/7/12	189	7.15	0.143	0.429	0.644	0.787	0	0	0	0
7/8/12	190	6.71	0.134	0.402	0.604	0.738	0	0	0	0
7/9/12	191	8.94	0.179	0.536	0.805	0.983	0	0	0	0
7/10/12	192	7.15	0.143	0.429	0.644	0.787	0	0	0	0
7/11/12	193	6.71	0.134	0.402	0.604	0.738	0	0	0	0
7/12/12	194	8.05	0.161	0.483	0.724	0.885	0	0	0	0
7/13/12	195	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
7/14/12	196	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
7/15/12	197	7.60	0.152	0.456	0.684	0.836	0	0	0	0
7/16/12	198	11.62	0.232	0.697	1.046	1.279	0	0	0	5.421
7/17/12	199	8.05	0.161	0.483	0.724	0.885	0	0	0	0
7/18/12	200	7.15	0.143	0.429	0.644	0.787	0	0	0	0
7/19/12	201	7.15	0.143	0.429	0.644	0.787	0	0	0	0
7/20/12	202	7.60	0.152	0.456	0.684	0.836	0	0	0	0
7/21/12	203	8.94	0.179	0.536	0.805	0.983	0	0	0	0
7/22/12	204	7.15	0.143	0.429	0.644	0.787	0	0	0	0
7/23/12	205	8.05	0.161	0.483	0.724	0.885	0	0	0	0
7/24/12	206	8.05	0.161	0.483	0.724	0.885	0	0	0	0
7/25/12	207	7.60	0.152	0.456	0.684	0.836	0	0	0	0
7/26/12	208	7.60	0.152	0.456	0.684	0.836	0	0	0	0
7/27/12	209	7.60	0.152	0.456	0.684	0.836	0	0	0	0
7/28/12	210	9.39	0.188	0.563	0.845	1.033	0	0	0	0
7/29/12	211	8.94	0.179	0.536	0.805	0.983	0	0	0	0
7/30/12	212	6.71	0.134	0.402	0.604	0.738	0	0	0	0
7/31/12	213	7.15	0.143	0.429	0.644	0.787	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
8/1/12	214	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/2/12	215	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/3/12	216	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/4/12	217	9.39	0.188	0.563	0.845	1.033	0	0	0	0
8/5/12	218	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/6/12	219	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/7/12	220	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/8/12	221	6.26	0.125	0.376	0.563	0.688	0	0	0	0
8/9/12	222	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/10/12	223	6.71	0.134	0.402	0.604	0.738	0	0	0	0
8/11/12	224	6.71	0.134	0.402	0.604	0.738	0	0	0	0
8/12/12	225	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/13/12	226	7.15	0.143	0.429	0.644	0.787	0	0	0	0
8/14/12	227	8.94	0.179	0.536	0.805	0.983	0	0	0	0
8/15/12	228	9.39	0.188	0.563	0.845	1.033	0	0	0	0
8/16/12	229	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/17/12	230	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/18/12	231	8.05	0.161	0.483	0.724	0.885	0	0	0	0
8/19/12	232	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/20/12	233	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/21/12	234	8.05	0.161	0.483	0.724	0.885	0	0	0	0
8/22/12	235	7.60	0.152	0.456	0.684	0.836	0	0	0	0
8/23/12	236	8.05	0.161	0.483	0.724	0.885	0	0	0	0
8/24/12	237	8.05	0.161	0.483	0.724	0.885	0	0	0	0
8/25/12	238		0.000	0.000	0.000	0.000	0	0	0	0
8/26/12	239	10.28	0.206	0.617	0.925	1.131	0	0	0	0.282
8/27/12	240	8.05	0.161	0.483	0.724	0.885	0	0	0	0
8/28/12	241	8.94	0.179	0.536	0.805	0.983	0	0	0	0
8/29/12	242	6.71	0.134	0.402	0.604	0.738	0	0	0	0
8/30/12	243	11.18	0.224	0.671	1.006	1.229	0	0	0	3.428
8/31/12	244	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715

Date	N	u_S/u_r :	Pile Subarea				Pile Subarea			
			0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
9/1/12	245	8.94	0.179	0.536	0.805	0.983	0	0	0	0
9/2/12	246	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/3/12	247	8.05	0.161	0.483	0.724	0.885	0	0	0	0
9/4/12	248	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/5/12	249	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/6/12	250	8.94	0.179	0.536	0.805	0.983	0	0	0	0
9/7/12	251	7.60	0.152	0.456	0.684	0.836	0	0	0	0
9/8/12	252	8.94	0.179	0.536	0.805	0.983	0	0	0	0
9/9/12	253	9.39	0.188	0.563	0.845	1.033	0	0	0	0
9/10/12	254	9.39	0.188	0.563	0.845	1.033	0	0	0	0
9/11/12	255	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/12/12	256	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/13/12	257	6.26	0.125	0.376	0.563	0.688	0	0	0	0
9/14/12	258	7.60	0.152	0.456	0.684	0.836	0	0	0	0
9/15/12	259	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/16/12	260	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/17/12	261	7.60	0.152	0.456	0.684	0.836	0	0	0	0
9/18/12	262	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/19/12	263	8.05	0.161	0.483	0.724	0.885	0	0	0	0
9/20/12	264	8.05	0.161	0.483	0.724	0.885	0	0	0	0
9/21/12	265	6.26	0.125	0.376	0.563	0.688	0	0	0	0
9/22/12	266	5.36	0.107	0.322	0.483	0.590	0	0	0	0
9/23/12	267	8.05	0.161	0.483	0.724	0.885	0	0	0	0
9/24/12	268	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/25/12	269	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/26/12	270	6.26	0.125	0.376	0.563	0.688	0	0	0	0
9/27/12	271	3.58	0.072	0.215	0.322	0.393	0	0	0	0
9/28/12	272	7.15	0.143	0.429	0.644	0.787	0	0	0	0
9/29/12	273	6.71	0.134	0.402	0.604	0.738	0	0	0	0
9/30/12	274	4.02	0.080	0.241	0.362	0.443	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
10/1/12	275	5.36	0.107	0.322	0.483	0.590	0	0	0	0
10/2/12	276	4.47	0.089	0.268	0.402	0.492	0	0	0	0
10/3/12	277	8.05	0.161	0.483	0.724	0.885	0	0	0	0
10/4/12	278	7.60	0.152	0.456	0.684	0.836	0	0	0	0
10/5/12	279	6.71	0.134	0.402	0.604	0.738	0	0	0	0
10/6/12	280	6.71	0.134	0.402	0.604	0.738	0	0	0	0
10/7/12	281	8.05	0.161	0.483	0.724	0.885	0	0	0	0
10/8/12	282	6.26	0.125	0.376	0.563	0.688	0	0	0	0
10/9/12	283	7.15	0.143	0.429	0.644	0.787	0	0	0	0
10/10/12	284	7.15	0.143	0.429	0.644	0.787	0	0	0	0
10/11/12	285	8.05	0.161	0.483	0.724	0.885	0	0	0	0
10/12/12	286	4.02	0.080	0.241	0.362	0.443	0	0	0	0
10/13/12	287	6.26	0.125	0.376	0.563	0.688	0	0	0	0
10/14/12	288	5.36	0.107	0.322	0.483	0.590	0	0	0	0
10/15/12	289	5.36	0.107	0.322	0.483	0.590	0	0	0	0
10/16/12	290	7.60	0.152	0.456	0.684	0.836	0	0	0	0
10/17/12	291	6.26	0.125	0.376	0.563	0.688	0	0	0	0
10/18/12	292	6.71	0.134	0.402	0.604	0.738	0	0	0	0
10/19/12	293	6.26	0.125	0.376	0.563	0.688	0	0	0	0
10/20/12	294	9.39	0.188	0.563	0.845	1.033	0	0	0	0
10/21/12	295	7.60	0.152	0.456	0.684	0.836	0	0	0	0
10/22/12	296	8.94	0.179	0.536	0.805	0.983	0	0	0	0
10/23/12	297	6.26	0.125	0.376	0.563	0.688	0	0	0	0
10/24/12	298	6.71	0.134	0.402	0.604	0.738	0	0	0	0
10/25/12	299	5.81	0.116	0.349	0.523	0.639	0	0	0	0
10/26/12	300	4.02	0.080	0.241	0.362	0.443	0	0	0	0
10/27/12	301	3.58	0.072	0.215	0.322	0.393	0	0	0	0
10/28/12	302	4.02	0.080	0.241	0.362	0.443	0	0	0	0
10/29/12	303	4.02	0.080	0.241	0.362	0.443	0	0	0	0
10/30/12	304	6.71	0.134	0.402	0.604	0.738	0	0	0	0
10/31/12	305	7.15	0.143	0.429	0.644	0.787	0	0	0	0

Date	N		Pile Subarea				Pile Subarea			
		u_S/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
11/1/12	306	5.81	0.116	0.349	0.523	0.639	0	0	0	0
11/2/12	307	5.36	0.107	0.322	0.483	0.590	0	0	0	0
11/3/12	308	3.58	0.072	0.215	0.322	0.393	0	0	0	0
11/4/12	309	3.13	0.063	0.188	0.282	0.344	0	0	0	0
11/5/12	310	5.81	0.116	0.349	0.523	0.639	0	0	0	0
11/6/12	311	4.02	0.080	0.241	0.362	0.443	0	0	0	0
11/7/12	312	9.39	0.188	0.563	0.845	1.033	0	0	0	0
11/8/12	313	8.94	0.179	0.536	0.805	0.983	0	0	0	0
11/9/12	314	6.71	0.134	0.402	0.604	0.738	0	0	0	0
11/10/12	315	5.81	0.116	0.349	0.523	0.639	0	0	0	0
11/11/12	316	4.47	0.089	0.268	0.402	0.492	0	0	0	0
11/12/12	317	6.26	0.125	0.376	0.563	0.688	0	0	0	0
11/13/12	318	5.36	0.107	0.322	0.483	0.590	0	0	0	0
11/14/12	319	5.36	0.107	0.322	0.483	0.590	0	0	0	0
11/15/12	320	4.02	0.080	0.241	0.362	0.443	0	0	0	0
11/16/12	321	3.58	0.072	0.215	0.322	0.393	0	0	0	0
11/17/12	322	9.39	0.188	0.563	0.845	1.033	0	0	0	0
11/18/12	323	4.47	0.089	0.268	0.402	0.492	0	0	0	0
11/19/12	324	6.26	0.125	0.376	0.563	0.688	0	0	0	0
11/20/12	325	9.39	0.188	0.563	0.845	1.033	0	0	0	0
11/21/12	326	6.26	0.125	0.376	0.563	0.688	0	0	0	0
11/22/12	327	3.58	0.072	0.215	0.322	0.393	0	0	0	0
11/23/12	328	4.47	0.089	0.268	0.402	0.492	0	0	0	0
11/24/12	329	4.02	0.080	0.241	0.362	0.443	0	0	0	0
11/25/12	330	3.13	0.063	0.188	0.282	0.344	0	0	0	0
11/26/12	331	4.02	0.080	0.241	0.362	0.443	0	0	0	0
11/27/12	332	3.58	0.072	0.215	0.322	0.393	0	0	0	0
11/28/12	333	7.15	0.143	0.429	0.644	0.787	0	0	0	0
11/29/12	334	10.73	0.215	0.644	0.966	1.180	0	0	0	1.715
11/30/12	335	11.18	0.224	0.671	1.006	1.229	0	0	0	3.428

Date	N		Pile Subarea				Pile Subarea			
		u_s/u_r :	0.2a	0.2b	0.6a	0.9	0.2a	0.2b	0.6a	0.9
		u^*_{10}	u^*	u^*	u^*	u^*	u^*	u^*	u^*	u^*
		(m/s)	(m/s)	(m/s)	(m/s)	(m/s)	(g/m^2)	(g/m^2)	(g/m^2)	(g/m^2)
12/1/12	336	8.94	0.179	0.536	0.805	0.983	0	0	0	0
12/2/12	337	12.52	0.250	0.751	1.127	1.377	0	0	0.166	10.249
12/3/12	338	3.58	0.072	0.215	0.322	0.393	0	0	0	0
12/4/12	339	3.58	0.072	0.215	0.322	0.393	0	0	0	0
12/5/12	340	6.71	0.134	0.402	0.604	0.738	0	0	0	0
12/6/12	341	4.47	0.089	0.268	0.402	0.492	0	0	0	0
12/7/12	342	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/8/12	343	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/9/12	344	3.58	0.072	0.215	0.322	0.393	0	0	0	0
12/10/12	345	4.47	0.089	0.268	0.402	0.492	0	0	0	0
12/11/12	346	8.05	0.161	0.483	0.724	0.885	0	0	0	0
12/12/12	347	7.15	0.143	0.429	0.644	0.787	0	0	0	0
12/13/12	348	5.36	0.107	0.322	0.483	0.590	0	0	0	0
12/14/12	349	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/15/12	350	5.36	0.107	0.322	0.483	0.590	0	0	0	0
12/16/12	351	8.05	0.161	0.483	0.724	0.885	0	0	0	0
12/17/12	352	7.60	0.152	0.456	0.684	0.836	0	0	0	0
12/18/12	353	9.83	0.197	0.590	0.885	1.082	0	0	0	0
12/19/12	354	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/20/12	355	9.83	0.197	0.590	0.885	1.082	0	0	0	0
12/21/12	356	11.62	0.232	0.697	1.046	1.279	0	0	0	5.421
12/22/12	357	9.39	0.188	0.563	0.845	1.033	0	0	0	0
12/23/12	358	12.96	0.259	0.778	1.167	1.426	0	0	1.296	13.084
12/24/12	359	4.47	0.089	0.268	0.402	0.492	0	0	0	0
12/25/12	360	8.05	0.161	0.483	0.724	0.885	0	0	0	0
12/26/12	361	9.83	0.197	0.590	0.885	1.082	0	0	0	0
12/27/12	362	3.13	0.063	0.188	0.282	0.344	0	0	0	0
12/28/12	363	4.47	0.089	0.268	0.402	0.492	0	0	0	0
12/29/12	364	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/30/12	365	4.02	0.080	0.241	0.362	0.443	0	0	0	0
12/31/12	366	4.02	0.080	0.241	0.362	0.443	0	0	0	0
					Sum:		0	0	8.7 g/m^2	155 g/m^2
					Pi x Area (Slag Heap North)		0	0	1,744 g	8,955 g
					Pi x Area (Slag Heap South)		0	0	4,699 g	24,129 g
					Pi x Area (Slag Heap 3 (gypsum))		0	0	1,380 g	7,083 g

Stockpile Wind Erosion – Maximum Day											
Based on worst-case shape B3 AP42 13.2.5 Industrial Wind Erosion											
Slag Heap 1 (Slag Heap South - GBFS)				Slag Heap 2 (Slag Heap North - GBFS)				Slag Heap 3 (Limestone / Gypsum)			
Area ID	u_s/u_r	%	Area (m^2)	Area ID	u_s/u_r	%	Area (m^2)	Area ID	u_s/u_r	%	Area (m^2)
A	1.1	4	5.33	A	1.1	4	5.33	A	1.1	4	0.70
B	0.9	14	18.67	B	0.9	14	18.67	B	0.9	14	2.44
C	0.6	54	72.00	C	0.6	54	72.00	C	0.6	54	9.43
D	0.2	28	37.33	D	0.2	28	37.33	D	0.2	28	4.89
		100	133.3			100	133.3			100	17.5
			Milestones 4-5								

Mitigation

Water Sprays – 90% Efficiency (AP42 Chapter 11-19 Sand & Gravel Processing Section 11-19.1.2 "Emissions And Controls")
3-Side Enclosure - Sierra Research, 2003 - Construction of 3-sided enclosures with 50% porosity – 75% Efficiency - Determined through modeling of open area windblown emissions with 50% reduction in wind speed and assuming no emission reduction when winds approach open side.
Combined water spray & 3-side enclosure – 97.5% Efficiency

Stockpile Wind Erosion – Maximum Day								
Slag Heap South (SHS) - GBFS			Slag Heap North (SHN) - GBFS			Slag Heap 3 – Limestone / Gypsum		
Maximum Day	1460.1	g / day	Maximum Day	3934.3	g / day	Maximum Day	1154.9	g / day
PM_{10}	730.1	g / day	PM_{10}	1967.2	g / day	PM_{10}	577.5	g / day
$PM_{2.5}$	109.5	g / day	$PM_{2.5}$	295.1	g / day	$PM_{2.5}$	86.6	g / day
Storage Piles Mitigation (90% watering of piles)			Storage Piles Mitigation (97.5% watering of piles & 3-sided enclosure)			Storage Piles Mitigation (97.5% watering of piles & 3-sided enclosure)		
PM_{10}	**73.0**	g / day	PM_{10}	**49.2**	g / day	PM_{10}	**14.4**	g / day
$PM_{2.5}$	**11.0**	g / day	$PM_{2.5}$	**7.4**	g / day	$PM_{2.5}$	**2.17**	g / day
Maximum 24-Hours								
Mass Emission			Mass Emission			Mass Emission		
PM_{10}	**0.161**	**lbs/day**	PM_{10}	**0.108**	**lbs/day**	PM_{10}	**0.032**	**lbs/day**
$PM_{2.5}$	**0.024**	**lbs/day**	$PM_{2.5}$	**0.016**	**lbs/day**	$PM_{2.5}$	**0.0048**	**lbs/day**

Maximum Day Mass Emission – S4 (Slag Heap South & Slag Heap South) Combined		
PM_{10}	**0.269**	**lbs/day**
$PM_{2.5}$	**0.040**	**lbs/day**
Maximum Day Mass Emission – S5 (Gypsum Slag Heap)		
PM_{10}	**0.032**	**lbs/day**
$PM_{2.5}$	**0.0048**	**lbs/day**

Stockpile Wind Erosion – Annual Mean								
Slag Heap South (SHS) - GBFS			**Slag Heap North (SHN) - GBFS**			**Slag Heap 3 – Limestone / Gypsum**		
Annual mean	10.70	Kg / year	**Annual mean**	28.78	Kg / year	**Annual mean**	8.46	Kg / year
PM_{10}	5.35	Kg / year	PM_{10}	14.39	Kg / year	PM_{10}	4.23	Kg / year
$PM_{2.5}$	0.803	Kg / year	$PM_{2.5}$	2.16	Kg / year	$PM_{2.5}$	0.63	Kg / year
Storage Piles Mitigation (90% watering of piles)			**Storage Piles Mitigation (97.5% watering of piles & 3-sided enclosure)**			**Storage Piles Mitigation (97.5% watering of piles & 3-sided enclosure)**		
PM_{10}	**0.535**	Kg / year	PM_{10}	**0.360**	Kg / year	PM_{10}	**0.106**	Kg / year
$PM_{2.5}$	**0.080**	Kg / year	$PM_{2.5}$	**0.054**	Kg / year	$PM_{2.5}$	**0.014**	Kg / year
Annual Mean								
Mass Emission			**Mass Emission**			**Mass Emission**		
PM_{10}	**0.000590**	**Tons / yr**	PM_{10}	**0.00040**	**Tons / yr**	PM_{10}	**0.00012**	**Tons / yr**
$PM_{2.5}$	**0.000088**	**Tons / yr**	$PM_{2.5}$	**0.000060**	**Tons / yr**	$PM_{2.5}$	**0.000015**	**Tons / yr**

Annual Mean Mass Emission – S4 (Slag Heap South & Slag Heap South) Combined		
PM_{10}	**0.00099**	**Tons / yr**
$PM_{2.5}$	**0.00015**	**Tons / yr**
Annual Mean Mass Emission – S5 (Gypsum Slag Heap)		
PM_{10}	**0.00012**	**Tons / yr**
$PM_{2.5}$	**0.000015**	**Tons / yr**

PM10 Raw Material Storage Areas – Mode 1 GBFS / Gypsum						
PM10	**tonnage**	**hours of operation**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1200	0.019	0.00016	0.00017	0.348
milestone 2	240000	2400	0.019	0.00016	0.00017	0.348
milestone 3	360000	3600	0.019	0.00032	0.00035	0.697
milestone 4	480000	4800	0.019	0.00047	0.00052	1.045
milestone 5	760000	7600	0.019	0.00063	0.0007	1.393
PM2.5 Raw Material Storage Areas – Mode 1 GBFS / Gypsum						
PM2.5	**tonnage**	**hours of operation**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1200	0.003	0.00002	0.00002	0.047
milestone 2	240000	2400	0.003	0.00004	0.00005	0.093
milestone 3	360000	3600	0.003	0.00006	0.00007	0.140
milestone 4	480000	4800	0.003	0.00008	0.00009	0.187
milestone 5	760000	7600	0.003	0.00013	0.0001	0.296

In addition to stockpile emissions from S-4, fugitive emissions will emanate from the stockpiles due to the uploading and dropping of material by the excavators and front loaders.

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Front Loader Upload (SHN) (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Front Loader Upload (SHN) (g/sec) = 0.00000123 (kg/Mg) x 50 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Front Loader Upload (SHN) (g/sec) = 0.0000171 g/sec

$PM_{2.5}$		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Day	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	Front Loader Upload (SHN)	n/a	50	0.0000171	24	1.480	0.00326
	Front Loader Upload (SHS)	n/a	50	0.0000171	24	1.480	0.00326
	Excavator Upload & Drop (SHN)	n/a	100	0.0000343	24	2.961	0.00653
	Excavator Upload & Drop (SHS)	n/a	100	0.0000343	24	2.961	0.00653
	Stockpiling Emissions (S-4)	n/a	n/a	n/a	n/a	18.1	0.040

		Sum	400	g/sec		27.0	0.060
			tonnes/hour			**g/day**	**lbs/day**

Front Loader Upload (SHN) (tons/yr) = Front Loader Upload (SHN) emission rate (g/sec) x 3600 sec/hr x hours of operation (hr)
Front Loader Upload (SHN) (tons/yr) = (0.0000171 g/sec x 3600 sec/hr x 7600 hr/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Front Loader Upload (SHN) (tons/yr) = (468.7 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Front Loader Upload (SHN) (tons/yr) = 0.000517 tons / annum

$PM_{2.5}$	**$PM_{2.5}$**	**GBFS**
	Emissions (g/yr)	**Emissions (tons/yr)**
Front Loader Upload (SHN)	468.7	0.000517
Front Loader Upload (SHS)	468.7	0.000517
Excavator Upload & Drop (SHN)	937.5	0.001033
Excavator Upload & Drop (SHS)	937.5	0.001033
Stockpiling Emissions (S-4)	134.2	0.000148
Sum (S-4)	2947	0.00325

In addition to stockpile emissions from S-5, fugitive emissions will emanate from the stockpiles due to the uploading of material by the front loaders.

$PM_{2.5}$		**tonnage / shipment**	**tonnage per hour**	**$PM_{2.5}$ emission rate**	**Hours Per Day**	**Emissions Per Day (g/day)**	**Gypsum Emissions per day (lbs/day)**
	Front Loader Upload (Gypsum)	n/a	3	1.03E-6	24	0.089	0.000196
	Stockpiling Emissions (S-4)	n/a	n/a	n/a	n/a	2.18	0.0048
		Sum	3	g/sec		2.27	0.0050
			tonnes/hour			**g/day**	**lbs/day**

$PM_{2.5}$	**$PM_{2.5}$**	**Gypsum**
	Emissions (g/yr)	**Emissions (tons/yr)**
Front Loader Upload (Gypsum)	28.1	0.000031
Stockpiling Emissions (S-4)	15.9	0.000017
Sum (S-4)	44.0	0.000049

S-5 Cement, Pozzolan, and Gypsum Stockpiles

Cement and clinker will not be stored in open stockpiles. Cement and clinker will be stored in the designated enclosed storage building. As these materials are naturally dry and hygroscopic, there is a need to enclose these stockpiles to prevent rainfall and atmospheric moisture damaging the product. The clinker stockpile will be managed as outlined below.

The clinker will be transported to the stockpile area by a covered belt and aspirated conveyor from the dockside. A bucket elevator will lift and discharge the clinker onto a horizontal belt conveyor which will run the length of the covered Raw Material Storage Building. The horizontal belt conveyor will be fitted with a travelling tripper which will allow the clinker to be discharged at sequential positions along the storage building floor to form a chevron stockpile with a maximum height of approximately 50 feet. The Raw Material Storage Building will be equipped with an air filtration system which will ensure that any particulate emissions created by either the stockpiling or reclaim process will be captured in the filters, and fugitive particulate emissions will be maintained within agreed permit limits, thereby allowing only clean air to leave the building.

Fugitive dust emissions will occur within the raw material storage building. A range of mitigation measures will be put in place to minimize these emissions including bag filtration and negative pressure as outlined in Table A1.1. Detailed emission calculations based on the engineering design associated with material handling are outlined below.

Potential Source of Emissions to Air	Operational Measure to Ensure Impacts are Minimised
Processing plant and material storage buildings	All air in contact with raw material or finished product, such as air from storage buildings, silos, elevators, is treated by bag filters or other types of filter prior to discharge to the atmosphere, with a not to exceed limit value of 2.5 mg/Nm^3 Note 1 (0.0011 grains/dscf) $PM_{2.5}$.
Truck filling with finished product	Filling takes place in an enclosed area, isolated from the external environment with air discharged through bag filter to atmosphere, with a not to exceed limit of 2.5 mg/Nm^3 Note 1 (0.0011 grains/dscf) $PM_{2.5}$.

Note 1 Normalised to 298K & 101.325kPa.

Table A1.1 Proposed Operational Mitigation Measures For Orcem

S-6 Mill Feed Hopper

Modes: Mode 1 and Mode 3

The emission calculations for S-6 are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for watering is based on the SCAQMD publication SCAQMD (2007) "*Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*".

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
$E = k(0.0016)*(U/2.2)^{1.3}/(M/2)^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837,748	tons/annum
Ships	40,000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Mill Feed Hopper (GBFS) (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Mill Feed Hopper (GBFS) (g/sec) = 0.00000123 (kg/Mg) x 100 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Mill Feed Hopper (GBFS) (g/sec) = 0.0000343 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Shipment	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	Mill Feed Hopper (GBFS)	n/a	100.0	0.0000343	24	2.96	0.0065
	Mill Feed Hopper (Gypsum)	n/a	3.0	0.000001	24	0.089	0.0002
	Elevator	n/a	103.0	0.0000344	24	3.05	0.0067
		Sum	206.0			7.10	0.0134
			tonnes/hour			**g/day**	**lbs/day**

Mill Feed Hopper (GBFS) (tons/yr) = Mill Feed Hopper (GBFS) emission rate (g/sec) x 3600 sec/hr x hours of operation (hr)
Mill Feed Hopper (GBFS) (tons/yr) = (0.0000343 g/sec x 3600 sec/hr x 7600 hr/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Mill Feed Hopper (GBFS)) (tons/yr) = (937.5 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Mill Feed Hopper (GBFS) (tons/yr) = 0.00103 tons / annum

PM2.5	PM2.5	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
Mill Feed Hopper (GBFS)	937.5	0.00103
Mill Feed Hopper (Gypsum)	28.1	3.1E-05
Elevator	965.6	0.00106
Sum	1,931	0.00213

S-7 GBFS Silo

The emission calculations for S-7 are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for watering is based on the SCAQMD publication SCAQMD (2007) "*Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*".

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
$E= k(0.0016)*(U/2.2)^{1.3}/(M/2)^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837748	tons/annum
Ships	40000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

GBFS Silo (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
GBFS Silo (g/sec) = 0.00000123 (kg/Mg) x 100 (Mg/hr) x 1000 g/kg / 3600 sec/hr
GBFS Silo (g/sec) = 0.0000343 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Shipment	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	GBFS Silo	n/a	100.0	0.0000343	24	2.96	0.0065
			tonnes/hour			**g/day**	**lbs/day**

GBFS Silo (tons/yr) = GBFS Silo emission rate (g/sec) x 3600 sec/hr x hours of operation (hr)
GBFS Silo (tons/yr) = (0.0000343 g/sec x 3600 sec/hr x 7600 hr/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
GBFS Silo (tons/yr) = (937.5 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
GBFS Silo (tons/yr) = 0.00103 tons / annum

PM2.5	PM2.5	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
GBFS Silo	937.5	0.00103

S-8 Gypsum Silo

The emission calculations for S-8 are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for watering is based on the SCAQMD publication SCAQMD (2007) "*Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*".

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
$E= k(0.0016)*(U/2.2)^{1.3}/(M/2)^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837748	tons/annum
Ships	40000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Gypsum Silo (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Gypsum Silo (g/sec) = 0.00000123 (kg/Mg) x 3 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Gypsum Silo (g/sec) = 0.0000010 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Day	Emissions Per Day (g/day)	Gypsum Emissions per day (lbs/day)
	Gypsum Silo	n/a	3.0	0.0000010	24	0.089	0.0002
			tonnes/hour			g/day	lbs/day

Gypsum Silo (tons/yr) = Gypsum Silo emission rate (g/sec) x 3600 sec/hr x hours of operation (hr)
Gypsum Silo (tons/yr) = (0.0000010 g/sec x 3600 sec/hr x 7600 hr/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Gypsum Silo (tons/yr) = (28.1 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Gypsum Silo (tons/yr) = 0.000031 tons / annum

PM2.5	PM2.5	Gypsum
	Emissions (g/yr)	Emissions (tons/yr)
Gypsum Silo	28.1	3.10E-5

S-9 Mill Feed Conveyor

The emission calculations for S-9 are based on AP-42 Section 13.2.4 "*Aggregate Handling And Storage Piles*". The control efficiency applied for watering is based on the SCAQMD publication SCAQMD (2007) "*Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*".

Material Handling - (Conveyors / Hopper Loading Raw Materials)				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
E= k(0.0016)*(U/2.2)$^{1.3}$/(M/2)$^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	7	7	Analysis of material (GBFS)
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000163	0.000025	Calculation
Control Efficiency for Watering / Covered Conveyor	Factor	0.95	0.95	SCAQMD (2007) *Particulate Matter (PM) Emission Factors For Processes/Equipment at Asphalt, Cement, Concrete and Aggregate Product Plants June 2007*
Controlled Emission factor, E	**kg/Mg**	**0.0000081**	**0.0000012**	

Milestone 5		
Tonnage Unloaded	**760,000**	metric tonnes/annum
Ton Unloaded	837,748	tons/annum
Ships	40,000	metric tonnes capacity
Frequency	19	trips per year
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.5	days (based on 24 hour day)

Unloading Capacity	303.0	tonnes/hour	(average)
Mill Capacity	100.0	tonnes/hour	(maximum)

$PM_{2.5}$ Sample Calculation – Material Handling (*Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)*)

Mill Feed Conveyor Drop (g/sec) = material handling emission rate (kg/Mg) x tonnage per hour (Mg/hr) x 1000 g/kg / 3600 sec/hr
Mill Feed Conveyor Drop (g/sec) = 0.00000123 (kg/Mg) x 103 (Mg/hr) x 1000 g/kg / 3600 sec/hr
Mill Feed Conveyor Drop (g/sec) = 0.0000352 g/sec

PM2.5		tonnage / shipment	tonnage per hour	$PM_{2.5}$ emission rate	Hours Per Shipment	Emissions Per Day (g/day)	GBFS Emissions per day (lbs/day)
	GBFS Silo Drop	n/a	100.0	0.0000343	24	2.96	0.0065
	Gypsum Silo Drop	n/a	3.0	0.000001	24	0.089	0.0002
	Mill Feed Conveyor Drop	n/a	103.0	0.000035	24	3.05	0.0067
		Sum	206.0	0.000070		6.10	0.0134
			tonnes/hour			**g/day**	**lbs/day**

Mill Feed Conveyor Drop (tons/yr) = Mill Feed Conveyor Drop emission rate (g/sec) x 3600 sec/hr x hours of operation (hr)
Mill Feed Conveyor Drop (tons/yr) = (0.0000352 g/sec x 3600 sec/hr x 7600 hr/yr / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Mill Feed Conveyor Drop (tons/yr) = (965.6 g/yr) / 1000000 (g/tonnes)) * 1.1023 (tons/tonne)
Mill Feed Conveyor Drop (tons/yr) = 0.001084 tons / annum

PM2.5	PM2.5	GBFS
	Emissions (g/yr)	**Emissions (tons/yr)**
GBFS Silo Drop	937.5	0.001053
Gypsum Silo Drop	28.1	3.16E-05
Mill Feed Conveyor Drop	965.6	0.001084
Sum	965.6	0.002169

S-10 Vertical Roller Mill, 100 tons/hr, abated by A-1, Main Bag Filter
S-11 Hot Gas Generator, natural gas fired, 34.3 MMBTU/hr

The proposed project will use a Vertical Roller Mill (VRM) (S-10). Raw material is fed to the VRM via an airlock and onto the center of a rotating grinding table. The raw material is thrown outward and under heavy steel rollers riding over the table by centrifugal force. A dam ring on the periphery of the grinding table contains the material and helps form it into a layer or "bed". The steel rollers are coupled to high pressure hydraulic arms to forcefully pull the rollers onto the grinding table to grind the bed of raw material to fine powder.

The milling process requires high flow of air (approximately 4,400,000 cubic feet per hour) to pass through the mill. As a result, the material within the mill is subject to a high velocity airflow, which passes up, around and over the grinding table. The airflow's primary function is to lift ground material particles from the table and convey them into an internal particle size classifier, aka high efficiency separator. This internal high efficiency separator classifies the incoming particles into two streams: (a) one stream of particles sufficiently small to meet the finished product specification passes through the separator with the air flow and leaves the mill; and (b) another stream of oversize particles, which is diverted back down to the grinding table for additional processing.

The GBFS will enter the mill with a moisture content of between 6% and 12%, but to properly store and transport the finished GGBFS product the material must be dried to a moisture content of less than 0.2% H_2O. The high volume of air required for the milling process of the VRM is also very effective at simultaneously drying the material being processed; however, when processing materials with especially high moisture content, such as GBFS, additional heat is often required to complete the drying process. In this project the additional heat will be supplied by a natural gas fired Hot Air Generator (HGG) (S-11) which will preheat the air coming into the VRM to a temperature sufficient to evaporate the excess GBFS moisture during milling.

Emissions of NO_X, SO_2, CO, TOC (assumed to be equivalent to POC as a worst-case), PM_{10} and $PM_{2.5}$ to the atmosphere from the Hot Air Generator (S-11) will be released via a 50m stack. The emission rates were calculated based on vendor data and default USEPA AP-42 emission rates and additional conservative assumptions related to emission variability as outlined in Tables A1-2 and A1-3. In accordance with BAAQMD Regulation 2-2-301, BACT is triggered if NO_X, PM_{10}, CO, SO_2, POC or NPOC exceed 10 pounds per day. Estimations of emissions indicate that BACT will be required for the emissions of NO_X and CO, both of which originate from the Hot Air Generator (S-11) as outlined in Table A1-3. The VRM will introduce addition emissions of PM_{10} and $PM_{2.5}$ which will be abated by the Main Bag Filter (A-1). The concentration of PM_{10} / $PM_{2.5}$ in Table A1-3 is the sum of the emissions from both the Vertical Roller Mill (S-10) and the Hot Gas Generator (S-11) which is then abated by the Main Bag Filter (A-1) prior to discharge to atmosphere via emission point P-1 (Main Stack). PM_{10} and $PM_{2.5}$ emissions used in the air dispersion modelling study were an upper estimate based on natural gas combustion in the Hot Gas Generator as outlined in AP42 (Section 1.4). The PM_{10} / $PM_{2.5}$ levels from the Hot Gas Generator will combine with additional PM_{10} / $PM_{2.5}$ emissions from the Vertical Roller Mill prior to abatement via the Main Bag Filter. The Main Bag Filter will operate to BACT and will have an upper post-abatement concentration for PM_{10} / $PM_{2.5}$ of 2.5 mg/Nm^3 (0.0011 gs/dscf). Thus, in reality, post-abatement PM_{10} / $PM_{2.5}$ emissions will be significantly less than 10 lbs/maximum day.

In relation to NO_X emissions from the plant, a detailed examination of BACT was undertaken in consultation with specialist suppliers. BACT was identified for this particular process as equivalent to a NO_X emission limit of 30 ppm at 3% O_2. In the absence of BACT, the stack would be likely to emit in the region of 150 ppm at 3% O_2, and thus the emission savings associated with the employment of BACT for the Hot Gas Generator is of the order of 22 tons/yr. It should be understood that consistent with BAAQMD requirements, BACT has been applied as an integral component of the engineering design of this Project by operation of law, and is therefore not a "mitigation measure".

Normalised Volume Flow	**11,784**	**Nm^3/hr**
Normalised Moisture Content	0	%
Normalised Oxygen Content	3	%
Normalised Temperature	298.15	K
Actual Temperature	381.05	K
Formula	$Volume\ Flow\ (Actual\ Temp) = Volume\ Flow\ (STP)\frac{Temp\ (Actual)}{Temp\ (STP)}$	m^3/hr
	$Volume\ Flow\ (Actual\ Temp) = 11{,}784 * \frac{381.05}{298.15} = \boldsymbol{15{,}060\ m^3/hr}$	m^3/hr
Actual Moisture	31.55	$\%H_2O$
Formula	$Volume\ Flow\ (Actual\ Moisture) = Volume\ Flow\ (Actual\ Temp) * \frac{(100)}{(100 - 31.55)}$	m^3/hr
	$Volume\ Flow\ (Actual\ Moisture) = 15060 * \frac{100}{68.45} = \boldsymbol{22{,}002\ m3/hr}$	m^3/hr
Actual Oxygen (before moisture correct)	11.09 % $\boldsymbol{O2}$	$\%O_2$
Actual Oxygen (after moisture correct)	$Actual\ Moisture\ (After\ Oxygen\ Correction) = 11.09 * \frac{100}{68.45} = \boldsymbol{16.2\ \%\ O2}$	$\%O_2$
Formula	$Volume\ Flow\ (Actual\ Oxygen) = Volume\ Flow\ (Actual\ Temp, Moisture) * \frac{(20.9 - 3)}{(20.9 - 16.2)}$	m^3/hr
Actual Volume Flow	$Volume\ Flow\ (Actual\ Oxygen) = 22{,}000 * \frac{17.9}{4.7} = \boldsymbol{83{,}800\ m3/hr}$	m^3/hr
Actual Exit Velocity	$= \frac{83800 m3/hr}{3600 s/hr * 3.14\ m2} = \boldsymbol{7.41\ m/s}$	m/s

Note 1 It is assumed that pressure differences are insignificant and have not been included in the calculation.

Table A1-2 Orcem P-1 Main Stack Process Emission Details (Abated By A-1 Main Bag Filter)

Orcem P-1 (Main Stack) Normalized To 298K	Conc. (ppm at 3% O_2)	Conc. (mg/Nm^3)	Duct Diameter (m)	surface area (m^2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emissions		
												lb/hr	lb/day	tons/yr
NO_X (as NO_2)	30.0	56.6	2.00	3.142	381.05	1.33	1.04	11784	0.667	667	0.185	1.47	**35.3**	5.59
SO_2 Note 1	0.77	2.0	2.00	3.142	381.05	1.33	1.04	11784	0.02	24	0.007	0.052	1.26	0.20
CO	100	114	2.00	3.142	381.05	1.33	1.04	11784	1.35	1349	0.375	2.98	71.4	11.3
PM_{10} Note 2	N/A	2.5	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	0.0082	0.065	1.56	0.247
$PM_{2.5}$ Note 2	N/A	2.5	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	0.0082	0.065	1.56	0.247
POC Note 1,3	31.6	15.5	2.00	3.142	381.05	1.33	1.04	11784	0.18	183	0.051	0.40	9.7	1.53

Note 1 SO_2 & POC Emission rate taken from default values given in AP42 Chapter 1.4 “Natural Gas Combustion”.

Note 2 The PM_{10} / $PM_{2.5}$ levels from the Hot Gas Generator will mix with additional PM_{10} / $PM_{2.5}$ emissions from the Vertical Roller Mill prior to abatement via the Main Bag Filter. The Main Bag Filter will operate to BACT and will have an upper post-abatement concentration for PM_{10} / $PM_{2.5}$ of 2.5 mg/Nm^3 (0.0011 gs/dscf).

Note 3 POC assumed equivalent to ROG

Table A1-3 Orcem P-1 Main Stack Process Emission Details (Abated By A-1 Main Bag Filter)

S-12 GGBFS Silo 1, abated by A-3
S-13 GGBFS Silo 2, abated by A-4
S-16 GGBFS Silo 3, abated by A-7

The finished product collected in the main bag filter is transported by an enclosed air-slide conveyor to a bucket elevator which lifts the product and discharges it to the product Storage Silos (S-12, S-13 and S-16). The finished product will be stored in three (3) large sealed finished product Storage Silos, each with a capacity of up to 4,000 tons. These Storage Silos will hold the various finished products prior to transport to the Loading Silos. Each silo will be up to 46 feet in diameter and approximately 140 feet in height.

As shown in Table A1-4, S-12, S-13 and S-16 have maximum daily emission levels of 0.30, 0.066 and 0.066 lbs/day respectively which are less than the BACT trigger level of 10 lbs/day.

Orcem Source / Abatement Unit / Emission Point	PM_{10} / $PM_{2.5}$ Conc. (mg/Nm^3)	Duct Diameter (m)	surface area (m^2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	PM_{10} / $PM_{2.5}$ Emissions		
											lb/hr	lb/day	tons/yr
S-12 GGBFS Silo1 / A-3 / P-3	2.5 Note 1	0.30	0.0707	343.15	11.4	9.0	2301	0.0058	5.75	0.0016	0.013	0.30	0.048
S-13 GGBFS Silo1 / A-4 / P-4	2.5 Note 1	0.30	0.0707	343.15	2.4	1.9	495	0.0012	1.24	0.00034	0.0027	0.066	0.010
S-16 GGBFS Silo1 / A-7 / P-7	2.5 Note 1	0.30	0.0707	343.15	2.4	1.9	495	0.0012	1.24	0.00034	0.0027	0.066	0.010

Note 1 Emission rate of 2.5 mg/Nm^3 is a manufacturer guarantee for maximum concentration at the baghouse.

Table A1-4 Orcem P3, P4 and P7 Bag Filter PM_{10} / $PM_{2.5}$ Process Emission Details (Abated By A-2, A-3 and A-4 Bag Filters)

PM_{10} / $PM_{2.5}$ Sample Calculation

S-12 GGBFS Silo 1 (g/sec) = PM_{10} / $PM_{2.5}$ emission rate (mg/Nm^3) x volume flow (Nm^3/hr) / (1000 mg/g * 3600 sec/hr)
S-12 GGBFS Silo 1 (g/sec) = 2.5 mg/Nm^3 x 2301 Nm^3/hr / (1000 mg/g * 3600 sec/hr)
S-12 GGBFS Silo 1 (g/sec) = 0.00160 g/sec
S-12 GGBFS Silo 1 (lbs/day) = 0.00160 g/sec x 0.002205 lbs/g x 24 hr/day x 3600 g/hr
S-12 GGBFS Silo 1 (lbs/day) = 0.30 lbs/day PM_{10} / $PM_{2.5}$

S-14 Railcar Loading from Silo 1, abated by A-5
S-15 Railcar Loading from Silo 2, abated by A-6
S-17 Railcar Loading from Silo 3, abated by A-8

Finished Product Out - Loading System

The bottoms of the large finished product Storage Silos are aerated to fluidize (the process of converting granular material from a static solid-like state to a dynamic fluid-like state) the finished product powder for discharge. When the finished product is withdrawn from the Storage Silos it is transported in enclosed conveyor systems into smaller Loading Silos of approximately 80 ton capacity each for loading of tanker trucks and rail tankers (via tanker truck transfer).

There will be initially two (2) Loading Silos (S-14 and S-15) configured at the Outload Building for loading of tanker trucks with an ultimate plan to install a third Loading Silo (S-17) on full build out. Each Loading Silo will have its own below-ground weighbridges to monitor truck weight as they are loaded. The road transport vehicles will be tractor trailer configurations, with standard tractors and single or double pneumatic dry bulk tank trailers. The tank trailers are sealed and have loading hatches on top. In order to load the trailers with product, the hatches will be opened, and loading bellows will descend and their nozzle(s) will seal onto the tanks to be loaded. A computer controlled filling system will be activated and the tankers will be loaded to the desired level by the control system monitoring the weighbridge. After the loading process is complete, a bill of lading will be printed for the driver to document that all tanker trucks leave the plant with the prescribed load on board.

Rail tanker cars will be served from the filling facility via tanker truck transfer using the upgraded and realigned California Northern rail spur line which currently extends into the adjoining VMT Site, running parallel to Orcem's westerly boundary. Rail tanker cars will be loaded at a location just north of the Orcem Site boundary.

As shown in Table A1-5, S-14, S-15 and S-17 have maximum daily emission levels of 0.237, 0.237 and 0.237 lbs/day respectively which are less than the BACT trigger level of 10 lbs/day.

Orcem Source / Abatement Unit / Emission Point	PM_{10} / $PM_{2.5}$ Conc. (mg/Nm^3)	Duct Diameter (m)	surface area (m^2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emissions		
											lb/hr	lb/day	tons/yr
S-14 GGBFS Unloading Silo1 / A-5 / P-5	2.5 Note 1	0.30	0.0707	343.15	8.6	7.0	1793	0.0045	4.5	0.0013	0.010	0.237	0.038
S-15 GGBFS Silo1 / A-6 / P-6	2.5 Note 1	0.30	0.0707	343.15	8.6	7.0	1793	0.0045	4.5	0.0013	0.010	0.237	0.038
S-17 GGBFS Silo1 / A-8 / P-8	2.5 Note 1	0.30	0.0707	343.15	8.6	7.0	1793	0.0045	4.5	0.0013	0.010	0.237	0.038

Note 1 Emission rate of 2.5 mg/Nm^3 is a manufacturer guarantee for maximum concentration at the baghouse.

Table A1-5 Orcem P5, P6 and P8 Bag Filter PM_{10} / $PM_{2.5}$ Process Emission Details (Abated By A-5, A-6 and A-8 Bag Filters)

PM_{10} / $PM_{2.5}$ Sample Calculation

S-14 GGBFS Unloading Silo 1 (g/sec) = PM_{10} / $PM_{2.5}$ emission rate (mg/Nm^3) x volume flow (Nm^3/hr) / (1000 mg/g * 3600 sec/hr)
S-14 GGBFS Unloading Silo 1 (g/sec) = 2.5 mg/Nm^3 x 1793 Nm^3/hr / (1000 mg/g * 3600 sec/hr)
S-14 GGBFS Unloading Silo 1 (g/sec) = 0.00125 g/sec
S-14 GGBFS Unloading Silo 1 (lbs/day) = 0.00125 g/sec x 0.002205 lbs/g x 24 hr/day x 3600 g/hr
S-14 GGBFS Unloading Silo 1 (lbs/day) = 0.237 lbs/day PM_{10} / $PM_{2.5}$

S-18 Raw Material Storage Building, Abated by A-2

Clinker will be transported to the Raw Material Storage Building area by covered belt conveyor from the dockside. A bucket elevator will lift and discharge the clinker on to a horizontal belt conveyor which will run the length of the covered Raw Material Storage Building. The horizontal belt conveyor will be fitted with a travelling tripper which will allow the clinker to be discharged at sequential positions along the storage building floor to form a chevron stockpile with a maximum height of approximately 50 feet. The Raw Material Storage Building will be equipped with an air filtration system which will ensure that any particulate emissions created by either the stockpiling or reclaim process will be captured in the bag filter (A-2), and fugitive particulate emissions will be maintained within agreed permit limits, thereby allowing only clean air to leave the building.

As shown in Table A1-6, S-18 will have a maximum daily emission level of 4.63 lbs/day which is less than the BACT trigger level of 10 lbs/day.

Orcem Source / Abatement Unit / Emission Point	PM_{10} / $PM_{2.5}$ Conc. (mg/Nm^3)	Duct Diameter (m)	surface area (m^2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	PM_{10} / $PM_{2.5}$ Emissions		
											lb/hr	lb/day	tons/yr
S-18 Raw Material Storage Building / A-2 / P-2	2.5 Note 1	0.75	0.442	298.15	22.0	22.0	35,000	0.0875	87.5	0.0243	0.193	4.63	0.73

Note 1 Emission rate of 2.5 mg/Nm^3 is a manufacturer guarantee for maximum concentration at the baghouse.

Table A1-6 Orcem P5, P6 and P8 Bag Filter PM_{10} / $PM_{2.5}$ Process Emission Details (Abated By A-5, A-6 and A-8 Bag Filters)

PM_{10} / $PM_{2.5}$ Sample Calculation

S-18 Raw Material Storage Building (g/sec) = PM_{10} / $PM_{2.5}$ emission rate (mg/Nm^3) x volume flow (Nm^3/hr) / (1000 mg/g * 3600 sec/hr)
S-18 Raw Material Storage Building (g/sec) = 2.5 mg/Nm^3 x 35000 Nm^3/hr / (1000 mg/g * 3600 sec/hr)
S-18 Raw Material Storage Building (g/sec) = 0.0243 g/sec
S-18 Raw Material Storage Building (lbs/day) = 0.0243 g/sec x 0.002205 lbs/g x 24 hr/day x 3600 g/hr
S-18 Raw Material Storage Building (lbs/day) = 4.63 lbs/day PM_{10} / $PM_{2.5}$

VMT Material Handling Emission Inventory

Material Handling - (Conveyors / Hopper Loading Raw Materials) - VMT				
Aggregate Handling And Storage Piles (Chapter 13.2.4 AP42 Dated 11/2006)				
E= k(0.0016)*(U/2.2)$^{1.3}$/(M/2)$^{1.4}$ kg/Mg				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Material Moisture Content	%	5	5	Analysis of material
Mean Wind Speed	m/s	3.28	3.28	CPRodeo Average 2007-12
Constant, k		0.35	0.053	AP42 Table 13.2.4-2
Uncontrolled Emission factor, E	kg/Mg	0.000261	0.000040	Calculation
Control Efficiency for Watering	Factor	0.95	0.95	SCAQMD (2007)
Controlled Emission factor, E	**kg/Mg**	**0.00001305**	**0.0000020**	

			Annual Tonnage				Trucks	Trucks	Rail	Barge
Phase	**Annual Tonnage**	**Annual Ships**	**Trans**	**Truck**	**Rail**	**Barge**	**Daily**	**Hourly**	**Number/ Yr**	**Number/ Yr**
Phase 1 Trucks Only	480,000	12		480000			1667	69.4	0	0
Phase 1 Trucks & Rail	720,000	18		240000	480000		833	34.7	52.9	0
Phase 1 Alternative	1,350,000	34		480000	870000		1667	69.4	95.9	0
Phase 2	1,160,000	29	217500	214,400	366000	579600	744	31.0	40.3	41.4
Phase 2 Alternative	1,160,000	29	217500	310400	770400	79200	1077.8	44.9	84.9	12.0
	tonnes			tonnes	tonnes	tonnes	tonnes	tonnes		

Phase 1 Alternative		
Tonnage Unloaded	**1,160,000**	metric tonnes/annum
Ton Unloaded	1278668	tons/annum
Ships	40000	metric tonnes capacity
Frequency	29	trips per year
Truck Capacity	18.14	metric tonnes
Unloading	303.0	metric tonnes/hr
Hours per ship	132.0	hours
Days per ship	5.50	days (based on 24 hour day)

Hours Of Operation	5760	per year
Truck Loading	25867	tonnes per month
Truck Loading	53.89	tonnes per hour
Rail Loading	64200	tonnes per month
Rail Loading (in one day)	9072	tonnes per day
Barge Loading	6600	tonnes per month
Barge Loading (per hour)	275.0	tonnes per hour
Trans Loading	7500	tonnes per month
Trans Loading (per hour)	156.3	tonnes per hour

PM2.5							
Phase	**Annual Tonnage**	**Annual Ships**	**Trans**	**Truck**	**Rail**	**Barge**	**Total**
Phase 1 Trucks Only	480000	12		1.90			**1.90**
Phase 1 Trucks & Rail	720000	18		0.95	2.85		**3.79**
Phase 1 Alternative	1350000	34		1.90	5.16		**7.05**
Phase 2	1,160,000	29	0.86	0.85	2.17	3.44	**7.31**
Phase 2 Alternative	**1,160,000**	29	0.86	1.23	4.57	0.47	**7.12**
	tonnes		**kg**	**kg**	**kg**	**kg**	**kg**

$PM_{2.5}$ – Drop Points		tonnage / shipment	tonnage per hour	PM2.5 emission rate (g/s)	Hours Per Shipment	Emissions Per Day (g/day)	Emissions Per Shipment (g)	Emissions Per Hour (g/hr)	Emissions Per Year (g/yr)
Phase 2 - Ship unloading (assumes all unloading in Phase 1)	ship upload 1	20000	151.5	0.0000831	132.0	7.2	39.5		1145.9
	ship upload 2	20000	151.5	0.0000831	132.0	7.2	39.5		1145.9
	mobile hopper 1	40000	303.0	0.0001663	132.0	14.4	79.0		2291.9
	mobile hopper 2	40000	303.0	0.0001663	132.0	14.4	79.0		2291.9
	mobile hopper 3	20000	151.5	0.0000831	132.0	7.2	39.5		1145.9
	mobile hopper 4	13333	101.0	0.0000554	132.0	4.8	26.3		764.0
	mobile hopper 5	13333	101.0	0.0000554	132.0	4.8	26.3		764.0
	mobile hopper 6	13333	101.0	0.0000554	132.0	4.8	26.3		764.0
	mobile hopper 7	13333	101.0	0.0000554	132.0	4.8	26.3		764.0
Phase 2 - Transloading from Phase 1 to 2 to facilitate barge loading (assumed 7500 tonnes per shipment over 2 days)	mobile hopper 8	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
	mobile hopper 9	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
	mobile hopper 10	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
	mobile hopper 11	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
	mobile hopper 12	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
	mobile hopper 13	7500	156.3	0.0000858	48.0	7.4	14.8		429.7
Phase 2 (truck / transloading loading, barge loading and rail loading not occurring on same day)	front loading truck upload 1		53.9	0.000030				0.106	613.3
	front loading transloading upload		312.5	0.000172				0.617	859.5
	front loading truck drop1		53.9	0.000030				0.106	613.3
	front loading transloading drop		312.5	0.000172				0.617	859.5
	front loader rail loading		378.0	0.000207				0.747	1718.9
	front loader rail drop		378.0	0.000207				0.747	1718.9
	rail drop		378.0	0.000207				0.747	1718.9
	front loader barge loading		275.0	0.000151				0.543	156.5
	front loader barge drop		275.0	0.000151				0.543	156.5
	barge drop		275.0	0.000151				0.543	156.5

				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	Shipments	Hours Of Operation	g/day shipment	g/shipment	g/hr worst-case day	lbs/worst-case day	MTPA (shipments)	MTPA (Material Handling)	tpa	lbs/year
Phase 1 Trucks Only	480000	12	5760	69.4	382.0	0.21	0.164	0.005	0.0019	0.01	14.3
Phase 1 Trucks & Rail	720000	18	5760	69.4	382.0	0.21	0.164	0.007	0.0038	0.01	23.5
Phase 1 Alternative	1350000	34	5760	69.4	382.0	0.21	0.164	0.013	0.0071	0.02	44.2
Phase 2	1,160,000	29	5760	69.4	382.0	0.21	0.164	0.011	0.0073	0.02	40.5
Phase 2 Alternative	1,160,000	29	5760	69.4	382.0	0.21	0.164	0.011	0.0071	0.02	40.1

Shipping – Orcem / VMT Emission Inventory Assumptions

Assumptions	
Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 59104m of transit prior to reduced speed transit for 1.7km and maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Assumption	Orcem Mode 1 Milestone 5		VMT Phase 2
Visits Per Year	19	visits	29
Hours Per Visit	138	hrs	138
Ship Capacity	40000	metric tonne	40000
Hotelling Time	132	hrs	132
Hotelling Time (Highest Day)	20.82	hrs	20.82
Transit & Maneuvering Time	6	hours (roundtrip)	6
Transit distance assessed (>3km)	59104	metres	59104
Transit Distance (within 3km)	1700	metres	1700
Maneurvering Distance	1300	metres	1300

Bulk Emission Details (CARB (2011) Appendix D)			
	knots	miles/hr	m/s
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuvering Inward speed	5	5.75	2.57
Maneuvering Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auxiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	

Maximum Handymax speed	15.0	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46 (PM10/PM2.5), 2.42 (NOX), 5.34 (CO), 2.18 (SO2), ROG (8.90)	Load Factor - 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36 (PM10/PM2.5), 1.21 (NOX), 1.93 (CO), 1.25 (SO2), ROG (2.15)	Load Factor - 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061 (POLA (2013))		
Maneuvering	0.275 (POLA (2013))		
Transit	0.104 (POLA (2013))		

PM_{10} / PM2.5 Shipping Emission Calculations

Source: (CARB (2011))

Main Engine

Transit

Engine Speed	Fuel	PM10	PM2.5	NO2	CO	SO2	ROG
Average	Marine Distillate (0.1% S)	0.250	0.244	13.75	1.38	0.351	0.687
		g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr

Engine Speed	Fuel	PM10	PM2.5	NO2	CO	SO2	ROG
Tugs / ME	Marine Distillate (0.1% S)	0.162	0.149	5.197	4.245	0.00595	0.588
Tugs / AE	Marine Distillate (0.1% S)	0.200	0.184	5.286	4.241	0.00595	0.872
		g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr

Auxiliary Engine

Engine Speed	Fuel	PM10	PM2.5	NO2	CO	SO2	ROG
Average	Marine Distillate (0.1% S)	0.250	0.230	10.53	1.10	0.399	0.520
		g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr

	Fuel	PM10	PM2.5	NO2	CO	SO2	ROG
Boiler / Average	Marine Distillate (0.1% S)	0.133	0.130	1.995	0.200	1.501	0.110
		g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr	g/kW-Hr

Transit			Time (hrs)	Distance	Speed (inwards)	Speed (outwards)							Emission Rate/Source	Emission Rate/Source (24-Hr Mean)
Main engine	975	g/hr	2.66	59104	6.17	6.17								
	0.271	g/sec	hrs	m	m/s	m/s							PM2.5	PM2.5
							Combined Emission Rate		AERMOD Volume sources	Spacing	Distance	Spacing	Transit Emission Rate	Transit Emission Rate
Auxiliary engine	59	g/hr	2.66	59104	6.17	6.17	0.287	g/s	65	50	3250	526.5	0.000646	2.69E-05
	0.016	g/sec	hrs	m	m/s	m/s				m	m	sec	g/s	g/s
Transit (within 3km of port)			Time	Distance	Speed	Speed								
			(hrs)	(3km to port))	(inwards)	(outwards)								
Main engine	264	g/hr	0.13	1700	3.60	3.60								
	0.073	g/sec	hrs	m	m/s	m/s							PM2.5	PM2.5
							Combined Emission Rate		AERMOD Volume sources	Spacing	Distance	Time	Transit Emission Rate	Transit Emission Rate
Auxiliary engine	59	g/hr	0.13	1700	3.60	3.60	0.090	g/s	34	50	1700	472.1	0.000346	1.44E-05
	0.016	g/sec	hrs	m	m/s	m/s				m	m	sec	g/s	g/s

Maneuvering			Time (hrs)	Distance	Speed (inwards)	Speed (outwards)												
PM2.5																		
Main engine (inward)	244	g/hr	0.39	1300	2.57													
	0.068	g/s	hrs	m	m/s													
Main engine (outward)	264	g/hr	0.35	1300		3.60												
	0.073	g/s	hrs	m		m/s												
Auxiliary engine	156	g/hr		1300	2.57	3.60										24-Hour Average		
	0.043	g/s		m	m/s	m/s	Emission Rate						Maneuvering			Maneuvering		
							Inwards		AERMOD Volume sources	Spacing	Distance	Time	Inward	Outward	Average	Inward	Outward	Average
Boiler	14	g/hr		1300	2.57	3.60	0.115	g/s	26	50	1300	1405	0.00173	0.00162	0.00167	7.19E-05	6.76E-05	6.98E-05
	0.004	g/s		m	m/s	m/s	Outwards			m	m	sec	g/s	g/s	g/s	g/s	g/s	g/s
							0.120	g/s	26	50	1300	1261						

Hoteling	PM2.5	Hours	Hoteling	AERMOD Point sources
Auxiliary Engine	35 g/hr	132 hrs	0.0096 g/sec	1
Boiler	14 g/hr	132 hrs	0.0039 g/sec	1

TUGS - Main Engines		
In relation to the main engines likely to be used for the tugs escorting the Handymax bulk carrier (40,000 mtonnes) into port, the following assumptions were made:		
• 2172 hp was assumed as the rated horsepower of each of the two main engines. • The emission factor for a 4344 hp tug is assumed to be as follows:		
Thus, for PM2.5:		
Main Engine Emissions	=	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr
HP (2172 hp x 2)	=	4344
Fuel Correction Factor	=	N/A
Main Engine Emissions	=	0.0556 g/sec

Auxiliary Engine		
In relation to the auxiliary engine likely to be used for the tugs escorting the Handymax bulk carrier (40,000 mtonnes) into port, the following assumptions were made:		
• 128 hp was assumed as the rated horsepower of the auxiliary engine. • The emission actor for a 128hp tug is assumed to be as follows:		
Thus, for PM2.5:		
Auxiliary Engine Emissions	=	EF_0 x F x (1 + D x A/DL) x HP x LF x Hr
Fuel Correction Factor	=	N/A
HP (256 hp x 2)	=	256
Auxiliary Engine Emissions	=	0.00563 g/s

Tugs – Ship Assist											Combined PM2.5 Emission			24-Hour Average PM2.5		
	Emission Rate	Time	Distance	Speed inward	Speed outward	Combined Emission Rate	AERMOD Volume sources	Spacing	Distance	Time	Inward	Outward	Average	Inward	Outward	Average
Main Engine	200	0.39	1300	2.57	3.60	0.061	26	50	1300	1405	0.00092		0.00087	3.83E-05		3.63E-05
	g/hr	hrs	m	m/s	m/s	g/s		m	m	sec	g/s	g/s	g/s	g/s	g/s	g/s
							26	50	1300	1261		0.00083			3.44E-05	
Auxiliary	20.3 g/hr	0.390	1300	2.57	3.60											

Orcem Inc.			Highest Day	Highest Day				
Shipping			PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
Based on 59 kms from site	tonnage	ships per year	g/day	lbs/day	g/2-way trip	mtonne/yr	tpa	lbs/year
Transit	120000	3.0	2750	6.1	5499	0.02	0.02	36
Transit	240000	6.0	2750	6.1	5499	0.03	0.04	73
Transit	360000	9.0	2750	6.1	5499	0.05	0.05	109
Transit	480000	12.0	2750	6.1	5499	0.07	0.07	145
Transit	760000	19.0	2750	6.1	5499	0.10	0.12	230
Shipping			PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	ships per year	g/day	lbs/day	g/2-way trip	mtonne/yr	tpa	lbs/year
Transit (<3km from port)	120000	3.0	42	0.09	85	2.54E-04	2.80E-04	1
Transit (<3km from port)	240000	6.0	42	0.09	85	5.08E-04	5.60E-04	1
Transit (<3km from port)	360000	9.0	42	0.09	85	7.62E-04	8.40E-04	2
Transit (<3km from port)	480000	12.0	42	0.09	85	1.02E-03	1.12E-03	2
Transit (<3km from port)	760000	19.0	42	0.09	85	1.61E-03	1.77E-03	4
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(inward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Maneuvering	120000	3.0	162	0.36	162	4.85E-04	5.34E-04	1
Maneuvering	240000	6.0	162	0.36	162	9.69E-04	1.07E-03	2
Maneuvering	360000	9.0	162	0.36	162	1.45E-03	1.60E-03	3
Maneuvering	480000	12.0	162	0.36	162	1.94E-03	2.14E-03	4
Maneuvering	760000	19.0	162	0.36	162	3.07E-03	3.38E-03	7
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(outward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Maneuvering	120000	3.0	152	0.33	152	4.56E-04	5.02E-04	1
Maneuvering	240000	6.0	152	0.33	152	9.12E-04	1.00E-03	2
Maneuvering	360000	9.0	152	0.33	152	1.37E-03	1.51E-03	3
Maneuvering	480000	12.0	152	0.33	152	1.82E-03	2.01E-03	4
Maneuvering	760000	19.0	152	0.33	152	2.89E-03	3.18E-03	6
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	ships per year			g/trip	mtonne/yr	tpa	lbs/year
Hoteling	120000	3.0	1013	2.2	6425	0.02	0.02	42
Hoteling	240000	6.0	1013	2.2	6425	0.04	0.04	85
Hoteling	360000	9.0	1013	2.2	6425	0.06	0.06	127
Hoteling	480000	12.0	1013	2.2	6425	0.08	0.08	170
Hoteling	760000	19.0	1013	2.2	6425	0.12	0.13	269
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(inward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Tugs	120000	3.0	86	0.19	86	0.0005	0.0006	1
Tugs	240000	6.0	86	0.19	86	0.0010	0.0011	2
Tugs	360000	9.0	86	0.19	86	0.0015	0.0017	3
Tugs	480000	12.0	86	0.19	86	0.0021	0.0023	5
Tugs	760000	19.0	86	0.19	86	0.0033	0.0036	7
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(outward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Tugs	120000	3.0	77	0.17	77	0.0005	0.0005	1
Tugs	240000	6.0	77	0.17	77	0.0009	0.0010	2
Tugs	360000	9.0	77	0.17	77	0.0014	0.0015	3
Tugs	480000	12.0	77	0.17	77	0.0019	0.0020	4
Tugs	760000	19.0	77	0.17	77	0.0029	0.0032	6
				lbs/day	PM2.5	mtpa	tpa	lbs/year
Combined Shipping				8.94	milestone 1	0.04	0.04	83.7
Combined Shipping				8.94	milestone 2	0.08	0.08	167.3
Combined Shipping				8.94	milestone 3	0.11	0.13	251.0
Combined Shipping				8.94	milestone 4	0.15	0.17	334.6
Combined Shipping				8.94	milestone 5	0.24	0.26	529.8

VMT			Highest Day	Highest Day				
Shipping			PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
Based on 59 kms from site	tonnage	ships per year	g/day	lbs/day	g/2-way trip	mtonne/yr	tpa	lbs/year
Transit	480000	12.0	2750	6.1	5499	0.07	0.07	145
Transit	720000	18.0	2750	6.1	5499	0.10	0.11	218
Transit	1350000	29.0	2750	6.1	5499	0.16	0.18	352
Transit	1160000	29.0	2750	6.1	5499	0.16	0.18	352
Transit	1160000	29.0	2750	6.1	5499	0.16	0.18	352
Shipping			PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	ships per year	g/day	lbs/day	g/2-way trip	mtonne/yr	tpa	lbs/year
Transit (<3km from port)	480000	12.0	42	0.1	85	1.02E-03	1.12E-03	2
Transit (<3km from port)	720000	18.0	42	0.1	85	1.52E-03	1.68E-03	3
Transit (<3km from port)	1350000	33.8	42	0.1	85	2.46E-03	2.71E-03	5
Transit (<3km from port)	1160000	29.0	42	0.1	85	2.46E-03	2.71E-03	5
Transit (<3km from port)	1160000	29.0	42	0.1	85	2.46E-03	2.71E-03	5
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(inward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Maneuvering	480000	12.0	162	0.4	162	1.94E-03	2.14E-03	4
Maneuvering	720000	18.0	162	0.4	162	2.91E-03	3.21E-03	6
Maneuvering	1350000	33.8	162	0.4	162	4.69E-03	5.17E-03	10
Maneuvering	1160000	29.0	162	0.4	162	4.69E-03	5.17E-03	10
Maneuvering	1160000	29.0	162	0.4	162	4.69E-03	5.17E-03	10
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(outward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Maneuvering	480000	12.0	152	0.3	152	1.82E-03	2.01E-03	4
Maneuvering	720000	18.0	152	0.3	152	2.73E-03	3.01E-03	6
Maneuvering	1350000	33.8	152	0.3	152	4.41E-03	4.86E-03	10
Maneuvering	1160000	29.0	152	0.3	152	4.41E-03	4.86E-03	10
Maneuvering	1160000	29.0	152	0.3	152	4.41E-03	4.86E-03	10
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	ships per year			g/trip	mtonne/yr	tpa	lbs/year
Hoteling	480000	12.0	1013	2.2	6425	0.08	0.08	170
Hoteling	720000	18.0	1013	2.2	6425	0.12	0.13	255
Hoteling	1350000	33.8	1013	2.2	6425	0.19	0.21	411
Hoteling	1160000	29.0	1013	2.2	6425	0.19	0.21	411
Hoteling	1160000	29.0	1013	2.2	6425	0.19	0.21	411
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(inward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Tugs	480000	12.0	86	0.19	86	0.0021	0.0023	5
Tugs	720000	18.0	86	0.19	86	0.0031	0.0034	7
Tugs	1350000	33.8	86	0.19	86	0.0050	0.0055	11
Tugs	1160000	29.0	86	0.19	86	0.0050	0.0055	11
Tugs	1160000	29.0	86	0.19	86	0.0050	0.0055	11
Shipping					PM2.5	PM2.5	PM2.5	PM2.5
(outward)	tonnage	ships per year			g/trip (one way)	mtonne/yr	tpa	lbs/year
Tugs	480000	12.0	77	0.17	77	0.0019	0.0020	4
Tugs	720000	18.0	77	0.17	77	0.0028	0.0031	6
Tugs	1350000	33.8	77	0.17	77	0.0045	0.0049	10
Tugs	1160000	29.0	77	0.17	77	0.0045	0.0049	10
Tugs	1160000	29.0	77	0.17	77	0.0045	0.0049	10
				lbs/day	PM2.5	mtpa	tpa	lbs/year
Combined Shipping				8.94	Phase 1 Trucks	0.15	0.17	335
Combined Shipping				8.94	Phase 1 Trucks &	0.23	0.25	502
Combined Shipping				8.94	Phase 1 Alternative	0.37	0.40	809
Combined Shipping				8.94	Phase 2	0.37	0.40	809
Combined Shipping				8.94	Phase 2 Alternative	0.367	0.40	809

PM_{10} / $PM_{2.5}$ Locomotive Emission Factors

Railways (Exhaust Emissions)		
Rail emissions based on the use of ultra-low emissions road-switcher locomotives (National Railway Equipment Company) for both switching and line haul.		
Emissions	**Switcher**	**Line Haul**
(g/bhp-hr)		
NOX	3.37	2.88
HC	0.04	0.02
CO	1.51	0.93
PM10	0.05	0.02

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher	Switcher
Notch Position			**%**	**Weighted**	**PM (g/hr)**	**PM (g/sec)**
			(based on Davis Yard Trim operations)			
Idle	0.81%	5.67	44.20%	2.51	0.13	0.000035
1	4.76%	33.32	5.00%	1.67	0.08	0.000023
2	14.18%	99.26	25.00%	24.82	1.24	0.000345
3	27.80%	194.6	2.30%	4.48	0.22	0.000062
4	42.07%	294.49	21.50%	63.32	3.17	0.000879
5	57.30%	401.1	1.50%	6.02	0.30	0.000084
6	72.51%	507.57	1.60%	8.12	0.41	0.000113
7	89.76%	628.32	0.00%	0.00	0.00	0.000000
8	105.31%	737.17	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**0.86**					
					4.77	**0.00132**
HP	**700**			222	PM (g/hr)	PM (g/sec)
Average Load (HP)				**16%**		

Switcher When Full	% of full power	BHP	Duty Cylce	BHP	Switcher	Switcher
Notch Position			%	Weighted	PM (g/hr)	PM (g/sec)
			(based on Davis Yard Trim operations)			
Idle	0.81%	17.01	44.20%	7.52	0.38	0.000104
1	4.76%	99.96	5.00%	5.00	0.25	0.000069
2	14.18%	297.78	25.00%	74.45	3.72	0.001034
3	27.80%	583.8	2.30%	13.43	0.67	0.000186
4	42.07%	883.47	21.50%	189.95	9.50	0.002638
5	57.30%	1203.3	1.50%	18.05	0.90	0.000251
6	72.51%	1522.71	1.60%	24.36	1.22	0.000338
7	89.76%	1884.96	0.00%	0.00	0.00	0.000000
8	105.31%	2211.51	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**0.86**					
					14.31	**0.00397**
HP	**2100**			333	PM (g/hr)	PM (g/sec)
Average Load (HP)				**16%**		

Line Haul	% of full power	BHP	EPA Duty Cylce	Orcem Duty Cylce	BHP	Line Haul	Line Haul
Notch Position					Weighted	PM (g/hr)	PM (g/sec)
Idle	0.4	8	38.00%	47.03%	3.76	0.08	0.000021
DB	2.1	42	12.50%	15.47%	6.50	0.13	0.000036
1	5	100	6.50%	8.04%	8.04	0.16	0.000045
2	11.4	228	6.50%	8.04%	18.34	0.37	0.000102
3	23.5	470	5.20%	6.44%	30.25	0.60	0.000168
4	34.3	686	4.40%	5.45%	37.36	0.75	0.000208
5	48.1	962	3.80%	4.70%	45.24	0.90	0.000251
6	64.3	1286	3.90%	4.83%	62.07	1.24	0.000345
7	86.6	1732	3.00%	0.00%	0.00	0.00	0.000000
8	102.5	2050	16.20%	0.00%	0.00	0.00	0.000000
Fuel Correction Factor	**0.86**						
HP	**2000**	(One locomotive)			212	**3.64**	**0.00101**
Average Load (HP)				**11%**		PM (g/hr)	PM (g/sec)

Line Haul	% of full power	BHP	EPA Duty Cylce	BHP	Line Haul	Line Haul	Line Haul
Based On EPA Line Haul Cycle				Weighted	PM (g/hr)	PM (g/sec)	Based On EPA Line Haul Cycle
Idle	0.4	8	38.0%	3.04	0.1	**0.0000**	**Idle**
DB	2.1	42	12.5%	5.25	0.1	**0.0000**	**DB**
1	5	100	6.5%	6.50	0.1	**0.0000**	**1**
2	11.4	228	6.5%	14.82	0.3	**0.0001**	**2**
3	23.5	470	5.2%	24.44	0.5	**0.0001**	**3**
4	34.3	686	4.4%	30.18	0.6	**0.0002**	**4**
5	48.1	962	3.8%	36.56	0.7	**0.0002**	**5**
6	64.3	1286	3.9%	50.15	1.0	**0.0003**	**6**
7	86.6	1732	3.0%	51.96	1.0	**0.0003**	**7**
8	102.5	2050	16.2%	332.10	6.6	**0.0018**	**8**
Fuel Correction Factor	**0.86**						
HP	**2000**	(per locomotive)			212	**9.55**	**0.003**
Average Load (HP)				**28%**		PM (g/hr)	PM (g/sec)

Orcem - Switchers When Empty						
Hours To Load 16 Wagon Train	**0.3333**	hours				
AERMOD sources	75					
Spacing	10	m		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	**1.77E-05**	g/(s*source)	**1.71E-05**	**2.45E-07**	**g/(s*source)**	**2.38E-07**
Orcem - Switchers When Full						
Hours To Load 16 Wagon Train	**0.3333**	hours				
AERMOD sources	75					
Spacing	10	m		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	**5.30E-05**	g/(s*source)	**5.14E-05**	**7.36E-07**	**g/(s*source)**	**7.14E-07**
Orcem Combined Emission rate				**9.81E-07**	**g/(s*source)**	**9.52E-07**

Orcem - Idling While Loading						
AERMOD sources	1	**idling**				
Time	1800	sec				
Idling Events	2	arrival & departure				
Emission rate	0.069	g/hr per train				
Locomotives	1					
Emission rate	1.91E-05	g/sec		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Idling Emission rate	**1.91E-05**	g/(s*source)	**1.854E-05**	**1.59E-06**	**g/(s*source)**	**1.54E-06**

Orcem - Line Haul In Operation						
AERMOD sources	41	within 0.41km of facility				
Spacing	10	m				
Distance	0.41	km				
Speed	10	kph				
Time	147.6	sec				
Emission rate	0.149	g/hr per train				
Locomotives	1					
Emission rate	0.00004	g/sec		Based on a 24-hr average		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	1.01E-06	g/(s*source)	9.80E-07	4.21E-08	g/(s*source)	4.09E-08
Orcem - Line Haul In Operation						
AERMOD sources	24	0.41km – 1.61km from facility				
Spacing	50	m				
Distance	1.2	km				
Speed	15	kph				
Time	288	sec				
Emission rate	0.291	g/hr per train				
Locomotives	1					
Emission rate	0.000081	g/sec		**Based on a 24-hr average**		

	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	3.37E-06	g/(s*source)	3.27E-06	1.40E-07	g/(s*source)	1.36E-07
Distance	60.0	miles	(Distance south - 100miles, distance east - 20 miles)			
	96.6	km				
Orcem Line Haul	**Average Distance**					
Distance	94.9	km				
Speed	50	kph	Hours			
Time	6836	sec	1.899			
	PM10		**PM2.5**			
Emission rate	**18.1**	g per train	**17.6**			

Orcem Emission Inventory Summary

Switching When Empty				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**rail**	**g/train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	5753	4	1.5	1.542	0.001	0.0000	0.0000	0.01
milestone 2	23010	16	1.5	1.542	0.001	0.0000	0.0000	0.05
milestone 3	51773	36	1.5	1.542	0.001	0.0001	0.0001	0.12
milestone 4	92041	63	1.5	1.542	0.001	0.0001	0.0001	0.21
milestone 5	145732	100	1.5	1.542	0.001	0.0002	0.0002	0.34
Switching When Full				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**rail**	**g/train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	5753	4	4.6	4.626	0.765	0.0000	0.0000	0.04
milestone 2	23010	16	4.6	4.626	0.765	0.0001	0.0001	0.16
milestone 3	51773	36	4.6	4.626	0.765	0.0002	0.0002	0.36
milestone 4	92041	63	4.6	4.626	0.765	0.0003	0.0003	0.64
milestone 5	145732	100	4.6	4.626	0.765	0.0005	0.0005	1.02
Line Haul idling				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**rail**	**g/train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	5753	4	0.13	0.067	0.00015	5.27E-07	5.81E-07	0.0012
milestone 2	23010	16	0.13	0.067	0.00015	2.11E-06	2.33E-06	0.0047
milestone 3	51773	36	0.13	0.067	0.00015	4.75E-06	5.23E-06	0.0105
milestone 4	92041	63	0.13	0.067	0.00015	8.44E-06	9.30E-06	0.0186
milestone 5	145732	100	0.13	0.067	0.00015	1.34E-05	1.47E-05	0.0295
Line Haul (10 kph)				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**

milestone 1	5753	4	0.29	0.145	0.00032	1.14E-06	1.26E-06	0.003
milestone 2	23010	16	0.29	0.145	0.00032	4.57E-06	5.04E-06	0.010
milestone 3	51773	36	0.29	0.145	0.00032	1.03E-05	1.13E-05	0.023
milestone 4	92041	63	0.29	0.145	0.00032	1.83E-05	2.02E-05	0.040
milestone 5	145732	100	0.29	0.145	0.00032	2.90E-05	3.19E-05	0.064
Line Haul (15 kph)				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
(air model)	**tonnage**	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	5753	4	0.56	0.282	0.00062	2.23E-06	2.46E-06	0.005
milestone 2	23010	16	0.56	0.282	0.00062	8.93E-06	9.84E-06	0.020
milestone 3	51773	36	0.56	0.282	0.00062	2.01E-05	2.21E-05	0.044
milestone 4	92041	63	0.56	0.282	0.00062	3.57E-05	3.94E-05	0.079
milestone 5	145732	100	0.56	0.282	0.00062	5.65E-05	6.23E-05	0.125
Line Haul (50 kph)				**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
(average 60 miles)	**tonnage**	**rail**	**g/2-way train load**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	5753	4	35.2	9.260	0.0388	1.39E-04	1.53E-04	0.306
milestone 2	23010	16	35.2	9.260	0.0388	5.56E-04	6.13E-04	1.225
milestone 3	51773	36	35.2	9.260	0.0388	1.25E-03	1.38E-03	2.757
milestone 4	92041	63	35.2	9.260	0.0388	2.22E-03	2.45E-03	4.901
milestone 5	145732	100	35.2	9.260	0.0388	3.52E-03	3.88E-03	7.760
			PM2.5		**lbs/day**	**MTPA**	**tpa**	**lbs/year**
			Combined	**milestone 1**	0.045	0.000	0.000	0.37
				milestone 2	0.045	0.001	0.001	1.47
				milestone 3	0.045	0.002	0.002	3.32
				milestone 4	0.045	0.003	0.003	5.90
				milestone 5	0.045	0.004	0.005	9.34

VMT - Switchers When Empty						
Hours To Load 16 Wagon Train	**2.3333**	hours				
AERMOD sources	75					
Spacing	10	m		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	**1.77E-05**	g/(s*source)	**1.71E-05**	**1.72E-06**	**g/(s*source)**	**1.67E-06**
VMT - Switchers When Full						
Hours To Load 16 Wagon Train	**2.3333**	hours				
AERMOD sources	75					
Spacing	10	m		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	**5.30E-05**	g/(s*source)	**5.14E-05**	**5.15E-06**	**g/(s*source)**	**5.00E-06**
VMT Combined Emission rate				**6.87E-07**	**g/(s*source)**	**6.66E-07**
VMT - Idling While Loading						
AERMOD sources	1	**idling**				
Time	1800	sec				
Idling Events	2	arrival & departure				
Emission rate	0.069	g/hr per train				
Locomotives	3					
Emission rate	1.91E-05	g/sec		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Idling Emission rate	**1.91E-05**	g/(s*source)	**1.854E-05**	**1.59E-06**	**g/(s*source)**	**1.54E-06**

VMT - Line Haul In Operation		
AERMOD sources	41	within 0.41km of facility
Spacing	10	m
Distance	0.41	km
Speed	10	kph
Time	147.6	sec

Emission rate	0.149	g/hr per train				
Locomotives	3					
Emission rate	0.00004	g/sec		Based on a 24-hr average		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	3.03E-06	g/(s*source)	2.94E-06	1.26E-07	g/(s*source)	1.23E-07
VMT - Line Haul In Operation						
AERMOD sources	24	0.41km – 1.61km from facility				
Spacing	50	m				
Distance	1.2	km				
Speed	15	kph				
Time	288	sec				
Emission rate	0.291	g/hr per train				
Locomotives	3					
Emission rate	0.000081	g/sec		**Based on a 24-hr average**		
	PM10		**PM2.5**	**PM10**		**PM2.5**
Emission rate	1.01E-05	g/(s*source)	9.80E-06	4.21E-07	g/(s*source)	4.09E-07
Distance	60.0	miles	(Distance south - 100miles, distance east - 20 miles)			
	96.6	km				
VMT Line Haul	**Average Distance**					
Distance	94.9	km				
Speed	50	kph	Hours			
Time	6836	sec	1.899			
	PM10		**PM2.5**			
Emission rate	**18.4**	g per train	**17.9**			

VMT Emission Inventory Summary

Switching When Empty				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	1	53	4.626	0.024	0.0006	0.0006	1.26
Phase 1 Alternative	870000	1	96	4.626	0.024	0.0010	0.0011	2.28
Phase 2	366000	1	40	4.626	0.024	0.0004	0.0005	0.96
Phase 2 Alternative	770400	1	85	4.626	0.024	0.0009	0.0010	2.02
Switching When Full				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks Only	480000	1	53	13.879	0.071	0.0017	0.0019	3.78
Phase 1 Trucks & Rail	870000	1	96	13.879	0.071	0.0031	0.0034	6.85
Phase 1 Alternative	366000	1	40	13.879	0.071	0.0013	0.0014	2.88
Phase 2	770400	1	85	13.879	0.071	0.0028	0.0030	6.06
Line Haul idling				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	rail	g/train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	3	53	0.200	0.00088	2.12E-05	2.34E-05	0.0467
Phase 1 Alternative	870000	3	96	0.200	0.00088	3.84E-05	4.23E-05	0.0847
Phase 2	366000	3	40	0.200	0.00088	1.62E-05	1.78E-05	0.0356
Phase 2 Alternative	770400	3	85	0.200	0.00088	3.40E-05	3.75E-05	0.0750
Line Haul (10 kph)				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	3	53	0.434	0.00191	4.59E-05	5.06E-05	0.101
Phase 1 Alternative	870000	3	96	0.434	0.00191	8.33E-05	9.18E-05	0.184
Phase 2	366000	3	40	0.434	0.00191	3.50E-05	3.86E-05	0.077
Phase 2 Alternative	770400	3	85	0.434	0.00191	7.37E-05	8.13E-05	0.163
Line Haul (15 kph)				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
(air model)	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	3	53	0.847	0.00374	8.96E-05	9.88E-05	0.198
Phase 1 Alternative	870000	3	96	0.847	0.00374	1.62E-04	1.79E-04	0.358
Phase 2	366000	3	40	0.847	0.00374	6.84E-05	7.53E-05	0.151
Phase 2 Alternative	770400	3	85	0.847	0.00374	1.44E-04	1.59E-04	0.317
Line Haul (50 kph)				PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
(average 60 miles)	tonnage	rail	g/2-way train load	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only								
Phase 1 Trucks & Rail	480000	3	53	27.779	0.2326	5.58E-03	6.15E-03	12.306
Phase 1 Alternative	870000	3	96	27.779	0.2326	1.01E-02	1.12E-02	22.305

Phase 2	366000	3	40	27.779	0.2326	4.26E-03	4.69E-03	9.383
Phase 2 Alternative	770400	3	85	27.779	0.2326	8.96E-03	9.88E-03	19.751
			PM2.5		**lbs/day**	**MTPA**	**tpa**	**lbs/year**
			Combined	**Phase 1 Trucks**				
				Phase 1 Trucks & Rail	0.334	0.008	0.009	17.69
				Phase 1	0.334	0.015	0.016	32.06
				Phase 2	0.334	0.006	0.007	13.49
				Phase 2	0.334	0.013	0.014	28.39

PM2.5									
Orcem			VMT			Cumulative			
Annualised Emission Rate	AERMOD Sources	Annualised Emission Rate	Annualised Emission Rate	AERMOD Sources	Annualised Emission Rate	Annualised Emission Rate	AERMOD Sources	Annualised Emission Rate	
(g/s)		(g/s/source)	(g/s)		(g/s/source)	(g/s)		(g/s/source)	
Switching		PM2.5	Switching		PM2.5	Switching		PM2.5	
1.93E-07	75	2.58E-09	0.00E+00	75	0.00E+00	1.93E-07	75	2.58E-09	
7.73E-07	75	1.03E-08	1.81E-05	75	2.41E-07	1.89E-05	75	2.52E-07	
1.74E-06	75	2.32E-08	3.28E-05	75	4.38E-07	3.46E-05	75	4.61E-07	
3.09E-06	75	4.12E-08	1.38E-05	75	1.84E-07	1.69E-05	75	2.25E-07	
4.89E-06	75	6.53E-08	2.91E-05	75	3.87E-07	3.40E-05	75	4.53E-07	
Switching (Full)		PM2.5	Switching (Full)		PM2.5	Switching (Full)		PM2.5	Combined
5.79E-07	75	7.73E-09	0.00E+00	75	0.00E+00	5.79E-07	75	7.73E-09	1.03E-08
2.32E-06	75	3.09E-08	5.43E-05	75	7.24E-07	5.66E-05	75	7.55E-07	1.01E-06
5.21E-06	75	6.95E-08	9.85E-05	75	1.31E-06	1.04E-04	75	1.38E-06	1.84E-06
9.27E-06	75	1.24E-07	4.14E-05	75	5.52E-07	5.07E-05	75	6.76E-07	9.01E-07
1.47E-05	75	1.96E-07	8.72E-05	75	1.16E-06	1.02E-04	75	1.36E-06	1.81E-06
Line Haul idling		PM2.5	Line Haul idling		PM2.5	Line Haul idling		PM2.5	per Locomotive
1.67E-08	1	1.67E-08	0.00E+00	1	0.00E+00	1.67E-08	1	1.67E-08	5.57E-09
6.69E-08	1	6.69E-08	6.72E-07	1	6.72E-07	7.39E-07	1	7.39E-07	2.46E-07
1.50E-07	1	1.50E-07	1.22E-06	1	1.22E-06	1.37E-06	1	1.37E-06	4.56E-07
2.68E-07	1	2.68E-07	5.12E-07	1	5.12E-07	7.80E-07	1	7.80E-07	2.60E-07
4.24E-07	1	4.24E-07	1.08E-06	1	1.08E-06	1.50E-06	1	1.50E-06	5.01E-07
Line Haul (10 kph)		PM2.5	Line Haul (10 kph)		PM2.5	Line Haul (10 kph)		PM2.5	
3.63E-08	41	8.84E-10	0.00E+00	41	0.00E+00	3.63E-08	41	8.84E-10	
1.45E-07	41	3.54E-09	1.46E-06	41	3.55E-08	1.60E-06	41	3.91E-08	
3.26E-07	41	7.96E-09	2.64E-06	41	6.44E-08	2.97E-06	41	7.23E-08	
5.80E-07	41	1.41E-08	1.11E-06	41	2.71E-08	1.69E-06	41	4.12E-08	
9.18E-07	41	2.24E-08	2.34E-06	41	5.70E-08	3.26E-06	41	7.94E-08	
Line Haul (15 kph)		PM2.5	Line Haul (15 kph)		PM2.5	Line Haul (15 kph)		PM2.5	
7.07E-08	24	2.95E-09	0.00E+00	24	0.00E+00	7.07E-08	24	2.95E-09	
2.83E-07	24	1.18E-08	2.84E-06	24	1.18E-07	3.13E-06	24	1.30E-07	
6.37E-07	24	2.65E-08	5.15E-06	24	2.15E-07	5.79E-06	24	2.41E-07	
1.13E-06	24	4.72E-08	2.17E-06	24	9.03E-08	3.30E-06	24	1.37E-07	
1.79E-06	24	7.47E-08	4.56E-06	24	1.90E-07	6.35E-06	24	2.65E-07	

$PM_{2.5}$ – Orcem Hoppers / Conveyor Emission Factors

Orcem – Mobile Diesel Hoppers / Conveyors			
OFFROAD2011	**Load Factor**	**HP**	**PM**
Excavator	0.40	201	0.010
			g/(hp-hr)
Deterioration Rate	3.70E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	0.852	g/hr	
Activity Factor	1		
Emission Rate / Hopper / Conveyor PM10	0.000237	g/sec	
PM2.5/PM10 Ratio	0.92		
Emission Rate / Hopper / Conveyor PM2.5	0.000218		

Sources	Emission Rate		Annual Emission Rate
Diesel Hopper 1	0.000218	g/s	2.83E-05
Diesel Hopper 2	0.000218	g/s	2.83E-05
Diesel Conveyor 1	0.000218	g/s	2.83E-05
Diesel Conveyor 2	0.000218	g/s	2.83E-05
Diesel Conveyor 3	0.000218	g/s	2.83E-05
Diesel Conveyor 4	0.000218	g/s	2.83E-05
Diesel Conveyor 5	0.000218	g/s	2.83E-05
Diesel Conveyor 6	0.000218	g/s	2.83E-05
Diesel Conveyor 7	0.000218	g/s	2.83E-05

PM2.5							
	tonnage	**hours of operation**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	180	7.055	0.3733	0.0013	0.0014	2.800
milestone 2	240000	360	7.055	0.3733	0.0025	0.0028	5.599
milestone 3	360000	540	7.055	0.3733	0.0038	0.0042	8.399
milestone 4	480000	720	7.055	0.3733	0.0051	0.0056	11.198
milestone 5	760000	1140	7.055	0.3733	0.0080	0.0089	17.731

$PM_{2.5}$ – Orcem Excavator / Front Loader Emission Factors

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)			
OFFROAD2011	**Load Factor**	**HP**	**PM10**
Excavator	0.3819	175	0.010
			g/(hp-hr)
Deterioration Rate	5.00E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	0.768	g/hr	
Activity Factor	0.25	Fractional usage per hour	
Emission Rate / Excavator PM10	0.000053	g/s	
PM2.5/PM10 Ratio	0.92		
Emission Rate / Excavator PM2.5	0.000049	g/s	

PM2.5							
	tonnage	**hours of operation**	**g/hr**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1200	0.177	0.0093	0.0002	0.0002	0.467
milestone 2	240000	2400	0.177	0.0093	0.0004	0.0005	0.935
milestone 3	360000	3600	0.177	0.0093	0.0006	0.0007	1.402
milestone 4 (2 excavators)	480000	4800	0.177	0.0093	0.0008	0.0009	1.870
milestone 5 (2 excavators)	760000	7000	0.177	0.0093	0.0012	0.0014	2.726

Orcem Front Loader (2 in operation for Milestone 5)			
OFFROAD	**Load Factor**	**HP**	**PM10**
Front Loader	0.3618	369	0.010
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.34	g/hr	
Activity Factor	0.75	Fractional usage per hour	

Unpaved Road - Industrial (Front Loader (2 in operation for Milestone 5)			Combined	
Emission Rate / Front Loader PM10	0.000279	g/s	0.000333	including excavator exhaust emissions
PM2.5/PM10 Ratio	0.92		0.92	
Emission Rate / Front Loader PM2.5	0.000257	g/s	0.000306	including excavator exhaust emissions
	Maximum 24-hrs	**Annual Mean**		
AERMOD Sources (Slag Heap N)	12	28		
AERMOD Sources (Slag Heap S)	5	28		
Maximum 24-Hours	**PM10**		**PM2.5**	
Emission Rate / Front Loader / Source (SHN)	2.77E-05	g/s	2.55E-05	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	6.66E-05	g/s	6.12E-05	including excavator exhaust emissions
Annual Mean	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	1.19E-05	g/s	1.09E-05	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	1.19E-05	g/s	1.09E-05	including excavator exhaust emissions

PM10	Front Loader - Gypsum Loading					
Emission Rate	1.34	g/hr				
	0.00037	g/sec		**Volume of front loader**	12.2	m3

Speed	16	km/hr	(10 miles/hr)	**Density of Gypsum**		1.10	tonnes/m3
Mass Emission per vehicle	0.084	g/km		**Tonnage / front loader**		13.42	tonnes
Gypsum Storage Sources	28			**Tons / front loader**		14.79	tons
Time per trip	0.035	hrs					
Spacing storage	0.020	km		**Tonnage**	**Hours of operation**	**Trips/annum**	**Trips / hour**
				3,522	1200	262	0.22
Distance Travelled S3	1.120	km	2-way average	**7,044**	2400	525	0.22
	Maximum Day		**Annual**	**10,566**	3600	787	0.22
Trips / hour	1	two-way	0.24	**14,088**	4800	1050	0.22
				22,306	7600	1662	0.22
Emissions per hour S3	0.0939	g/hr	0.0223				
Emissions per sec S3	0.0000261	g/sec	0.00000619				
	PM10 Maximum Day		**PM10 Annual Mean**	**PM2.5 Maximum Day**		**PM2.5 Annual Mean**	
Emissions per sec S3/source	9.32E-07	g/sec	2.21E-07	8.57E-07	g/sec	2.04E-07	

Front Loaders - PM10				**Front Loaders - PM2.5**			
Milestone 5 (2 front loaders)	**S1**	**S2**	**S3**	**Milestone 5 (2 front loaders)**	**S1**	**S2**	**S3**
Annualised Emission Rate	1.55E-06	9.50E-06	1.77E-07	Annualised Emission Rate	1.42E-06	8.74E-06	1.63E-07
	g/s	**g/s**	**g/s**		**g/s**	**g/s**	**g/s**

PM2.5 Front Loaders Exhaust Emissions							
	tonnage	**hours of operation**	**Maximum Day (g/hr)**	**Maximum Day (lbs/day)**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	1105	1.012	0.054	0.0012	0.0013	2.67
milestone 2	240000	2211	1.012	0.054	0.0024	0.0027	5.35
milestone 3	360000	3316	1.012	0.054	0.0036	0.0040	8.02
milestone 4 (2 front loaders)	480000	4421	1.938	0.103	0.0048	0.0053	10.69
milestone 5 (2 front loaders)	760000	7000	1.938	0.103	0.0077	0.0085	16.93

PM_{10} / $PM_{2.5}$ – VMT Front Loader Emission Factors

Front Loader (2 in operation for Phase 1 Alternative)			
OFFROAD	**Load Factor**	**HP**	**PM10**
Front Loader	0.3618	369	0.010
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.34	g/hr	
Activity Factor	0.90	Fractional usage per hour	

Unpaved Road - Industrial (Front Loader (2 in operation for Milestone 5)				
Emission Rate / Front Loader PM10	0.000335	g/s		
PM2.5/PM10 Ratio	0.92			
Emission Rate / Front Loader PM2.5	0.000309	g/s		
	Maximum 24-hrs	**Annual Mean**		
Truck Loading Sources	**5**	**1**		
TransLoading Sources	**4**	**1**		
Rail Loading Sources	**5**	**1**		
Barge Loading Sources	**5**	**1**		
PM2.5	**Maximum Day**		**Hours Of Operation**	
Emission Rate / Front Loader / Truck Loading	**0.0000617**	g/s	**5760**	
Emission Rate / Front Loader / TransLoading	**0.0000771**	g/s	**1392**	
Emission Rate / Front Loader / Rail Loading	**0.0000617**	g/s	**2038**	
Emission Rate / Front Loader / Barge Loading	**0.0000617**	g/s	**288**	

PM2.5 Front Loaders Exhaust Emissions							
	tonnage	hours of operation	Maximum Day (g/hr)	Maximum Day (lbs/day)	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	5760	1.11	0.059	0.00640	0.00705	14.1
Phase 1 Trucks & Rail	720000	5760	1.11	0.059	0.00640	0.00705	14.1
Phase 1 Alternative	1350000	4320	2.22	0.118	0.00960	0.01058	21.2
Phase 2	1,160,000	5760	2.22	0.118	0.01280	0.01411	28.2
Phase 2 Alternative	1,160,000	5760	2.22	0.118	0.01280	0.01411	28.2

VMT - $PM_{2.5}$ Forklift Emission Factors

Unpaved Road - Industrial (Forklift)			
OFFROAD2011	**Load Factor**	**HP**	**PM10**
Forklift	0.20	100	0.010
			g/(hp-hr)
Deterioration Rate	4.55E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1800	hours/year	
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	0.240	g/hr	
Activity Factor	0.50	Fractional usage per hour	
Emission Rate / Forklift PM10	0.000033	g/s	
PM2.5/PM10 Ratio	0.92		
Emission Rate / Forklift PM2.5	0.000031	g/s	

PM2.5									
	tonnage	hours of operation	No. of Forklifts (maximum day)	No. of Forklifts (annual)	g/hr	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	1800	2	2	0.221	0.01169	0.000795	0.000877	1.754
Phase 1 Trucks & Rail	720000	1800	2	2	0.221	0.01169	0.000795	0.000877	1.754
Phase 1 Alternative	1350000	1800	2	2	0.221	0.01169	0.000795	0.000877	1.754
Phase 2	1160000	1800	2	2	0.221	0.01169	0.000795	0.000877	1.754
Phase 2 Alternative	1160000	1800	2	2	0.221	0.01169	0.000795	0.000877	1.754

Orcem $PM_{2.5}$ Orcem Onsite Paved Road Emission Factors

PM2.5 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			**Annual**
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**PM2.5_run**			**Combined**
						(gms/mile)			**(gms/mile)**
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	0.0284			0.0284

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**PM2.5 (g/hr-veh)**	
2020	HHDT	D	SV	A		
					0.0035	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	**g/mile**		
T7 Single	g/vkt	0.0176	0.0284	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	0.0163	0.0263	Sum	

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM2.5_RUNEX**	**PM2.5_STREX**	**PM2.5_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.0069	0.00039	0.0069
2020	Annual	LDA	DSL	Aggregated	10	0.0306	0.00000	0.0306

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM2.5_RUNEX**	
						(gms/mile)	gms/km
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.0109	0.0068
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.0414	0.0258

		PM2.5_run	g/mile		
Gas LDA (ann)	g/vkt	0.00482	0.0078	EMFAC2007	start emissions - one start per day averaged over onsite trip distance (0.756km)
DSL LDA (ann)	g/vkt	0.01902	0.0306		
Idling Gas LDA	g/vkt	0.00680	0.0109		
Idling Diesel LDA	g/vkt	0.02575	0.0414		
Composite Emission Factor Gas (ann)	g/vkt	0.00497	0.0080	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01952	0.0314	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0050	0.0081	sum	Based on 0.38% Diesel

	HHDT		LDA	
	PM2.5		**PM2.5**	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.012	g/hr	0.004	based on annual
Emission Factor/vehicle	3.43E-06	g/sec	1.69E-05	includes all trips/day
Emissions /vehicle/AERMOD Source	4.13E-08	g/sec	2.03E-07	

Staff Numbers		
milestone 1	7	1 shift
milestone 2	12	1 shift
milestone 3	12	1 shift
milestone 4	16	2 shift
milestone 5	16	2 shift

	PM2.5	PM2.5	PM2.5	PM2.5
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour (based on Mode 3 Milestone 5)**	**Emissions (g/s)**	**Including LDA**
1	4.13E-08	5	2.01E-07	4.040E-07
2	4.13E-08	6	2.68E-07	2.679E-07
3	4.13E-08	10	4.02E-07	4.019E-07
4	4.13E-08	11	4.69E-07	4.689E-07
5	4.13E-08	13	5.36E-07	5.358E-07
6	4.13E-08	13	5.36E-07	5.358E-07
7	4.13E-08	13	5.36E-07	5.358E-07
8	4.13E-08	13	5.36E-07	5.358E-07
9	4.13E-08	13	5.36E-07	9.419E-07
10	4.13E-08	13	5.36E-07	5.358E-07
11	4.13E-08	15	6.18E-07	6.185E-07
12	4.13E-08	13	5.36E-07	5.358E-07
13	4.13E-08	11	4.69E-07	4.689E-07
14	4.13E-08	5	2.01E-07	2.009E-07
15	4.13E-08	7	2.84E-07	2.836E-07
16	4.13E-08	0	0.00E+00	0.000E+00
17	4.13E-08	0	0.00E+00	2.030E-07
18	4.13E-08	0	0.00E+00	0.000E+00
19	4.13E-08	0	0.00E+00	0.000E+00
20	4.13E-08	0	0.00E+00	0.000E+00
21	4.13E-08	0	0.00E+00	0.000E+00
22	4.13E-08	0	0.00E+00	0.000E+00
23	4.13E-08	2	6.70E-08	6.698E-08
24	4.13E-08	3	1.34E-07	1.340E-07
	Total HHDT/Day	**166.1**		

Including Orcem Rail Loading – 60 truck movements over a 10 hour day	PM2.5	Milestone5	PM2.5	PM2.5
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour (based on Mode 3 Milestone 5)**	**Emissions (g/s)**	**Including LDA**
1	4.13E-08	5	2.01E-07	4.04E-07
2	4.13E-08	6	2.68E-07	2.68E-07
3	4.13E-08	10	4.02E-07	4.02E-07
4	4.13E-08	11	4.69E-07	4.69E-07
5	4.13E-08	13	5.36E-07	5.36E-07
6	4.13E-08	13	5.36E-07	5.36E-07
7	4.13E-08	13	5.36E-07	5.36E-07
8	4.13E-08	19	7.84E-07	7.84E-07
9	4.13E-08	19	7.84E-07	1.19E-06
10	4.13E-08	19	7.84E-07	7.84E-07
11	4.13E-08	21	8.66E-07	8.66E-07
12	4.13E-08	19	7.84E-07	7.84E-07
13	4.13E-08	17	7.17E-07	7.17E-07
14	4.13E-08	11	4.49E-07	4.49E-07
15	4.13E-08	13	5.31E-07	5.31E-07
16	4.13E-08	6	2.48E-07	2.48E-07
17	4.13E-08	6	2.48E-07	4.51E-07
18	4.13E-08	0	0.00E+00	0.00E+00
19	4.13E-08	0	0.00E+00	0.00E+00
20	4.13E-08	0	0.00E+00	0.00E+00
21	4.13E-08	0	0.00E+00	0.00E+00
22	4.13E-08	0	0.00E+00	0.00E+00
23	4.13E-08	2	6.70E-08	6.70E-08
24	4.13E-08	3	1.34E-07	1.34E-07
	Total HHDT/Day	**226.1**		

Normal Loading	6600	Hrs			
Rail Loading	1000	Hrs	Annualised		
Total	7600	Hrs	Emission Rate		
	PM10	Milestone5	PM2.5	PM2.5	PM2.5
	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Including LDA
1	4.13E-08	5	2.01E-07	4.04E-07	3.50E-07
2	4.13E-08	6	2.68E-07	2.68E-07	2.32E-07
3	4.13E-08	10	4.02E-07	4.02E-07	3.49E-07
4	4.13E-08	11	4.69E-07	4.69E-07	4.07E-07
5	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07
6	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07
7	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07
8	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07
9	4.13E-08	14	5.68E-07	9.75E-07	8.45E-07
10	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07
11	4.13E-08	16	6.51E-07	6.51E-07	5.65E-07
12	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07
13	4.13E-08	12	5.01E-07	5.01E-07	4.35E-07
14	4.13E-08	6	2.34E-07	2.34E-07	2.03E-07
15	4.13E-08	8	3.16E-07	3.16E-07	2.74E-07
16	4.13E-08	1	3.26E-08	3.26E-08	2.83E-08
17	4.13E-08	1	3.26E-08	2.36E-07	2.04E-07
18	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00
19	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00
20	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00
21	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00
22	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00
23	4.13E-08	2	6.70E-08	6.70E-08	5.81E-08
24	4.13E-08	3	1.34E-07	1.34E-07	1.16E-07
		174.0			Annualised
					2.89E-07

Annual					Maximum Day	Annual Mean				
HGV Traffic					**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage		**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000		8481	0.755	0.0123	0.0123	0.005	0.0001	0.0001	0.23
milestone 2	240000		14578	0.755	0.0123	0.0123	0.005	0.0002	0.0002	0.40
milestone 3	360000		20676	0.755	0.0123	0.0123	0.005	0.0003	0.0003	0.56
milestone 4	480000		22723	0.755	0.0123	0.0123	0.005	0.0003	0.0003	0.62
milestone 5	760000		32534	0.755	0.0123	0.0123	0.005	0.0004	0.0004	0.89
LDA Traffic					**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**Movements / day**	**Movements per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	14	2184	0.755	0.0038	0.0038	0.000	0.000008	0.000009	0.02
milestone 2	240000	24	4992	0.755	0.0038	0.0038	0.000	0.000019	0.000021	0.04
milestone 3	360000	24	6240	0.755	0.0038	0.0038	0.000	0.000024	0.000026	0.05
milestone 4	480000	64	16640	0.755	0.0038	0.0038	0.001	0.000063	0.000070	0.14
milestone 5	760000	64	19968	0.755	0.0038	0.0038	0.001	0.000076	0.000083	0.17
							PM2.5			
							lbs/day	**MTPA**	**tpa**	**lbs/year**
					Combined	**milestone 1**	4.64E-03	1.13E-04	1.25E-04	2.49E-01
						milestone 2	4.72E-03	1.99E-04	2.19E-04	4.38E-01
						milestone 3	4.72E-03	2.79E-04	3.07E-04	6.15E-01
						milestone 4	5.06E-03	3.44E-04	3.79E-04	7.57E-01
						milestone 5	5.06E-03	4.77E-04	5.26E-04	1.05E+00

VMT $PM_{2.5}$ Orcem Onsite Paved Road Emission Factors

PM2.5 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			**Annual**
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**PM2.5_run**			**Combined**
						(gms/mile)			**(gms/mile)**
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	0.0284			0.0284

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**PM2.5 (g/hr-veh)**	
2020	HHDT	D	SV	A		
					0.0035	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	**g/mile**		
T7 Single	g/vkt	0.0176	0.0284	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	0.0163	0.0263	Sum	

LDA Emission Factor								
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM2.5_RUNEX**	**PM2.5_STREX**	**PM2.5_Combined**
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.0069	0.00039	0.0069
2020	Annual	LDA	DSL	Aggregated	10	0.0306	0.00000	0.0306

LDA Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM2.5_RUNEX**	
						(gms/mile)	gms/km
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.0109	0.0068
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.0414	0.0258

		PM2.5_run	g/mile		
Gas LDA (ann)	g/vkt	0.00482	0.0078	EMFAC2007	start emissions - one start per day averaged over onsite trip distance (0.756km)
DSL LDA (ann)	g/vkt	0.01902	0.0306		
Idling Gas LDA	g/vkt	0.00680	0.0109		
Idling Diesel LDA	g/vkt	0.02575	0.0414		
Composite Emission Factor Gas (ann)	g/vkt	0.00497	0.0080	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01952	0.0314	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0050	0.0081	sum	Based on 0.38% Diesel

	HHDT		LDA	
	PM2.5		**PM2.5**	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.012	g/hr	0.004	based on annual
Emission Factor/vehicle	3.29E-06	g/sec	2.03-05	includes all trips/day
Emissions /vehicle/AERMOD Source	4.12E-08	g/sec	2.54E-07	

Staff Numbers		
Phase 1 Trucks Only	12	1 shift
Phase 1 Trucks & Rail	12	1 shift
Phase 1 Alternative	20	1 shift
Phase 2	20	2 shift
Phase 2 Alternative	20	2 shift

	PM2.5	phase 2 alternative	PM2.5	PM2.5	PM2.5	PM2.5
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	4.12E-08	0	0.00E+00	2.539E-07	0	0.00E+00
2	4.12E-08	0	0.00E+00	0.000E+00	0	0.00E+00
3	4.12E-08	0	0.00E+00	0.000E+00	0	0.00E+00
4	4.12E-08	3	1.23E-07	1.235E-07	2	1.03E-07
5	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
6	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
7	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
8	4.12E-08	6	2.47E-07	2.470E-07	5	2.06E-07
9	4.12E-08	4	1.65E-07	6.724E-07	3	1.37E-07
10	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
11	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
12	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
13	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
14	4.12E-08	6	2.47E-07	2.470E-07	5	2.06E-07
15	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
16	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
17	4.12E-08	4	1.65E-07	4.185E-07	3	1.37E-07
18	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
19	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
20	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
21	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
22	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
23	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
24	4.12E-08	4	1.65E-07	1.646E-07	3	1.37E-07
	Total HHDT/Day	87.0			72.5	

Annual					Annual Mean				
HGV Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage		trucks per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.725	0.0119	0.002	0.0003	0.0003	0.69
Phase 1 Trucks & Rail	720000	240000	13846	0.725	0.0119	0.002	0.0002	0.0002	0.36
Phase 1 Alternative	1350000	480000	26445	0.725	0.0119	0.002	0.0003	0.0003	0.69
Phase 2	1,160,000	214,400	12503	0.725	0.0119	0.002	0.0001	0.0002	0.33
Phase 2 Alternative	1,160,000	310,400	17542	0.725	0.0119	0.002	0.0002	0.0002	0.46
LDA Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	Movements / day	Movements per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.0037	0.000	0.000014	0.000015	0.03
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.0037	0.000	0.000018	0.000020	0.04
Phase 1 Alternative	1350000	40	10400	0.725	0.0037	0.000	0.000038	0.000042	0.08
Phase 2	1,160,000	80	20800	0.725	0.0037	0.001	0.000076	0.000084	0.17
Phase 2 Alternative	1,160,000	80	20800	0.725	0.0037	0.001	0.000076	0.000084	0.17

	PM2.5			
	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	0.002	0.0003	0.0004	0.72
Phase 1 Trucks & Rail	0.002	0.0002	0.0002	0.40
Phase 1 Alternative	0.003	0.0004	0.0004	0.77
Phase 2	0.003	0.0002	0.0002	0.49
Phase 2 Alternative	0.0029	0.0003	0.0003	0.63

Orcem $PM_{2.5}$ Off-site Paved Road Emission Factors

PM2.5 Public Paved Road (Exhaust Emissions) Along Lemon Street West Of Sonoma Boulevard - Assumed 20 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			**Annual**
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**PM2.5_run**			**Combined**
						(gms/mile)			**(gms/mile)**
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	0.0218			0.0218

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**PM2.5 (g/hr-veh)**	
2020	HHDT	D	SF	A		
					0.0035	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM2.5_run	**g/mile**		
T7 Single	g/vkt	0.0135	0.0218	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	0.0125	0.0202	Sum	

LDA Emission Factor										
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM2.5_RUNEX**			**PM2.5_STREX**	**PM2.5_Combined**
					miles/hr	(gms/mile)			(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	20	0.0032				0.0032
2016	Annual	LDA	DSL	Aggregated	20	0.0183				0.0183

LDA Idling Calculation							
2016	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM2.5_RUNEX**	
						(gms/mile)	gms/km
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.0109	0.0068
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.0414	0.0258

		PM2.5_run	g/mile		
Gas LDA (ann)	g/vkt	0.00201	0.0032	EMFAC2007	no start emission (applied to onsite only)
DSL LDA (ann)	g/vkt	0.01135	0.0183		
Idling Gas LDA	g/vkt	0.00680	0.0109		
Idling Diesel LDA	g/vkt	0.02575	0.0414		
Composite Emission Factor Gas (ann)	g/vkt	0.00237	0.0038	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01243	0.0200	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0024	0.0039	sum	Based on 0.38% Diesel

	HHDT		LDA	
	PM2.5		**PM2.5**	
Spacing of volume sources	14	m	14	
AERMOD Volume Sources	51		51	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	0.009	g/hr	0.0090	based on annual
Emission Factor/vehicle	2.51E-6	g/sec	7.71E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	4.92E-08	g/sec	1.51E-07	

Diurnal Emission Factors Based On Truck Movement Breakdown					
	PM2.5	PM2.5	PM2.5	PM2.5	Annualised PM2.5
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Including LDA
1	4.92E-08	5	4.79E-07	6.30E-07	5.46E-07
2	4.92E-08	6	6.38E-07	6.38E-07	5.54E-07
3	4.92E-08	10	9.57E-07	9.57E-07	8.31E-07
4	4.92E-08	11	1.12E-06	1.12E-06	9.69E-07
5	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
6	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
7	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
8	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
9	4.92E-08	13	1.28E-06	1.58E-06	1.37E-06
10	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
11	4.92E-08	15	1.47E-06	1.47E-06	1.28E-06
12	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06
13	4.92E-08	11	1.12E-06	1.12E-06	9.69E-07
14	4.92E-08	5	4.79E-07	4.79E-07	4.15E-07
15	4.92E-08	7	6.76E-07	6.76E-07	5.86E-07
16	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
17	4.92E-08	0	0.00E+00	1.51E-07	1.31E-07
18	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
19	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
20	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
21	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
22	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00
23	4.92E-08	2	1.60E-07	1.60E-07	1.38E-07
24	4.92E-08	3	3.19E-07	3.19E-07	2.77E-07
	Total HHDT/Day	**166.1**			
		including deliveries (2 per day, 10am, 2pm)			

PM2.5 Public Paved Road (Exhaust Emissions)							Length (m)	Width (m)
		HHDT	LDA			Sonoma South of Lemon	735	24
Emission factor, E	g/VKT	0.013	0.0024	Lemon		Sonoma North of Lemon	525	24
Emission factor, E (annual)	g/VKT	0.0092	0.0013	Sonoma Blvd		Lemon East of Sonoma	820	16
						Sonoma South of Magazine	698	24

Sonoma North of Lemon	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	22		22	
Distance Travelled	0.525	km	0.525	
Distance Travelled	0.326	miles	0.326	
Emission Factor/vehicle	0.005	g/hr	0.0007	based on annual
Emission Factor/vehicle	1.33E-6	g/sec	3.05E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	6.07E-08	g/sec	1.38E-07	

Sonoma South of Lemon	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	31		31	
Distance Travelled	0.735	km	0.735	
Distance Travelled	0.457	miles	0.457	
Emission Factor/vehicle	0.0067	g/hr	0.0010	based on annual
Emission Factor/vehicle	1.87E-6	g/sec	4.26E-06	includes all trips/day
Emissions /vehicle/AERMOD Source	6.03E-08	g/sec	1.38E-07	

Diurnal Emission Factors Based On Truck Movement Breakdown					
Sonoma North of Lemon	PM2.5	PM2.5	PM2.5	PM2.5 (g/s)	Annualised PM2.5 (g/s)
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Including LDA
1	6.07E-08	0.24	2.95E-08	3.64E-08	3.16E-08
2	6.07E-08	0.32	3.93E-08	3.93E-08	3.41E-08
3	6.07E-08	0.49	5.90E-08	5.90E-08	5.12E-08
4	6.07E-08	0.57	6.89E-08	6.89E-08	5.97E-08
5	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
6	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
7	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
8	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
9	6.07E-08	0.65	7.87E-08	9.25E-08	8.03E-08
10	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
11	6.07E-08	0.75	9.08E-08	9.08E-08	7.88E-08
12	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08
13	6.07E-08	0.57	6.89E-08	6.89E-08	5.97E-08
14	6.07E-08	0.24	2.95E-08	2.95E-08	2.56E-08
15	6.07E-08	0.34	4.16E-08	4.16E-08	3.61E-08
16	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
17	6.07E-08	0.00	0.00E+00	6.92E-09	6.00E-09
18	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
19	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
20	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
21	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
22	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00
23	6.07E-08	0.08	9.84E-09	9.84E-09	8.53E-09
24	6.07E-08	0.16	1.97E-08	1.97E-08	1.71E-08
	Total HHDT/Day	**8.3**			
		including deliveries (2 per day, 10am, 2pm)			

Diurnal Emission Factors Based On Truck Movement Breakdown					
Sonoma South of Lemon	PM2.5	PM2.5	PM2.5	PM2.5 (g/s)	Annualised PM2.5 (g/s)
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Including LDA
1	6.03E-08	2	2.29E-07	2.82E-07	2.45E-07
2	6.03E-08	3	3.05E-07	3.05E-07	2.65E-07
3	6.03E-08	4	4.57E-07	4.57E-07	3.97E-07
4	6.03E-08	4	5.34E-07	5.34E-07	4.63E-07
5	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
6	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
7	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
8	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
9	6.03E-08	5	6.10E-07	7.17E-07	6.22E-07
10	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
11	6.03E-08	6	7.04E-07	7.04E-07	6.11E-07
12	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07
13	6.03E-08	4	5.34E-07	5.34E-07	4.63E-07
14	6.03E-08	2	2.29E-07	2.29E-07	1.98E-07
15	6.03E-08	3	3.23E-07	3.23E-07	2.80E-07
16	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
17	6.03E-08	0	0.00E+00	5.36E-08	4.65E-08
18	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
19	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
20	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
21	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
22	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00
23	6.03E-08	1	7.62E-08	7.62E-08	6.61E-08
24	6.03E-08	1	1.52E-07	1.52E-07	1.32E-07
	Total HHDT/Day	64.8			
		including deliveries (2 per day, 10am, 2pm)			

Lemon East Of Sonoma Boulevard	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	16	m	16	
AERMOD Volume Sources	51		51	
Distance Travelled	0.820	km	0.820	
Distance Travelled	0.510	miles	0.510	
Emission Factor/vehicle	0.010	g/hr	0.0020	based on annual
Emission Factor/vehicle	2.86E-06	g/sec	8.78E-06	includes all trips/day
Emissions /vehicle/AERMOD Source	5.60E-08	g/sec	1.72E-07	

Sonoma Boulevard South Of Magazine St	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	29		29	
Distance Travelled	0.698	km	0.698	
Distance Travelled	0.434	miles	0.434	
Emission Factor/vehicle	0.0064	g/hr	0.0009	based on annual
Emission Factor/vehicle	1.77E-06	g/sec	4.05E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	6.12E-08	g/sec	1.40E-07	

Diurnal Emission Factors Based On Truck Movement Breakdown					
Lemon East Of Sonoma Boulevard	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5 (g/s)**	**Annualised PM2.5 (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**	**Including LDA**
1	5.60E-08	3	3.05E-07	4.02E-07	3.49E-07
2	5.60E-08	4	4.07E-07	4.07E-07	3.53E-07
3	5.60E-08	5	6.11E-07	6.11E-07	5.30E-07
4	5.60E-08	6	7.12E-07	7.12E-07	6.18E-07
5	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
6	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
7	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
8	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
9	5.60E-08	7	8.14E-07	1.01E-06	8.74E-07
10	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
11	5.60E-08	8	9.40E-07	9.40E-07	8.15E-07
12	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07
13	5.60E-08	6	7.12E-07	7.12E-07	6.18E-07
14	5.60E-08	3	3.05E-07	3.05E-07	2.65E-07
15	5.60E-08	4	4.31E-07	4.31E-07	3.74E-07
16	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
17	5.60E-08	0	0.00E+00	9.64E-08	8.36E-08
18	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
19	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
20	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
21	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
22	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00
23	5.60E-08	1	1.02E-07	1.02E-07	8.83E-08
24	5.60E-08	2	2.04E-07	2.04E-07	1.77E-07
	Total HHDT/Day	93.0			
		including deliveries (2 per day, 10am, 2pm)			

Diurnal Emission Factors Based On Truck Movement Breakdown					
Sonoma Boulevard South Of Magazine St	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5 (g/s)**	**Annualised PM2.5 (g/s)**
Weekday Hours	**Emissions (g/s)**	**Vehicles Per Hour**	**Emissions (g/s)**	**Including LDA**	**Including LDA**
1	6.12E-08	2	2.32E-07	2.87E-07	2.49E-07
2	6.12E-08	3	3.10E-07	3.10E-07	2.69E-07
3	6.12E-08	4	4.64E-07	4.64E-07	4.03E-07
4	6.12E-08	4	5.42E-07	5.42E-07	4.70E-07
5	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
6	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
7	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
8	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
9	6.12E-08	5	6.19E-07	7.28E-07	6.32E-07
10	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
11	6.12E-08	6	7.15E-07	7.15E-07	6.20E-07
12	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07
13	6.12E-08	4	5.42E-07	5.42E-07	4.70E-07
14	6.12E-08	2	2.32E-07	2.32E-07	2.01E-07
15	6.12E-08	3	3.28E-07	3.28E-07	2.84E-07
16	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
17	6.12E-08	0	0.00E+00	5.44E-08	4.72E-08
18	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
19	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
20	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
21	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
22	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00
23	6.12E-08	1	7.74E-08	7.74E-08	6.71E-08
24	6.12E-08	1	1.55E-07	1.55E-07	1.34E-07
	Total HHDT/Day	64.8			
		including deliveries (2 per day, 10am, 2pm)			

	Deliveries	Staff Commute
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					**Maximum Day**	**Annual Mean**				
HGV Traffic					**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage		**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000		8481	80.467	1.01	1.01	0.370	0.0086	0.0094	18.88
milestone 2	240000		14578	80.467	1.01	1.01	0.370	0.0147	0.0162	32.45
milestone 3	360000		20676	80.467	1.01	1.01	0.370	0.0209	0.0230	46.03
milestone 4	480000		22723	80.467	1.01	1.01	0.370	0.0229	0.0253	50.59
milestone 5	760000		32534	80.467	1.01	1.01	0.370	0.0329	0.0362	72.43
LDA Traffic					**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
	tonnage	**Movements / day**	**Movements per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**	**lbs/year**
milestone 1	120000	14	2184	39.910	0.096	0.096	0.003	0.000210	0.000231	0.46
milestone 2	240000	24	4992	39.910	0.096	0.096	0.005	0.000480	0.000529	1.06
milestone 3	360000	24	6240	39.910	0.096	0.096	0.005	0.000600	0.000661	1.32
milestone 4	480000	64	16640	39.910	0.096	0.096	0.014	0.001600	0.001763	3.53
milestone 5	760000	64	19968	39.910	0.096	0.096	0.014	0.001920	0.002116	4.23
							PM2.5			
							lbs/day	**MTPA**	**tpa**	**lbs/year**
					Combined	**milestone 1**	0.373	0.0088	0.0097	19.3
						milestone 2	0.375	0.0152	0.0168	33.5
						milestone 3	0.375	0.0215	0.0237	47.4
						milestone 4	0.383	0.0245	0.0271	54.1
						milestone 5	0.383	0.0348	0.0383	76.7

VMT $PM_{2.5}$ Off-site Paved Road Emission Factors

PM2.5 Public Paved Road (Exhaust Emissions) Along Lemon Street West Of Sonoma Boulevard - Assumed 20 miles/hr									
HHDT Emission Factor									
EMFAC2007 Emission Rates									
Region Type:	GAI								
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	**EMFAC2007 Categories**					**Annual**			**Annual**
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**PM2.5_run**			**Combined**
						(gms/mile)			**(gms/mile)**
Solano (SV)	2020	Annual	HHDT	DSL	Aggregated	0.0218			0.0218

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Category**	**Fuel_Type**	**air_basin**	**season**	**PM2.5 (g/hr-veh)**	
2020	HHDT	D	SF	A		
					0.0035	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM2.5_run	**g/mile**		
T7 Single	g/vkt	0.0135	0.0218	EMFAC2007	Assumption - Based On Idling for 7.5% of time
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2007	
Composite Emission Factor (Ann)	g/vkt	0.0125	0.0202	Sum	

LDA Emission Factor										
CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM2.5_RUNEX**			**PM2.5_STREX**	**PM2.5_Combined**
					miles/hr	(gms/mile)			(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	20	0.0032				0.0032
2016	Annual	LDA	DSL	Aggregated	20	0.0183				0.0183

LDA Idling Calculation							
2016	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM2.5_RUNEX**	
						(gms/mile)	gms/km
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.0109	0.0068
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.0414	0.0258

		PM2.5_run	g/mile		
Gas LDA (ann)	g/vkt	0.00201	0.0032	EMFAC2007	no start emission (applied to onsite only)
DSL LDA (ann)	g/vkt	0.01135	0.0183		
Idling Gas LDA	g/vkt	0.00680	0.0109		
Idling Diesel LDA	g/vkt	0.02575	0.0414		
Composite Emission Factor Gas (ann)	g/vkt	0.00237	0.0038	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01243	0.0200	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0024	0.0039	sum	Based on 0.38% Diesel

	HHDT		LDA	
	PM2.5		**PM2.5**	
Spacing of volume sources	14	m	14	
AERMOD Volume Sources	51		51	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	0.009	g/hr	0.0017	based on annual
Emission Factor/vehicle	2.51E-6	g/sec	9.64E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	4.92E-08	g/sec	1.89E-07	

Lemon St West of Sonoma Boulevard	**PM2.5**	**phase 1 alternative**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	4.92E-08	0	0.00E+00	1.89E-07	0	0.00E+00
2	4.92E-08	0	0.00E+00	0.00E+00	0	0.00E+00
3	4.92E-08	0	0.00E+00	0.00E+00	0	0.00E+00
4	4.92E-08	3	2.95E-07	2.95E-07	2	2.46E-07
5	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
6	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
7	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
8	4.92E-08	6	5.91E-07	5.91E-07	5	4.92E-07
9	4.92E-08	4	3.94E-07	7.72E-07	3	3.28E-07
10	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
11	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
12	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
13	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
14	4.92E-08	6	5.91E-07	5.91E-07	5	4.92E-07
15	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
16	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
17	4.92E-08	4	3.94E-07	5.83E-07	3	3.28E-07
18	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
19	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
20	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
21	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
22	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
23	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
24	4.92E-08	4	3.94E-07	3.94E-07	3	3.28E-07
	Total HHDT/Day	87.0			72.5	

PM2.5 Public Paved Road (Exhaust Emissions)							Length (m)	Width (m)
		HHDT	LDA			Sonoma South of Lemon	735	24
Emission factor, E	g/VKT	0.013	0.0024	Lemon		Sonoma North of Lemon	525	24
Emission factor, E (annual)	g/VKT	0.0092	0.0013	Sonoma Blvd		Lemon East of Sonoma	820	16
						Sonoma South of Magazine	698	24

Sonoma North of Lemon	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	22		22	
Distance Travelled	0.525	km	0.525	
Distance Travelled	0.326	miles	0.326	
Emission Factor/vehicle	0.005	g/hr	0.0007	based on annual
Emission Factor/vehicle	1.33E-6	g/sec	3.81E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	6.07E-08	g/sec	1.73E-07	

Sonoma South of Lemon	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	31		31	
Distance Travelled	0.735	km	0.735	
Distance Travelled	0.457	miles	0.457	
Emission Factor/vehicle	0.0067	g/hr	0.0010	based on annual
Emission Factor/vehicle	1.87E-6	g/sec	5.3E-06	includes all trips/day
Emissions /vehicle/AERMOD Source	6.03E-08	g/sec	1.72E-07	

Sonoma North Of Lemon	**PM2.5**	**phase 2 alternative**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	6.07E-08	0.00	0.00E+00	8.65E-09	0	0.00E+00
2	6.07E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00
3	6.07E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00
4	6.07E-08	0.15	1.82E-08	1.82E-08	0	1.52E-08
5	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
6	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
7	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
8	6.07E-08	0.30	3.64E-08	3.64E-08	0	3.03E-08
9	6.07E-08	0.20	2.43E-08	4.16E-08	0	2.02E-08
10	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
11	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
12	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
13	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
14	6.07E-08	0.30	3.64E-08	3.64E-08	0	3.03E-08
15	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
16	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
17	6.07E-08	0.20	2.43E-08	3.29E-08	0	2.02E-08
18	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
19	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
20	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
21	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
22	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
23	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
24	6.07E-08	0.20	2.43E-08	2.43E-08	0	2.02E-08
	Total HHDT/Day	4.4			3.6	

Sonoma South Of Lemon	PM2.5	phase 2 alternative	PM2.5	PM2.5	PM2.5	PM2.5
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	6.03E-08	0	0.00E+00	6.70E-08	0.00	0.00E+00
2	6.03E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
3	6.03E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
4	6.03E-08	1	1.41E-07	1.41E-07	0.97	1.17E-07
5	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
6	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
7	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
8	6.03E-08	2	2.82E-07	2.82E-07	1.95	2.35E-07
9	6.03E-08	2	1.88E-07	3.22E-07	1.30	1.57E-07
10	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
11	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
12	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
13	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
14	6.03E-08	2	2.82E-07	2.82E-07	1.95	2.35E-07
15	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
16	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
17	6.03E-08	2	1.88E-07	2.55E-07	1.30	1.57E-07
18	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
19	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
20	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
21	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
22	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
23	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
24	6.03E-08	2	1.88E-07	1.88E-07	1.30	1.57E-07
	Total HHDT/Day	33.9			28.3	

Lemon East Of Sonoma Boulevard	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	16	m	16	
AERMOD Volume Sources	51		51	
Distance Travelled	0.820	km	0.820	
Distance Travelled	0.510	miles	0.510	
Emission Factor/vehicle	0.010	g/hr	0.0020	based on annual
Emission Factor/vehicle	2.86E-06	g/sec	1.10E-07	includes all trips/day
Emissions /vehicle/AERMOD Source	5.60E-08	g/sec	2.15E-07	

Sonoma Boulevard South Of Magazine St	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	
AERMOD Volume Sources	29		29	
Distance Travelled	0.698	km	0.698	
Distance Travelled	0.434	miles	0.434	
Emission Factor/vehicle	0.0064	g/hr	0.0009	based on annual
Emission Factor/vehicle	1.77E-06	g/sec	5.1E-6	includes all trips/day
Emissions /vehicle/AERMOD Source	6.12E-08	g/sec	1.75E-07	

Lemon East Of Sonoma	**PM2.5**	**phase 2 alternative**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	5.60E-08	0	0.00E+00	1.20E-07	0.00	0.00E+00
2	5.60E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
3	5.60E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
4	5.60E-08	2	1.88E-07	1.88E-07	1.40	1.57E-07
5	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
6	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
7	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
8	5.60E-08	3	3.77E-07	3.77E-07	2.80	3.14E-07
9	5.60E-08	2	2.51E-07	4.92E-07	1.87	2.09E-07
10	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
11	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
12	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
13	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
14	5.60E-08	3	3.77E-07	3.77E-07	2.80	3.14E-07
15	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
16	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
17	5.60E-08	2	2.51E-07	3.72E-07	1.87	2.09E-07
18	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
19	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
20	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
21	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
22	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
23	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
24	5.60E-08	2	2.51E-07	2.51E-07	1.87	2.09E-07
	Total HHDT/Day	48.7			40.6	

Sonoma South Of Magazine St	**PM2.5**	**phase 2 alternative**	**PM2.5**	**PM2.5**	**PM2.5**	**PM2.5**
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA	Vehicles Per Hour	Including LDA
1	6.12E-08	0	0.00E+00	6.81E-08	0.00	0.00E+00
2	6.12E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
3	6.12E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00
4	6.12E-08	1	1.43E-07	1.43E-07	0.97	1.19E-07
5	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
6	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
7	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
8	6.12E-08	2	2.86E-07	2.86E-07	1.95	2.38E-07
9	6.12E-08	2	1.91E-07	3.27E-07	1.30	1.59E-07
10	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
11	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
12	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
13	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
14	6.12E-08	2	2.86E-07	2.86E-07	1.95	2.38E-07
15	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
16	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
17	6.12E-08	2	1.91E-07	2.59E-07	1.30	1.59E-07
18	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
19	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
20	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
21	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
22	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
23	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
24	6.12E-08	2	1.91E-07	1.91E-07	1.30	1.59E-07
	Total HHDT/Day	33.9			28.3	

	Deliveries	Staff Commute
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	Tonnage by truck	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.467	1.01	1.01	0.194	0.0267	0.0294	58.87
Phase 1 Trucks & Rail	720000	240000	13846	80.467	1.01	1.01	0.194	0.0140	0.0154	30.82
Phase 1 Alternative	1350000	480000	26445	80.467	1.01	1.01	0.194	0.0267	0.0294	58.87
Phase 2	1,160,000	214,400	12503	80.467	1.01	1.01	0.194	0.0126	0.0139	27.83
Phase 2 Alternative	1,160,000	310,400	17542	80.467	1.01	1.01	0.194	0.0177	0.0195	39.05
LDA Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	Movements/day	Movements per year	distance travelled	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	0.10	0.10	0.005	0.0004	0.0004	0.79
Phase 1 Trucks & Rail	720000	24	4992	39.910	0.10	0.10	0.005	0.0005	0.0005	1.06
Phase 1 Alternative	1350000	40	10400	39.910	0.10	0.10	0.008	0.0010	0.0011	2.20
Phase 2	1,160,000	80	20800	39.910	0.10	0.10	0.017	0.0020	0.0022	4.41
Phase 2 Alternative	1,160,000	80	20800	39.910	0.10	0.10	0.017	0.0020	0.0022	4.41
							PM2.5			
							lbs/day	MTPA	tpa	lbs/year
					Combined	Phase 1 Trucks Only	0.199	0.0271	0.0298	59.7
						Phase 1 Trucks & Rail	0.199	0.0145	0.0159	31.9
						Phase 1 Alternative	0.202	0.0277	0.0305	61.1
						Phase 2	0.211	0.0146	0.0161	32.2
						Phase 2 Alternative	0.211	0.0197	0.0217	43.5

APPENDIX AQ EMITS

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600	per year			
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days		**Maximum Day**	
Duration of ship unloading	132	hrs (5.5 days)		**CO**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	56	lbs/day

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**CO**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	2825	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.9	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	
Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	5.34	CO at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.93	CO at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2012)	
Maneuvering	0.275	POLA (2012)	
Transit	0.104	POLA (2012)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CO**
Slow	Marine Distillate (0.1% S)	**1.380**
Medium	Marine Distillate (0.1% S)	**1.380**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CO**
Slow	Marine Distillate (0.1% S)	**1.380**
Medium	Marine Distillate (0.1% S)	**1.380**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CO**
Medium	Marine Distillate (0.1% S)	**1.100**
		g/kW-HR

Boiler

	CO
Marine Distillate (0.1% S)	**0.20**
	g/kW-HR

Tug

	CO
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

		Emission Factors (g/kW-hr)								
Year	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	0.195542	0.001767
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	0.195032	0.001765
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category
With fuel regulations and MARPOL standards

Golden Gate	Dock		23.13	nm	23.13		AWN	73673	
Sea Buoy	GG		8.72		8.91			1700	
At Buoy			1.5		1.5			1300	
North	Sea Buoy		7.4		6.1	Link not included			
			40.75	nm	39.64			76673	meters
		1.1508	46.8951					41.43703	nm
			75454.22						
			72454.22						
	Out to Sea Buoy		33.35		33.54	nm			
				1.1508	38.59783	statute miles			
					62103.91	meters			
					59103.91	meters - 3000 meters for maneuvering			

			g/hp-hr					
Calendar Year	Area	Engine	NOx	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172

Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
http://www.arb.ca.gov/msei/categories.htm#chc_category

Diesel Hoppers / Conveyors

OFFROAD2011	Load Factor	kw	CO
Hopper / Conveyor	0.40	201	0.9200
			g/(hp-hr)
Deterioration Rate	2.43E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	N/A		
Emission Rate	79.90	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate / Hopper/Conveyor CO	0.022193	g/s

Unpaved Road - Industrial (Excavator in stockpile)

OFFROAD2011	Load Factor	HP	CO
Excavator	0.38	175	2.70
			g/(hp-hr)
Deterioration Rate	7.14E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	1		
Emission Rate	195.7	g/hr	

Activity Factor	0.25	Fractional usage per hour
Emission Rate / Excavator	0.01359	g/s

Unpaved Road - Industrial (Front Loader stockpile to hopper)

OFFROAD2011	Load Factor	HP	CO (diesel)
Front Loader	0.36	369	0.92
CAT980K			g/(hp-hr)
Deterioration Rate	1.82E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	3 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	123.08	g/hr	

Activity Factor	0.75	Fractional usage per hour	
Emission Rate / Front Loader & Excavator	0.039	g/s	Both excavator and front loader

	24-HR Maximum	Annual
Sources (Slag Heap N)	12	26
Sources (Slag Heap S)	5	13

	24-HR Maximum	Annual	
Emission Rate / Front Loader & Excavator / Source (SHN)	0.0033	0.00151	g/s
Emission Rate / Front Loader & Excavator/ Source (SHS)	0.0078	0.00302	g/s

CO (diesel)	Front Loader - Gypsum Loading			
Emission Rate	123.08	g/hr		
	0.0342	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	7.69	g/km		Tonnage / front loader
Gypsum Storage Sources	12			Tons / front loader
Spacing storage	0.010	km		Gypsum Tonnage
				3,522
Distance Travelled S3	0.240	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.24	14,088
				22,306
Emissions per hour S3	1.85	g/hr	0.438	
Emissions per sec S3	0.00051	g/sec	0.00012	
	CO Maximum Day		CO Annual	
Emissions per sec S3/source	4.27E-05	g/sec	1.01E-05	

CO Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	3.33	Annual	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO(g/hr-veh)	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (Ann)	g/vkt	2.07	3.33	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.44	0.71	EMFAC2011	
					Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	1.95	3.13	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	1.050	0.231	1.050
2020	Annual	LDA	DSL	Aggregated	10	2.588	0.000	2.588

LDA Idling Calculation						
2020	Annual	LDA	GAS	Aggregated		CO_RUNEX
						Annual
Speed	5	miles/hr	GAS	Aggregated	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	Aggregated	3.468

		CO_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.959	1.544	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	1.608	2.588	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.942	1.515	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	1.649	2.654	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.944	1.520	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	CO		CO	
Spacing of point sources	9	m	9	
AERMOD Point Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469		0.469	
Emission Factor/vehicle	1.470	g/hr	0.713	based on annual
Emission Factor/vehicle	0.00041	g/sec	0.00317	based on annual
Emission Factor/vehicle/AERMOD Source	4.92E-06	g/sec	3.82E-05	based on annual

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	CO Emission Factor	CO Vehicles / hr	CO Emission Factor	CO Including LDA
1	4.92E-06	5	2.39E-05	6.211E-05
2	4.92E-06	6	3.19E-05	3.191E-05
3	4.92E-06	10	4.79E-05	4.786E-05
4	4.92E-06	11	5.58E-05	5.584E-05
5	4.92E-06	13	6.38E-05	6.381E-05
6	4.92E-06	13	6.38E-05	6.381E-05
7	4.92E-06	13	6.38E-05	6.381E-05
8	4.92E-06	13	6.38E-05	6.381E-05
9	4.92E-06	13	6.38E-05	1.402E-04
10	4.92E-06	13	6.38E-05	6.381E-05
11	4.92E-06	15	7.37E-05	7.365E-05
12	4.92E-06	13	6.38E-05	6.381E-05
13	4.92E-06	11	5.58E-05	5.584E-05
14	4.92E-06	5	2.39E-05	2.393E-05
15	4.92E-06	7	3.38E-05	3.377E-05
16	4.92E-06	0	0.00E+00	0.000E+00
17	4.92E-06	0	0.00E+00	3.818E-05
18	4.92E-06	0	0.00E+00	0.000E+00
19	4.92E-06	0	0.00E+00	0.000E+00
20	4.92E-06	0	0.00E+00	0.000E+00
21	4.92E-06	0	0.00E+00	0.000E+00
22	4.92E-06	0	0.00E+00	0.000E+00
23	4.92E-06	2	7.98E-06	7.977E-06
24	4.92E-06	3	1.60E-05	1.595E-05

Total HHDT/Day	166.1
	including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

				24-Hour Maximum
	CO Emission Factor	Milestone5 Vehicles / hr	CO Emission Factor	CO Including LDA
1	4.92E-06	5	2.39E-05	6.21E-05
2	4.92E-06	6	3.19E-05	3.19E-05
3	4.92E-06	10	4.79E-05	4.79E-05
4	4.92E-06	11	5.58E-05	5.58E-05
5	4.92E-06	13	6.38E-05	6.38E-05
6	4.92E-06	13	6.38E-05	6.38E-05
7	4.92E-06	13	6.38E-05	6.38E-05
8	4.92E-06	19	9.33E-05	9.33E-05
9	4.92E-06	19	9.33E-05	1.70E-04

24-Hour Maximum

VMT	Cumulative
CO Including LDA	CO Including LDA
4.81E-05	1.10E-04
0.00E+00	3.19E-05
0.00E+00	4.79E-05
1.47E-05	7.05E-05
1.96E-05	8.34E-05
1.96E-05	8.34E-05
1.96E-05	8.34E-05
1.96E-05	1.13E-04
1.16E-04	2.86E-04

10	4.92E-06	19	9.33E-05	9.33E-05	2.94E-05	1.23E-04
11	4.92E-06	21	1.03E-04	1.03E-04	1.96E-05	1.23E-04
12	4.92E-06	19	9.33E-05	9.33E-05	1.96E-05	1.13E-04
13	4.92E-06	17	8.54E-05	8.54E-05	1.96E-05	1.05E-04
14	4.92E-06	11	5.34E-05	5.34E-05	2.94E-05	8.29E-05
15	4.92E-06	13	6.33E-05	6.33E-05	1.96E-05	8.29E-05
16	4.92E-06	6	2.95E-05	2.95E-05	1.96E-05	4.91E-05
17	4.92E-06	6	2.95E-05	6.77E-05	6.77E-05	1.35E-04
18	4.92E-06	0	0.00E+00	0.00E+00	1.96E-05	1.96E-05
19	4.92E-06	0	0.00E+00	0.00E+00	1.96E-05	1.96E-05
20	4.92E-06	0	0.00E+00	0.00E+00	1.96E-05	1.96E-05
21	4.92E-06	0	0.00E+00	0.00E+00	1.96E-05	1.96E-05
22	4.92E-06	0	0.00E+00	0.00E+00	1.96E-05	1.96E-05
23	4.92E-06	2	7.98E-06	7.98E-06	1.96E-05	2.76E-05
24	4.92E-06	3	1.60E-05	1.60E-05	1.96E-05	3.56E-05

Total HHDT/Day	226.1	
	including deliveries (2 per day, 10am, 2pm)	

Annual					Maximum Day	Annual Mean				
HGV Traffic					CO	CO	CO	CO	CO	CO
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	1.470	1.470	0.733	0.0125	0.0137	27.49
milestone 2	240000		14578	0.755	1.470	1.470	0.733	0.0214	0.0236	47.25
milestone 3	360000		20676	0.755	1.470	1.470	0.733	0.0304	0.0335	67.01
milestone 4	480000		22723	0.755	1.470	1.470	0.733	0.0334	0.0368	73.64
milestone 5	760000		32534	0.755	1.470	1.470	0.733	0.0478	0.0527	105.44
					Maximum Day	Annual Mean				
LDA Traffic					CO	CO	CO	CO	CO	CO
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1		14	2184	0.755	0.713	0.713	0.022	0.0016	0.0017	3.43
milestone 2		24	4992	0.755	0.713	0.713	0.038	0.0036	0.0039	7.85
milestone 3		24	6240	0.755	0.713	0.713	0.038	0.0044	0.0049	9.81
milestone 4		64	16640	0.755	0.713	0.713	0.101	0.0119	0.0131	26.16
milestone 5		64	19968	0.755	0.713	0.713	0.101	0.0142	0.0157	31.39
									tpa	
							CO			
							lbs/day	MTPA	tpa	lbs/year
					Combined	milestone 1	0.75	0.0140	0.0155	30.9
						milestone 2	0.77	0.0250	0.0275	55.1
						milestone 3	0.77	0.0348	0.0384	76.8
						milestone 4	0.83	0.0453	0.0499	99.8
						milestone 5	0.83	0.0621	0.0684	136.8

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor CO

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	1.69	Annual	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO (g/hr-veh)	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	1.05	1.69	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.44	0.71	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	1.01	1.62	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.865		0.865
2020	Annual	LDA	DSL	Aggregated	20	0.550		0.550

Idling Calculation					
2020	Annual	LDA	GAS	Aggregated	CO
					Annual
Speed	5	miles/hr	GAS	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	3.468

		CO	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.538	0.865	EMFAC2011	No start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.342	0.550	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.552	0.888	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.478	0.769	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.551	0.888	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT		LDA	
		CO		CO	
Spacing of point sources		14	m	14	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.725	g/hr	0.397	based on Annual
Emission Factor/vehicle		0.00020	g/sec	0.001765	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		3.95E-06	g/sec	3.46E-05	based on annual

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	CO Emission Factor (Maximum Day)	Milestone5 Trucks	CO Emission Factor	CO Including LDA (Maximum Day)	Maximum 24-Hr VMT CO Including LDA	Cumulative CO Including LDA
1	3.95E-06	4.86	3.84E-05	7.30E-05	4.33E-05	1.16E-04
2	3.95E-06	6.49	5.12E-05	5.12E-05	0.00E+00	5.12E-05
3	3.95E-06	9.73	7.68E-05	7.68E-05	0.00E+00	7.68E-05
4	3.95E-06	11.35	8.96E-05	8.96E-05	2.37E-05	1.13E-04
5	3.95E-06	12.97	1.02E-04	1.02E-04	3.17E-05	1.34E-04
6	3.95E-06	12.97	1.02E-04	1.02E-04	3.17E-05	1.34E-04
7	3.95E-06	12.97	1.02E-04	1.02E-04	3.17E-05	1.34E-04
8	3.95E-06	12.97	1.02E-04	1.02E-04	3.17E-05	1.34E-04
9	3.95E-06	12.97	1.02E-04	1.72E-04	1.18E-04	2.90E-04
10	3.95E-06	12.97	1.02E-04	1.02E-04	4.75E-05	1.50E-04
11	3.95E-06	14.97	1.18E-04	1.18E-04	3.17E-05	1.50E-04
12	3.95E-06	12.97	1.02E-04	1.02E-04	3.17E-05	1.34E-04
13	3.95E-06	11.35	8.96E-05	8.96E-05	3.17E-05	1.21E-04
14	3.95E-06	4.86	3.84E-05	3.84E-05	4.75E-05	8.59E-05
15	3.95E-06	6.86	5.42E-05	5.42E-05	3.17E-05	8.59E-05
16	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
17	3.95E-06	0.00	0.00E+00	3.46E-05	7.49E-05	1.10E-04
18	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
19	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
20	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
21	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
22	3.95E-06	0.00	0.00E+00	0.00E+00	3.17E-05	3.17E-05
23	3.95E-06	1.62	1.28E-05	1.28E-05	3.17E-05	4.45E-05
24	3.95E-06	3.24	2.56E-05	2.56E-05	3.17E-05	5.73E-05
		166.1 including deliveries (2 per day, 10am, 2pm)			3.59E-05	9.63E-05

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					CO	CO	CO	CO	CO	CO
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.47	81.01	81.01	29.7	0.7	0.8	1514.7
milestone 2	240000		14578	80.47	81.01	81.01	29.7	1.2	1.3	2603.6
milestone 3	360000		20676	80.47	81.01	81.01	29.7	1.7	1.8	3692.6
milestone 4	480000		22723	80.47	81.01	81.01	29.7	1.8	2.0	4058.2
milestone 5	760000		32534	80.47	81.01	81.01	29.7	2.6	2.9	5810.4
LDA Traffic					CO	CO	CO	CO	CO	CO
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1		14	2184	39.91	22.01	22.01	0.679	0.048	0.053	106.0
milestone 2		24	4992	39.91	22.01	22.01	1.165	0.110	0.121	242.2
milestone 3		24	6240	39.91	22.01	22.01	1.165	0.137	0.151	302.8
milestone 4		64	16640	39.91	22.01	22.01	3.106	0.366	0.404	807.4
milestone 5		64	19968	39.91	22.01	22.01	3.106	0.440	0.484	968.9
									tpa	
							CO			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	30.4	0.7	0.81	1621
						milestone 2	30.8	1.3	1.42	2846
						milestone 3	30.8	1.8	2.00	3995
						milestone 4	32.8	2.2	2.43	4866
						milestone 5	32.8	3.1	3.39	6779

		Length	Width	Area
SONOM_S	Sonoma South of Lemon	735	24	17640
SONOM_N	Sonoma North of Lemon	525	24	12600
LEMON_E	Lemon East of Sonoma	820	16	13120
SONOM_S2	Sonoma South of Magazine	698	24	16752

CO		HHDT	LDA	
Emission factor, E	g/VKT	0.320	0.411	Sonoma Blvd
Emission factor, E	g/VKT	1.007	0.551	Lemon

Sonoma North of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		CO		CO	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		22		22	
Distance Travelled (Sonoma North)		0.525	km	0.525	
Emission Factor/vehicle		0.168	g/hr	0.216	
Emission Factor/vehicle		0.000047	g/sec	0.000958	includes shift trips/day
Emission factor, E		2.12E-06	g/sec	4.36E-05	

Sonoma North of Lemon			0.525
Split	0.05		km

Maximum 24-Hr

VMT	Cumulative

Milestone 5

Weekday Hours	CO Emission Factor	0.0000 0.0000	CO Emission Factor	CO Including LDA	CO Including LDA	CO Including LDA
1	2.12E-06	0.24	1.03E-06	3.21E-06	2.72E-06	5.93E-06
2	2.12E-06	0.32	1.38E-06	1.38E-06	0.00E+00	1.38E-06
3	2.12E-06	0.49	2.07E-06	2.07E-06	0.00E+00	2.07E-06
4	2.12E-06	0.57	2.41E-06	2.41E-06	6.37E-07	3.05E-06
5	2.12E-06	0.65	2.75E-06	2.75E-06	8.50E-07	3.60E-06
6	2.12E-06	0.65	2.75E-06	2.75E-06	8.50E-07	3.60E-06
7	2.12E-06	0.65	2.75E-06	2.75E-06	8.50E-07	3.60E-06
8	2.12E-06	0.65	2.75E-06	2.75E-06	8.50E-07	3.60E-06
9	2.12E-06	0.65	2.75E-06	7.11E-06	6.29E-06	1.34E-05
10	2.12E-06	0.65	2.75E-06	2.75E-06	1.27E-06	4.03E-06
11	2.12E-06	0.75	3.18E-06	3.18E-06	8.50E-07	4.03E-06
12	2.12E-06	0.65	2.75E-06	2.75E-06	8.50E-07	3.60E-06
13	2.12E-06	0.57	2.41E-06	2.41E-06	8.50E-07	3.26E-06
14	2.12E-06	0.24	1.03E-06	1.03E-06	1.27E-06	2.31E-06
15	2.12E-06	0.34	1.46E-06	1.46E-06	8.50E-07	2.31E-06
16	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
17	2.12E-06	0.00	0.00E+00	2.18E-06	3.57E-06	5.75E-06
18	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
19	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
20	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
21	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
22	2.12E-06	0.00	0.00E+00	0.00E+00	8.50E-07	8.50E-07
23	2.12E-06	0.08	3.44E-07	3.44E-07	8.50E-07	1.19E-06
24	2.12E-06	0.16	6.89E-07	6.89E-07	8.50E-07	1.54E-06
				g/sec		

8.31

including deliveries (2 per day, 10am, 2pm)

Sonoma South of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		CO		CO	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		31		31	
Distance Travelled (Sonoma South)		0.735	km	0.735	
Emission Factor/vehicle		0.24	g/hr	0.302	
Emission Factor/vehicle		0.00007	g/sec	0.001341	includes shift trips/day
Emission factor, E		2.11E-06	g/sec	4.33E-05	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	CO Emission Factor	CO Vehicles / hr	CO Emission Factor	CO Including LDA	Maximum 24-Hr VMT CO Including LDA	Cumulative CO Including LDA
1	2.11E-06	2	8.01E-06	2.49E-05	2.11E-05	4.60E-05
2	2.11E-06	3	1.07E-05	1.07E-05	0.00E+00	1.07E-05
3	2.11E-06	4	1.60E-05	1.60E-05	0.00E+00	1.60E-05
4	2.11E-06	4	1.87E-05	1.87E-05	4.94E-06	2.36E-05
5	2.11E-06	5	2.13E-05	2.13E-05	6.58E-06	2.79E-05
6	2.11E-06	5	2.13E-05	2.13E-05	6.58E-06	2.79E-05
7	2.11E-06	5	2.13E-05	2.13E-05	6.58E-06	2.79E-05
8	2.11E-06	5	2.13E-05	2.13E-05	6.58E-06	2.79E-05
9	2.11E-06	5	2.13E-05	5.51E-05	4.88E-05	1.04E-04
10	2.11E-06	5	2.13E-05	2.13E-05	9.88E-06	3.12E-05
11	2.11E-06	6	2.46E-05	2.46E-05	6.58E-06	3.12E-05
12	2.11E-06	5	2.13E-05	2.13E-05	6.58E-06	2.79E-05
13	2.11E-06	4	1.87E-05	1.87E-05	6.58E-06	2.53E-05
14	2.11E-06	2	8.01E-06	8.01E-06	9.88E-06	1.79E-05
15	2.11E-06	3	1.13E-05	1.13E-05	6.58E-06	1.79E-05
16	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
17	2.11E-06	0	0.00E+00	1.69E-05	2.77E-05	4.46E-05
18	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
19	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
20	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
21	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
22	2.11E-06	0	0.00E+00	0.00E+00	6.58E-06	6.58E-06
23	2.11E-06	1	2.67E-06	2.67E-06	6.58E-06	9.25E-06
24	2.11E-06	1	5.34E-06	5.34E-06	6.58E-06	1.19E-05
				g/hr		

64.8

including deliveries (2 per day, 10am, 2pm)

Annualised
2.37E-05

Lemon St East Of Sonoma

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		16	m	16	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street East)		0.820	km	0.820	
Emission Factor/vehicle		0.826	g/hr	0.452	
Emission Factor/vehicle		0.00023	g/sec	0.002010	includes shift trips/day
Emission factor, E		4.50E-06	g/sec	3.94E-05	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Weekday Hours	CO Emission Factor	CO Vehicles / hr	CO Emission Factor	CO Including LDA	Maximum 24-Hr VMT CO Including LDA	Cumulative CO Including LDA
1	4.50E-06	3	2.45E-05	4.66E-05	2.76E-05	7.42E-05
2	4.50E-06	4	3.27E-05	3.27E-05	0.00E+00	3.27E-05
3	4.50E-06	5	4.90E-05	4.90E-05	0.00E+00	4.90E-05
4	4.50E-06	6	5.72E-05	5.72E-05	1.51E-05	7.23E-05
5	4.50E-06	7	6.53E-05	6.53E-05	2.02E-05	8.55E-05
6	4.50E-06	7	6.53E-05	6.53E-05	2.02E-05	8.55E-05
7	4.50E-06	7	6.53E-05	6.53E-05	2.02E-05	8.55E-05
8	4.50E-06	7	6.53E-05	6.53E-05	2.02E-05	8.55E-05
9	4.50E-06	7	6.53E-05	1.09E-04	7.54E-05	1.85E-04
10	4.50E-06	7	6.53E-05	6.53E-05	3.03E-05	9.56E-05
11	4.50E-06	8	7.54E-05	7.54E-05	2.02E-05	9.56E-05
12	4.50E-06	7	6.53E-05	6.53E-05	2.02E-05	8.55E-05
13	4.50E-06	6	5.72E-05	5.72E-05	2.02E-05	7.73E-05
14	4.50E-06	3	2.45E-05	2.45E-05	3.03E-05	5.48E-05
15	4.50E-06	4	3.46E-05	3.46E-05	2.02E-05	5.48E-05
16	4.50E-06	0	0.00E+00	0.00E+00	2.02E-05	2.02E-05
17	4.50E-06	0	0.00E+00	2.21E-05	4.78E-05	6.99E-05
18	4.50E-06	0	0.00E+00	0.00E+00	2.02E-05	2.02E-05
19	4.50E-06	0	0.00E+00	0.00E+00	2.02E-05	2.02E-05
20	4.50E-06	0	0.00E+00	0.00E+00	2.02E-05	2.02E-05
21	4.50E-06	0	0.00E+00	0.00E+00	2.02E-05	2.02E-05

22	4.50E-06	0	0.00E+00	0.00E+00		2.02E-05	2.02E-05
23	4.50E-06	1	8.16E-06	8.16E-06		2.02E-05	2.84E-05
24	4.50E-06	2	1.63E-05	1.63E-05		2.02E-05	3.65E-05
				g/hr			

93.0
including deliveries (2 per day, 10am, 2pm)

Sonoma South of Magazine

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		29		29	
Distance Travelled (Sonoma South Magazine)		0.698	km	0.698	
Emission Factor/vehicle		0.224	g/hr	0.287	
Emission Factor/vehicle		0.00006	g/sec	0.001274	includes shift trips/day
Emission factor, E		2.14E-06	g/sec	4.39E-05	

Sonoma South of Magazine				0.698		Maximum 24-Hr	
Split	0.39			km		VMT	Cumulative
Milestone 5							
	CO	CO	CO	CO		CO	CO
Weekday Hours	Emission Factor	Vehicles / hr	Emission Factor	Including LDA		Including LDA	Including LDA
1	2.14E-06	2	8.13E-06	2.53E-05		2.14E-05	4.67E-05
2	2.14E-06	3	1.08E-05	1.08E-05		0.00E+00	1.08E-05
3	2.14E-06	4	1.63E-05	1.63E-05		0.00E+00	1.63E-05
4	2.14E-06	4	1.90E-05	1.90E-05		5.01E-06	2.40E-05
5	2.14E-06	5	2.17E-05	2.17E-05		6.68E-06	2.84E-05
6	2.14E-06	5	2.17E-05	2.17E-05		6.68E-06	2.84E-05
7	2.14E-06	5	2.17E-05	2.17E-05		6.68E-06	2.84E-05
8	2.14E-06	5	2.17E-05	2.17E-05		6.68E-06	2.84E-05
9	2.14E-06	5	2.17E-05	5.59E-05		4.95E-05	1.05E-04
10	2.14E-06	5	2.17E-05	2.17E-05		1.00E-05	3.17E-05
11	2.14E-06	6	2.50E-05	2.50E-05		6.68E-06	3.17E-05
12	2.14E-06	5	2.17E-05	2.17E-05		6.68E-06	2.84E-05
13	2.14E-06	4	1.90E-05	1.90E-05		6.68E-06	2.56E-05
14	2.14E-06	2	8.13E-06	8.13E-06		1.00E-05	1.82E-05
15	2.14E-06	3	1.15E-05	1.15E-05		6.68E-06	1.82E-05
16	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
17	2.14E-06	0	0.00E+00	1.71E-05		2.81E-05	4.52E-05
18	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
19	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
20	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
21	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
22	2.14E-06	0	0.00E+00	0.00E+00		6.68E-06	6.68E-06
23	2.14E-06	1	2.71E-06	2.71E-06		6.68E-06	9.39E-06
24	2.14E-06	1	5.42E-06	5.42E-06		6.68E-06	1.21E-05
				g/s			

64.8
including deliveries (2 per day, 10am, 2pm)

Annualised
2.40E-05

Public Paved Road (Exhaust Emissions)

(Assumed 40 miles/hr for all vehicles on Sonoma Blvd)

HHDT Emission Factor CO

EMFAC2011 Emission Rates							0.6214
Region Type:	GAI						mile to km
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	40	miles/hr					
Vehicle Classification:	EMFAC2007 Categories					Annual	
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run	
						(gms/mile)	
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.500	Annual

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO (g/hr-veh)	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.31	0.50	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.44	0.71	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.32	0.52	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40	0.6207		0.621
2020	Annual	LDA	DSL	Aggregated	40	0.1939		0.194

Idling Calculation					
2020	Annual	LDA	GAS	Aggregated	(gms/mile)
					Annual
Speed	5	miles/hr	GAS	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	3.468

		CO	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	0.386	0.621	EMFAC2011	start emissions - 10mins
Tailpipe DSL LDA (ann)	g/vkt	0.121	0.194	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.411	0.662	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.273	0.439	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.411	0.661	sum	Based on 0.38% Diesel

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 3% O2, Dry	11,784	1.04	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**30**	ppm at 3% O2	#REF!	ratio
NOX Emission Level	30.0	ppm at 3% O2		

convert from	converrt to	
	m3/hr	
cfm	1.699	
	cfm	
m3/hr	0.589	#REF!
		ACFM

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2)	**56.60**	2.00	3.142	381.05	1.33	1.04	11784	0.67	667	0.185	1.4705	35.29
SO2	1.82	2.00	3.142	381.05	1.33	1.04	11784	0	21	0.006	0.0472	1.13
CO	114.50	2.00	3.142	381.05	1.33	1.04	11784	1.35	1349	**0.375**	2.9745	71.39
PM10	10.72	2.00	3.142	381.05	1.33	1.04	11784	0.13	126	0.035	0.2785	6.68
PM2.5	9.65	2.00	3.142	381.05	1.33	1.04	11784	0.11	114	0.032	0.2507	6.02
TOC	15.52	2.00	3.142	381.05	1.33	1.04	11784	0.18	183	0.051	0.4032	9.68

PM10
PM2.5
NOX (as NO2)
SO2
CO
PM10
PM2.5
Background
NO2
SO2
CO

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	CO (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	3.78
1	4.76%	33.32	5.00%	1.67	2.52
2	14.18%	99.26	25.00%	24.82	37.47
3	27.80%	194.6	2.30%	4.48	6.76
4	42.07%	294.49	21.50%	63.32	95.61
5	57.30%	401.1	1.50%	6.02	9.08
6	72.51%	507.57	1.60%	8.12	12.26
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**1.00**				

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

CO
Annual Average

Shipping (48 Movements)	Emission Rates	Units	Sources	Contributors
Transit (greater than 3km from port)	3.62E-03	g/s/source	65	Orcem Only On Maximum Day
Transit (within 3km of port)	2.56E-03	g/s/source	34	Orcem Only On Maximum Day
Maneuvering	1.21E-02	g/s/source	26	Orcem Only On Maximum Day
Hoteling (Aux Eng)	0.04583	g/s/source	1	Orcem Only On Maximum Day
Hoteling (Boiler)	0.00606	g/s/source	1	Orcem Only On Maximum Day
Tugs (Ship Assist)	2.58E-02	g/s/source	26	Orcem Only On Maximum Day

Barge (No barge for Phase 1 alternative)	Emission Rates	Units	Sources	Contributors
Barge	0.00E+00	g/s/source		VMT (None on Maximum Day)

Diesel Hoppers	Emission Rates	Units	Sources	Contributors
Diesel Hopper 1	0.0222	g/s	1	Orcem Only
Diesel Hopper 2	0.0222	g/s	1	Orcem Only
Diesel Conveyor 1	0.0222	g/s	1	Orcem Only
Diesel Conveyor 2	0.0222	g/s	1	Orcem Only
Diesel Conveyor 3	0.0222	g/s	1	Orcem Only
Diesel Conveyor 4	0.0222	g/s	1	Orcem Only
Diesel Conveyor 5	0.0222	g/s	1	Orcem Only
Diesel Conveyor 6	0.0222	g/s	1	Orcem Only
Diesel Conveyor 7	0.0222	g/s	1	Orcem Only

Excavators / Front Loaders (Orcem)	Emission Rates	Units	Sources	Contributors
S1 Front Loader & Excavtor Combined	3.27E-03	g/s/source	12	Orcem Only
S2 Front Loader & Excavtor Combined	7.85E-03	g/s/source	5	Orcem Only
S3 Front Loader & Excavtor Combined	4.27E-05	g/s/source	12	Orcem Only

Front Loaders (VMT)	Emission Rates	Units	Sources	Contributors
Front Loader (truck loading)	6.69E-03	g/s/source	1	VMT Only

Forklift	Emission Rates	Units	Sources	Contributors
Forklift	4.39E-03	g/s	1	VMT Only

Industrial Paved (Onsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors	
CO Onsite Paved Road	1.00E+00	g/s/source	61	Orcem & VMT On Max Day	Hourly Emission Rate 1
CO Onsite Paved Road	1.00E+00	g/s/source	22	Orcem Only	Hourly Emission Rate 2
CO Onsite Paved Road	1.00E+00	g/s/source	19	VMT Only	Hourly Emission Rate 3

Public Paved Rd (Offsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors	
Lemon St West Of Sonoma	1.00E+00	g/s/source	51	Orcem & VMT On Max Day	Hourly Emission Rate 4
Sonoma North of Lemon	1.00E+00	g/s/source	22	Orcem & VMT On Max Day	Hourly Emission Rate 5
Sonoma South of Lemon	1.00E+00	g/s/source	31	Orcem & VMT On Max Day	Hourly Emission Rate 6
Lemon St East Of Sonoma	1.00E+00	g/s/source	51	Orcem & VMT On Max Day	Hourly Emission Rate 7
Sonoma South of Magazine	1.00E+00	g/s/source	29	Orcem & VMT On Max Day	Hourly Emission Rate 8

Main Stack	Emission Rates	Units	Sources	Contributors
Main Stack	0.37478	g/s	1	Orcem Only

Railways (Milestone 5)	Emission Rates	Units	Sources	Contributors
Switching (average)	8.27E-04	g/s/source	75	Orcem Only On Maximum Day
Line Haul idling	1.03E-03	g/s/source	1	Orcem Only On Maximum Day
Line Haul (10 kph)	5.47E-05	g/s/source	41	Orcem Only On Maximum Day
Line Haul (15 kph)	1.82E-04	g/s/source	24	Orcem Only On Maximum Day

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

CO
Annual Average

Point Sources

Source	Description	Emission Rate	Units
STACK	MAIN STACK	3.748E-01	g/s
RAIL_ID	Rail Idling	1.033E-03	g/s
RAILID2	Rail Idling	0.000E+00	g/s
RAILID3	Rail Idling	0.000E+00	g/s
SHPHTAX1	ship hoteling emission point	4.583E-02	g/s
SHPHBR1	Auxiliary Boiler 1	6.056E-03	g/s
MOB_HOP1	mobile hopper 1	2.219E-02	g/s
MOB_HOP2	mobile hopper 2	2.219E-02	g/s
CONVY4	conveyor	2.219E-02	g/s
CONVY3	conveyor	2.219E-02	g/s
CONVY1	conveyor	2.219E-02	g/s
CONVY6	conveyor	2.219E-02	g/s
CONVY5	conveyor	2.219E-02	g/s
CONVY7	conveyor	2.219E-02	g/s
CONVY2	conveyor	2.219E-02	g/s

Volume Sources

Source	Description	Emission Rate	Units	
ONFUG1	Onsite Exh	1.000E+00	g/s	Hourly Emission Rate 1
ONFUG2	Onsite Exh	1.000E+00	g/s	
ONFUG3	Onsite Exh	1.000E+00	g/s	
ONFUG4	Onsite Exh	1.000E+00	g/s	
ONFUG5	Onsite Exh	1.000E+00	g/s	
ONFUG6	Onsite Exh	1.000E+00	g/s	
ONFUG7	Onsite Exh	1.000E+00	g/s	
ONFUG8	Onsite Exh	1.000E+00	g/s	
ONFUG9	Onsite Exh	1.000E+00	g/s	
ONFUG10	Onsite Exh	1.000E+00	g/s	
ONFUG11	Onsite Exh	1.000E+00	g/s	
ONFUG12	Onsite Exh	1.000E+00	g/s	
ONFUG13	Onsite Exh	1.000E+00	g/s	
ONFUG14	Onsite Exh	1.000E+00	g/s	
ONFUG15	Onsite Exh	1.000E+00	g/s	
ONFUG16	Onsite Exh	1.000E+00	g/s	
ONFUG17	Onsite Exh	1.000E+00	g/s	
ONFUG18	Onsite Exh	1.000E+00	g/s	
ONFUG19	Onsite Exh	1.000E+00	g/s	
ONFUG20	Onsite Exh	1.000E+00	g/s	
ONFUG21	Onsite Exh	1.000E+00	g/s	
ONFUG22	Onsite Exh	1.000E+00	g/s	
ONFUG23	Onsite Exh	1.000E+00	g/s	
ONFUG24	Onsite Exh	1.000E+00	g/s	
ONFUG25	Onsite Exh	1.000E+00	g/s	
ONFUG26	Onsite Exh	1.000E+00	g/s	
ONFUG27	Onsite Exh	1.000E+00	g/s	
ONFUG28	Onsite Exh	1.000E+00	g/s	
ONFUG29	Onsite Exh	1.000E+00	g/s	
ONFUG30	Onsite Exh	1.000E+00	g/s	
ONFUG31	Onsite Exh	1.000E+00	g/s	
ONFUG32	Onsite Exh	1.000E+00	g/s	
ONFUG33	Onsite Exh	1.000E+00	g/s	
ONFUG34	Onsite Exh	1.000E+00	g/s	
ONFUG35	Onsite Exh	1.000E+00	g/s	
ONFUG36	Onsite Exh	1.000E+00	g/s	
ONFUG37	Onsite Exh	1.000E+00	g/s	
ONFUG38	Onsite Exh	1.000E+00	g/s	
ONFUG39	Onsite Exh	1.000E+00	g/s	
ONFUG40	Onsite Exh	1.000E+00	g/s	
ONFUG41	Onsite Exh	1.000E+00	g/s	
ORFUG42	Orcem Only Exh	1.000E+00	g/s	Hourly Emission Rate 2
ORFUG43	Orcem Only Exh	1.000E+00	g/s	
ORFUG44	Orcem Only Exh	1.000E+00	g/s	
ORFUG45	Orcem Only Exh	1.000E+00	g/s	
ORFUG46	Orcem Only Exh	1.000E+00	g/s	
ORFUG47	Orcem Only Exh	1.000E+00	g/s	
ORFUG48	Orcem Only Exh	1.000E+00	g/s	
ORFUG49	Orcem Only Exh	1.000E+00	g/s	
ORFUG50	Orcem Only Exh	1.000E+00	g/s	

ORFUG51	Orcem Only Exh	1.000E+00	g/s	
ORFUG52	Orcem Only Exh	1.000E+00	g/s	
ORFUG53	Orcem Only Exh	1.000E+00	g/s	
ORFUG54	Orcem Only Exh	1.000E+00	g/s	
ORFUG55	Orcem Only Exh	1.000E+00	g/s	
ORFUG56	Orcem Only Exh	1.000E+00	g/s	
ORFUG57	Orcem Only Exh	1.000E+00	g/s	
ORFUG58	Orcem Only Exh	1.000E+00	g/s	
ORFUG59	Orcem Only Exh	1.000E+00	g/s	
ORFUG60	Orcem Only Exh	1.000E+00	g/s	
ORFUG61	Orcem Only Exh	1.000E+00	g/s	
ORFUG62	Orcem Only Exh	1.000E+00	g/s	
ORFUG63	Orcem Only Exh	1.000E+00	g/s	
ONFUG64	Onsite Exh	1.000E+00	g/s	Hourly Emission Rate 1
ONFUG65	Onsite Exh	1.000E+00	g/s	
ONFUG66	Onsite Exh	1.000E+00	g/s	
ONFUG67	Onsite Exh	1.000E+00	g/s	
ONFUG68	Onsite Exh	1.000E+00	g/s	
ONFUG69	Onsite Exh	1.000E+00	g/s	
ONFUG70	Onsite Exh	1.000E+00	g/s	
ONFUG71	Onsite Exh	1.000E+00	g/s	
ONFUG72	Onsite Exh	1.000E+00	g/s	
ONFUG73	Onsite Exh	1.000E+00	g/s	
ONFUG74	Onsite Exh	1.000E+00	g/s	
ONFUG75	Onsite Exh	1.000E+00	g/s	
ONFUG76	Onsite Exh	1.000E+00	g/s	
ONFUG77	Onsite Exh	1.000E+00	g/s	
ONFUG78	Onsite Exh	1.000E+00	g/s	
ONFUG79	Onsite Exh	1.000E+00	g/s	
ONFUG80	Onsite Exh	1.000E+00	g/s	
ONFUG81	Onsite Exh	1.000E+00	g/s	
ONFUG82	Onsite Exh	1.000E+00	g/s	
ONFUG83	Onsite Exh	1.000E+00	g/s	
LMFUG1	Lemon St Exh	1.000E+00	g/s	Hourly Emission Rate 4
LMFUG2	Lemon St Exh	1.000E+00	g/s	
LMFUG3	Lemon St Exh	1.000E+00	g/s	
LMFUG4	Lemon St Exh	1.000E+00	g/s	
LMFUG5	Lemon St Exh	1.000E+00	g/s	
LMFUG6	Lemon St Exh	1.000E+00	g/s	
LMFUG7	Lemon St Exh	1.000E+00	g/s	
LMFUG8	Lemon St Exh	1.000E+00	g/s	
LMFUG9	Lemon St Exh	1.000E+00	g/s	
LMFUG10	Lemon St Exh	1.000E+00	g/s	
LMFUG11	Lemon St Exh	1.000E+00	g/s	
LMFUG12	Lemon St Exh	1.000E+00	g/s	
LMFUG13	Lemon St Exh	1.000E+00	g/s	
LMFUG14	Lemon St Exh	1.000E+00	g/s	
LMFUG15	Lemon St Exh	1.000E+00	g/s	
LMFUG16	Lemon St Exh	1.000E+00	g/s	
LMFUG17	Lemon St Exh	1.000E+00	g/s	
LMFUG18	Lemon St Exh	1.000E+00	g/s	
LMFUG19	Lemon St Exh	1.000E+00	g/s	
LMFUG20	Lemon St Exh	1.000E+00	g/s	
LMFUG21	Lemon St Exh	1.000E+00	g/s	
LMFUG22	Lemon St Exh	1.000E+00	g/s	
LMFUG23	Lemon St Exh	1.000E+00	g/s	
LMFUG24	Lemon St Exh	1.000E+00	g/s	
LMFUG25	Lemon St Exh	1.000E+00	g/s	
LMFUG26	Lemon St Exh	1.000E+00	g/s	
LMFUG27	Lemon St Exh	1.000E+00	g/s	
LMFUG28	Lemon St Exh	1.000E+00	g/s	
LMFUG29	Lemon St Exh	1.000E+00	g/s	
LMFUG30	Lemon St Exh	1.000E+00	g/s	
LMFUG31	Lemon St Exh	1.000E+00	g/s	
LMFUG32	Lemon St Exh	1.000E+00	g/s	
LMFUG33	Lemon St Exh	1.000E+00	g/s	
LMFUG34	Lemon St Exh	1.000E+00	g/s	
LMFUG35	Lemon St Exh	1.000E+00	g/s	
LMFUG36	Lemon St Exh	1.000E+00	g/s	
LMFUG37	Lemon St Exh	1.000E+00	g/s	
LMFUG38	Lemon St Exh	1.000E+00	g/s	
LMFUG39	Lemon St Exh	1.000E+00	g/s	
LMFUG40	Lemon St Exh	1.000E+00	g/s	
LMFUG41	Lemon St Exh	1.000E+00	g/s	
LMFUG42	Lemon St Exh	1.000E+00	g/s	
LMFUG43	Lemon St Exh	1.000E+00	g/s	

LMFUG44	Lemon St Exh	1.000E+00	g/s	
LMFUG45	Lemon St Exh	1.000E+00	g/s	
LMFUG46	Lemon St Exh	1.000E+00	g/s	
LMFUG47	Lemon St Exh	1.000E+00	g/s	
LMFUG48	Lemon St Exh	1.000E+00	g/s	
LMFUG49	Lemon St Exh	1.000E+00	g/s	
LMFUG50	Lemon St Exh	1.000E+00	g/s	
LMFUG51	Lemon St Exh	1.000E+00	g/s	
SNFUG1	Sonona Blvd North	1.000E+00	g/s	Hourly Emission Rate 5
SNFUG2	Sonona Blvd North	1.000E+00	g/s	
SNFUG3	Sonona Blvd North	1.000E+00	g/s	
SNFUG4	Sonona Blvd North	1.000E+00	g/s	
SNFUG5	Sonona Blvd North	1.000E+00	g/s	
SNFUG6	Sonona Blvd North	1.000E+00	g/s	
SNFUG7	Sonona Blvd North	1.000E+00	g/s	
SNFUG8	Sonona Blvd North	1.000E+00	g/s	
SNFUG9	Sonona Blvd North	1.000E+00	g/s	
SNFUG10	Sonona Blvd North	1.000E+00	g/s	
SNFUG11	Sonona Blvd North	1.000E+00	g/s	
SNFUG12	Sonona Blvd North	1.000E+00	g/s	
SNFUG13	Sonona Blvd North	1.000E+00	g/s	
SNFUG14	Sonona Blvd North	1.000E+00	g/s	
SNFUG15	Sonona Blvd North	1.000E+00	g/s	
SNFUG16	Sonona Blvd North	1.000E+00	g/s	
SNFUG17	Sonona Blvd North	1.000E+00	g/s	
SNFUG18	Sonona Blvd North	1.000E+00	g/s	
SNFUG19	Sonona Blvd North	1.000E+00	g/s	
SNFUG20	Sonona Blvd North	1.000E+00	g/s	
SNFUG21	Sonona Blvd North	1.000E+00	g/s	
SNFUG22	Sonona Blvd North	1.000E+00	g/s	
SSFUG1	Sonoma Blvd South	1.000E+00	g/s	Hourly Emission Rate 6
SSFUG2	Sonoma Blvd South	1.000E+00	g/s	
SSFUG3	Sonoma Blvd South	1.000E+00	g/s	
SSFUG4	Sonoma Blvd South	1.000E+00	g/s	
SSFUG5	Sonoma Blvd South	1.000E+00	g/s	
SSFUG6	Sonoma Blvd South	1.000E+00	g/s	
SSFUG7	Sonoma Blvd South	1.000E+00	g/s	
SSFUG8	Sonoma Blvd South	1.000E+00	g/s	
SSFUG9	Sonoma Blvd South	1.000E+00	g/s	
SSFUG10	Sonoma Blvd South	1.000E+00	g/s	
SSFUG11	Sonoma Blvd South	1.000E+00	g/s	
SSFUG12	Sonoma Blvd South	1.000E+00	g/s	
SSFUG13	Sonoma Blvd South	1.000E+00	g/s	
SSFUG14	Sonoma Blvd South	1.000E+00	g/s	
SSFUG15	Sonoma Blvd South	1.000E+00	g/s	
SSFUG16	Sonoma Blvd South	1.000E+00	g/s	
SSFUG17	Sonoma Blvd South	1.000E+00	g/s	
SSFUG18	Sonoma Blvd South	1.000E+00	g/s	
SSFUG19	Sonoma Blvd South	1.000E+00	g/s	
SSFUG20	Sonoma Blvd South	1.000E+00	g/s	
SSFUG21	Sonoma Blvd South	1.000E+00	g/s	
SSFUG22	Sonoma Blvd South	1.000E+00	g/s	
SSFUG23	Sonoma Blvd South	1.000E+00	g/s	
SSFUG24	Sonoma Blvd South	1.000E+00	g/s	
SSFUG25	Sonoma Blvd South	1.000E+00	g/s	
SSFUG26	Sonoma Blvd South	1.000E+00	g/s	
SSFUG27	Sonoma Blvd South	1.000E+00	g/s	
SSFUG28	Sonoma Blvd South	1.000E+00	g/s	
SSFUG29	Sonoma Blvd South	1.000E+00	g/s	
SSFUG30	Sonoma Blvd South	1.000E+00	g/s	
SSFUG31	Sonoma Blvd South	1.000E+00	g/s	
SMFUG1	Sonona South Of Magazine	1.000E+00	g/s	Hourly Emission Rate 8
SMFUG2	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG3	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG4	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG5	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG6	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG7	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG8	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG9	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG10	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG11	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG12	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG13	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG14	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG15	Sonona South Of Magazine	1.000E+00	g/s	

SMFUG16	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG17	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG18	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG19	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG20	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG21	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG22	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG23	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG24	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG25	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG26	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG27	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG28	Sonona South Of Magazine	1.000E+00	g/s	
SMFUG29	Sonona South Of Magazine	1.000E+00	g/s	
LEFUG1	Lemon East Of Sonoma	1.000E+00	g/s	Hourly Emission Rate 7
LEFUG2	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG3	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG4	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG5	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG6	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG7	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG8	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG9	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG10	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG11	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG12	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG13	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG14	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG15	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG16	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG17	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG18	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG19	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG20	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG21	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG22	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG23	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG24	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG25	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG26	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG27	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG28	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG29	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG30	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG31	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG32	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG33	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG34	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG35	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG36	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG37	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG38	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG39	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG40	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG41	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG42	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG43	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG44	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG45	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG46	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG47	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG48	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG49	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG50	Lemon East Of Sonoma	1.000E+00	g/s	
LEFUG51	Lemon East Of Sonoma	1.000E+00	g/s	
VMTFUG1	VMT Only Exh	1.000E+00	g/s	Hourly Emission Rate 3
VMTFUG2	VMT Only Exh	1.000E+00	g/s	
VMTFUG3	VMT Only Exh	1.000E+00	g/s	
VMTFUG4	VMT Only Exh	1.000E+00	g/s	
VMTFUG5	VMT Only Exh	1.000E+00	g/s	
VMTFUG6	VMT Only Exh	1.000E+00	g/s	
VMTFUG7	VMT Only Exh	1.000E+00	g/s	
VMTFUG8	VMT Only Exh	1.000E+00	g/s	
VMTFUG9	VMT Only Exh	1.000E+00	g/s	
VMTFUG10	VMT Only Exh	1.000E+00	g/s	
VMTFUG11	VMT Only Exh	1.000E+00	g/s	

VMTFUG12	VMT Only Exh	1.000E+00	g/s
VMTFUG13	VMT Only Exh	1.000E+00	g/s
VMTFUG14	VMT Only Exh	1.000E+00	g/s
VMTFUG15	VMT Only Exh	1.000E+00	g/s
VMTFUG16	VMT Only Exh	1.000E+00	g/s
VMTFUG17	VMT Only Exh	1.000E+00	g/s
VMTFUG18	VMT Only Exh	1.000E+00	g/s
VMTFUG19	VMT Only Exh	1.000E+00	g/s
FLS2F1	RMSP2 to Mhopper Exh	7.85E-03	g/s
FLS2F2	RMSP2 to Mhopper Exh	7.85E-03	g/s
FLS2F3	RMSP2 to Mhopper Exh	7.85E-03	g/s
FLS2F4	RMSP2 to Mhopper Exh	7.85E-03	g/s
FLS2F5	RMSP2 to Mhopper Exh	7.85E-03	g/s
FLS1F1	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F2	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F3	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F4	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F5	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F6	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F7	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F8	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F9	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F10	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F11	RMSP1 to Mhopper Exh	3.27E-03	g/s
FLS1F12	RMSP1 to Mhopper Exh	3.27E-03	g/s
GYPEXH1	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH2	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH3	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH4	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH5	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH6	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH7	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH8	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH9	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH10	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH11	Gypsum to MHopper Exh	4.27E-05	g/s
GYPEXH12	Gypsum to MHopper Exh	4.27E-05	g/s
TRANS33	transit33	2.56E-03	g/s
TRANS32	transit32	2.56E-03	g/s
TRANS31	transit31	2.56E-03	g/s
TRANS30	transit30	2.56E-03	g/s
TRANS29	transit29	2.56E-03	g/s
TRANS28	transit28	2.56E-03	g/s
TRANS27	transit27	2.56E-03	g/s
TRANS26	transit26	2.56E-03	g/s
TRANS25	transit25	2.56E-03	g/s
TRANS24	transit24	2.56E-03	g/s
TRANS23	transit23	2.56E-03	g/s
TRANS22	transit22	2.56E-03	g/s
TRANS21	transit21	2.56E-03	g/s
TRANS20	transit20	2.56E-03	g/s
TRANS19	transit19	2.56E-03	g/s
TRANS18	transit18	2.56E-03	g/s
TRANS17	transit17	2.56E-03	g/s
TRANS16	transit16	2.56E-03	g/s
TRANS15	transit15	2.56E-03	g/s
TRANS14	transit14	2.56E-03	g/s
TRANS13	transit13	2.56E-03	g/s
TRANS12	transit12	2.56E-03	g/s
TRANS11	transit11	2.56E-03	g/s
TRANS10	transit10	2.56E-03	g/s
TRANS9	transit9	2.56E-03	g/s
TRANS8	transit8	2.56E-03	g/s
TRANS7	transit7	2.56E-03	g/s
TRANS6	transit6	2.56E-03	g/s
TRANS5	transit5	2.56E-03	g/s
TRANS4	transit4	2.56E-03	g/s
TRANS3	transit3	2.56E-03	g/s
TRANS2	transit2	2.56E-03	g/s
TRANS1	transit1	2.56E-03	g/s
TRANS34	transit34	2.56E-03	g/s
TRANS35	transit35	3.62E-03	g/s
TRANS36	transit36	3.62E-03	g/s
TRANS37	transit37	3.62E-03	g/s
TRANS38	transit38	3.62E-03	g/s
TRANS39	transit39	3.62E-03	g/s

TRANS40	transit40	3.62E-03	g/s
TRANS41	transit41	3.62E-03	g/s
TRANS42	transit42	3.62E-03	g/s
TRANS43	transit43	3.62E-03	g/s
TRANS44	transit44	3.62E-03	g/s
TRANS45	transit45	3.62E-03	g/s
TRANS46	transit46	3.62E-03	g/s
TRANS47	transit47	3.62E-03	g/s
TRANS48	transit48	3.62E-03	g/s
TRANS49	transit49	3.62E-03	g/s
TRANS50	transit50	3.62E-03	g/s
TRANS51	transit51	3.62E-03	g/s
TRANS52	transit52	3.62E-03	g/s
TRANS53	transit53	3.62E-03	g/s
TRANS54	transit54	3.62E-03	g/s
TRANS55	transit55	3.62E-03	g/s
TRANS56	transit56	3.62E-03	g/s
TRANS57	transit57	3.62E-03	g/s
TRANS58	transit58	3.62E-03	g/s
TRANS59	transit59	3.62E-03	g/s
TRANS60	transit60	3.62E-03	g/s
TRANS61	transit61	3.62E-03	g/s
TRANS62	transit62	3.62E-03	g/s
TRANS63	transit63	3.62E-03	g/s
TRANS64	transit64	3.62E-03	g/s
TRANS65	transit65	3.62E-03	g/s
TRANS66	transit66	3.62E-03	g/s
TRANS67	transit67	3.62E-03	g/s
TRANS68	transit68	3.62E-03	g/s
TRANS69	transit69	3.62E-03	g/s
TRANS70	transit70	3.62E-03	g/s
TRANS71	transit71	3.62E-03	g/s
TRANS72	transit72	3.62E-03	g/s
TRANS73	transit73	3.62E-03	g/s
TRANS74	transit74	3.62E-03	g/s
TRANS75	transit75	3.62E-03	g/s
TRANS76	transit76	3.62E-03	g/s
TRANS77	transit77	3.62E-03	g/s
TRANS78	transit78	3.62E-03	g/s
TRANS79	transit79	3.62E-03	g/s
TRANS80	transit80	3.62E-03	g/s
TRANS81	transit81	3.62E-03	g/s
TRANS82	transit82	3.62E-03	g/s
TRANS83	transit83	3.62E-03	g/s
TRANS84	transit84	3.62E-03	g/s
TRANS85	transit85	3.62E-03	g/s
TRANS86	transit86	3.62E-03	g/s
TRANS87	transit87	3.62E-03	g/s
TRANS88	transit88	3.62E-03	g/s
TRANS89	transit89	3.62E-03	g/s
TRANS90	transit90	3.62E-03	g/s
TRANS91	transit91	3.62E-03	g/s
TRANS92	transit92	3.62E-03	g/s
TRANS93	transit93	3.62E-03	g/s
TRANS94	transit94	3.62E-03	g/s
TRANS95	transit95	3.62E-03	g/s
TRANS96	transit96	3.62E-03	g/s
TRANS97	transit97	3.62E-03	g/s
TRANS98	transit98	3.62E-03	g/s
TRANS99	transit99	3.62E-03	g/s
MANV1	maneuv1	1.21E-02	g/s
MANV2	maneuv2	1.21E-02	g/s
MANV3	maneuv3	1.21E-02	g/s
MANV4	maneuv4	1.21E-02	g/s
MANV5	maneuv5	1.21E-02	g/s
MANV6	maneuv6	1.21E-02	g/s
MANV7	maneuv7	1.21E-02	g/s
MANV8	maneuv8	1.21E-02	g/s
MANV9	maneuv9	1.21E-02	g/s
MANV10	maneuv10	1.21E-02	g/s
MANV11	maneuv11	1.21E-02	g/s
MANV12	maneuv12	1.21E-02	g/s
MANV13	maneuv13	1.21E-02	g/s
MANV14	maneuv14	1.21E-02	g/s
MANV15	maneuv15	1.21E-02	g/s
MANV16	MANV16	1.21E-02	g/s

MANV17	MANV17	1.21E-02	g/s
MANV18	MANV18	1.21E-02	g/s
MANV19	MANV19	1.21E-02	g/s
MANV20	MANV20	1.21E-02	g/s
MANV21	MANV21	1.21E-02	g/s
MANV22	MANV22	1.21E-02	g/s
MANV23	MANV23	1.21E-02	g/s
MANV24	MANV24	1.21E-02	g/s
MANV25	MANV25	1.21E-02	g/s
MANV26	MANV26	1.21E-02	g/s
TUG1	Tug Emissions	2.58E-02	g/s
TUG2	Tug Emissions	2.58E-02	g/s
TUG3	Tug Emissions	2.58E-02	g/s
TUG4	Tug Emissions	2.58E-02	g/s
TUG5	Tug Emissions	2.58E-02	g/s
TUG6	Tug Emissions	2.58E-02	g/s
TUG7	Tug Emissions	2.58E-02	g/s
TUG8	Tug Emissions	2.58E-02	g/s
TUG9	Tug Emissions	2.58E-02	g/s
TUG10	Tug Emissions	2.58E-02	g/s
TUG11	Tug Emissions	2.58E-02	g/s
TUG12	Tug Emissions	2.58E-02	g/s
TUG13	Tug Emissions	2.58E-02	g/s
TUG14	Tug Emissions	2.58E-02	g/s
TUG15	Tug Emissions	2.58E-02	g/s
TUG16	Tug Emissions	2.58E-02	g/s
TUG17	Tug Emissions	2.58E-02	g/s
TUG18	Tug Emissions	2.58E-02	g/s
TUG19	Tug Emissions	2.58E-02	g/s
TUG20	Tug Emissions	2.58E-02	g/s
TUG21	Tug Emissions	2.58E-02	g/s
TUG22	Tug Emissions	2.58E-02	g/s
TUG23	Tug Emissions	2.58E-02	g/s
TUG24	Tug Emissions	2.58E-02	g/s
TUG25	Tug Emissions	2.58E-02	g/s
TUG26	Tug Emissions	2.58E-02	g/s
RAILST1	rail switching	8.27E-04	g/s
RAILST2	rail switching	8.27E-04	g/s
RAILST3	rail switching	8.27E-04	g/s
RAILST4	rail switching	8.27E-04	g/s
RAILST5	rail switching	8.27E-04	g/s
RAILST6	rail switching	8.27E-04	g/s
RAILST7	rail switching	8.27E-04	g/s
RAILST8	rail switching	8.27E-04	g/s
RAILST9	rail switching	8.27E-04	g/s
RAILST10	rail switching	8.27E-04	g/s
RAILST11	rail switching	8.27E-04	g/s
RAILST12	rail switching	8.27E-04	g/s
RAILST13	rail switching	8.27E-04	g/s
RAILST14	rail switching	8.27E-04	g/s
RAILST15	rail switching	8.27E-04	g/s
RAILST16	rail switching	8.27E-04	g/s
RAILST17	rail switching	8.27E-04	g/s
RAILST18	rail switching	8.27E-04	g/s
RAILST19	rail switching	8.27E-04	g/s
RAILST20	rail switching	8.27E-04	g/s
RAILST21	rail switching	8.27E-04	g/s
RAILST22	rail switching	8.27E-04	g/s
RAILST23	rail switching	8.27E-04	g/s
RAILST24	rail switching	8.27E-04	g/s
RAILST25	rail switching	8.27E-04	g/s
RAILST26	rail switching	8.27E-04	g/s
RAILST27	rail switching	8.27E-04	g/s
RAILST28	rail switching	8.27E-04	g/s
RAILST29	rail switching	8.27E-04	g/s
RAILST30	rail switching	8.27E-04	g/s
RAILST31	rail switching	8.27E-04	g/s
RAILST32	rail switching	8.27E-04	g/s
RAILST33	rail switching	8.27E-04	g/s
RAILST34	rail switching	8.27E-04	g/s
RAILST35	rail switching	8.27E-04	g/s
RAILST36	rail switching	8.27E-04	g/s
RAILST37	rail switching	8.27E-04	g/s
RAILST38	rail switching	8.27E-04	g/s
RAILST39	rail switching	8.27E-04	g/s
RAILST40	rail switching	8.27E-04	g/s

RAILST41	rail switching	8.27E-04	g/s
RAILST42	rail switching	8.27E-04	g/s
RAILST43	rail switching	8.27E-04	g/s
RAILST44	rail switching	8.27E-04	g/s
RAILST45	rail switching	8.27E-04	g/s
RAILST46	rail switching	8.27E-04	g/s
RAILST47	rail switching	8.27E-04	g/s
RAILST48	rail switching	8.27E-04	g/s
RAILST49	rail switching	8.27E-04	g/s
RAILST50	rail switching	8.27E-04	g/s
RAILST51	rail switching	8.27E-04	g/s
RAILST52	rail switching	8.27E-04	g/s
RAILST53	rail switching	8.27E-04	g/s
RAILST54	rail switching	8.27E-04	g/s
RAILST55	rail switching	8.27E-04	g/s
RAILST56	rail switching	8.27E-04	g/s
RAILST57	rail switching	8.27E-04	g/s
RAILST58	rail switching	8.27E-04	g/s
RAILST59	rail switching	8.27E-04	g/s
RAILST60	rail switching	8.27E-04	g/s
RAILST61	rail switching	8.27E-04	g/s
RAILST62	rail switching	8.27E-04	g/s
RAILST63	rail switching	8.27E-04	g/s
RAILST64	rail switching	8.27E-04	g/s
RAILST65	rail switching	8.27E-04	g/s
RAILST66	rail switching	8.27E-04	g/s
RAILST67	rail switching	8.27E-04	g/s
RAILST68	rail switching	8.27E-04	g/s
RAILST69	rail switching	8.27E-04	g/s
RAILST70	rail switching	8.27E-04	g/s
RAILST71	rail switching	8.27E-04	g/s
RAILST72	rail switching	8.27E-04	g/s
RAILST73	rail switching	8.27E-04	g/s
RAILST74	rail switching	8.27E-04	g/s
RAILST75	rail switching	8.27E-04	g/s
RAILLN1	rail haul	5.47E-05	g/s
RAILLN2	rail haul	5.47E-05	g/s
RAILLN3	rail haul	5.47E-05	g/s
RAILLN4	rail haul	5.47E-05	g/s
RAILLN5	rail haul	5.47E-05	g/s
RAILLN6	rail haul	5.47E-05	g/s
RAILLN7	rail haul	5.47E-05	g/s
RAILLN8	rail haul	5.47E-05	g/s
RAILLN9	rail haul	5.47E-05	g/s
RAILLN10	rail haul	5.47E-05	g/s
RAILLN11	rail haul	5.47E-05	g/s
RAILLN12	rail haul	5.47E-05	g/s
RAILLN13	rail haul	5.47E-05	g/s
RAILLN14	rail haul	5.47E-05	g/s
RAILLN15	rail haul	5.47E-05	g/s
RAILLN16	rail haul	5.47E-05	g/s
RAILLN17	rail haul	5.47E-05	g/s
RAILLN18	rail haul	5.47E-05	g/s
RAILLN19	rail haul	5.47E-05	g/s
RAILLN20	rail haul	5.47E-05	g/s
RAILLN21	rail haul	5.47E-05	g/s
RAILLN22	rail haul	5.47E-05	g/s
RAILLN23	rail haul	5.47E-05	g/s
RAILLN24	rail haul	5.47E-05	g/s
RAILLN25	rail haul	5.47E-05	g/s
RAILLN26	rail haul	5.47E-05	g/s
RAILLN27	rail haul	5.47E-05	g/s
RAILLN28	rail haul	5.47E-05	g/s
RAILLN29	rail haul	5.47E-05	g/s
RAILLN30	rail haul	5.47E-05	g/s
RAILLN31	rail haul	5.47E-05	g/s
RAILLN32	rail haul	5.47E-05	g/s
RAILLN33	rail haul	5.47E-05	g/s
RAILLN34	rail haul	5.47E-05	g/s
RAILLN35	rail haul	5.47E-05	g/s
RAILLN36	rail haul	5.47E-05	g/s
RAILLN37	rail haul	5.47E-05	g/s
RAILLN38	rail haul	5.47E-05	g/s
RAILLN39	rail haul	5.47E-05	g/s
RAILLN40	rail haul	5.47E-05	g/s
RAILLN41	rail haul	5.47E-05	g/s

RAILLN42	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN43	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN44	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN45	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN46	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN47	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN48	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN49	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN50	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN51	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN52	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN53	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN54	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN55	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN56	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN57	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN58	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN59	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN60	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN61	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN62	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN63	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN64	rail haul (15 km/hr)	1.82E-04	g/s
RAILLN65	rail haul (15 km/hr)	1.82E-04	g/s
TUGB2	Tug Emissions	2.58E-02	g/s
TUGB3	Tug Emissions	2.58E-02	g/s
TUGB4	Tug Emissions	2.58E-02	g/s
TUGB5	Tug Emissions	2.58E-02	g/s
TUGB6	Tug Emissions	2.58E-02	g/s
TUGB7	Tug Emissions	2.58E-02	g/s
TUGB8	Tug Emissions	2.58E-02	g/s
TUGB9	Tug Emissions	2.58E-02	g/s
TUGB10	Tug Emissions	2.58E-02	g/s
TUGB11	Tug Emissions	2.58E-02	g/s
TUGB12	Tug Emissions	2.58E-02	g/s
TUGB13	Tug Emissions	2.58E-02	g/s
TUGB14	Tug Emissions	2.58E-02	g/s
TUGB15	Tug Emissions	2.58E-02	g/s
TUGB16	Tug Emissions	2.58E-02	g/s
TUGB17	Tug Emissions	2.58E-02	g/s
TUGB18	Tug Emissions	2.58E-02	g/s
TUGB19	Tug Emissions	2.58E-02	g/s
TUGB20	Tug Emissions	2.58E-02	g/s
TUGB21	Tug Emissions	2.58E-02	g/s
TUGB22	Tug Emissions	2.58E-02	g/s
TUGB23	Tug Emissions	2.58E-02	g/s
TUGB24	Tug Emissions	2.58E-02	g/s
TUGB25	Tug Emissions	2.58E-02	g/s
TUGB26	Tug Emissions	2.58E-02	g/s
TUGB1	Tug Emissions	2.58E-02	g/s
BARGE1	Barge	0.00E+00	g/s
BARGE2	Barge	0.00E+00	g/s
BARGE3	Barge	0.00E+00	g/s
BARGE4	Barge	0.00E+00	g/s
BARGE5	Barge	0.00E+00	g/s
BARGE6	Barge	0.00E+00	g/s
BARGE7	Barge	0.00E+00	g/s
BARGE8	Barge	0.00E+00	g/s
BARGE9	Barge	0.00E+00	g/s
BARGE10	Barge	0.00E+00	g/s
BARGE11	Barge	0.00E+00	g/s
BARGE12	Barge	0.00E+00	g/s
BARGE13	Barge	0.00E+00	g/s
BARGE14	Barge	0.00E+00	g/s
BARGE15	Barge	0.00E+00	g/s
BARGE16	Barge	0.00E+00	g/s
BARGE17	Barge	0.00E+00	g/s
BARGE18	Barge	0.00E+00	g/s
BARGE19	Barge	0.00E+00	g/s
BARGE20	Barge	0.00E+00	g/s
BARGE21	Barge	0.00E+00	g/s
BARGE22	Barge	0.00E+00	g/s
BARGE23	Barge	0.00E+00	g/s
BARGE24	Barge	0.00E+00	g/s
BARGE25	Barge	0.00E+00	g/s
BARGE26	Barge	0.00E+00	g/s

BARGE27	Barge	0.00E+00	g/s
BARGE28	Barge	0.00E+00	g/s
BARGE29	Barge	0.00E+00	g/s
BARGE30	Barge	0.00E+00	g/s
BARGE31	Barge	0.00E+00	g/s
BARGE32	Barge	0.00E+00	g/s
BARGE33	Barge	0.00E+00	g/s
BARGE34	Barge	0.00E+00	g/s
BARGE35	Barge	0.00E+00	g/s
BARGE36	Barge	0.00E+00	g/s
BARGE37	Barge	0.00E+00	g/s
BARGE38	Barge	0.00E+00	g/s
BARGE39	Barge	0.00E+00	g/s
BARGE40	Barge	0.00E+00	g/s
BARGE41	Barge	0.00E+00	g/s
BARGE42	Barge	0.00E+00	g/s
BARGE43	Barge	0.00E+00	g/s
BARGE44	Barge	0.00E+00	g/s
BARGE45	Barge	0.00E+00	g/s
BARGE46	Barge	0.00E+00	g/s
BARGE47	Barge	0.00E+00	g/s
BARGE48	Barge	0.00E+00	g/s
BARGE49	Barge	0.00E+00	g/s
BARGE50	Barge	0.00E+00	g/s
BARGE51	Barge	0.00E+00	g/s
BARGE52	Barge	0.00E+00	g/s
BARGE53	Barge	0.00E+00	g/s
BARGE54	Barge	0.00E+00	g/s
BARGE55	Barge	0.00E+00	g/s
BARGE56	Barge	0.00E+00	g/s
BARGE57	Barge	0.00E+00	g/s
BARGE58	Barge	0.00E+00	g/s
BARGE59	Barge	0.00E+00	g/s
BARGE60	Barge	0.00E+00	g/s
BARGE61	Barge	0.00E+00	g/s
BARGE62	Barge	0.00E+00	g/s
BARGE63	Barge	0.00E+00	g/s
BARGE64	Barge	0.00E+00	g/s
BARGE65	Barge	0.00E+00	g/s
BARGE66	Barge	0.00E+00	g/s
BARGE67	Barge	0.00E+00	g/s
BARGE68	Barge	0.00E+00	g/s
BARGE69	Barge	0.00E+00	g/s
BARGE70	Barge	0.00E+00	g/s
BARGE71	Barge	0.00E+00	g/s
BARGE72	Barge	0.00E+00	g/s
BARGE73	Barge	0.00E+00	g/s
BARGE74	Barge	0.00E+00	g/s
BARGE75	Barge	0.00E+00	g/s
BARGE76	Barge	0.00E+00	g/s
BARGE77	Barge	0.00E+00	g/s
BARGE78	Barge	0.00E+00	g/s
BARGE79	Barge	0.00E+00	g/s
BARGE80	Barge	0.00E+00	g/s
BARGE81	Barge	0.00E+00	g/s
BARGE82	Barge	0.00E+00	g/s
BARGE83	Barge	0.00E+00	g/s
BARGE84	Barge	0.00E+00	g/s
BARGE85	Barge	0.00E+00	g/s
BARGE86	Barge	0.00E+00	g/s
BARGE87	Barge	0.00E+00	g/s
BARGE88	Barge	0.00E+00	g/s
BARGE89	Barge	0.00E+00	g/s
BARGE90	Barge	0.00E+00	g/s
BARGE91	Barge	0.00E+00	g/s
BARGE92	Barge	0.00E+00	g/s
BARGE93	Barge	0.00E+00	g/s
BARGE94	Barge	0.00E+00	g/s
BARGE95	Barge	0.00E+00	g/s
BARGE96	Barge	0.00E+00	g/s
BARGE97	Barge	0.00E+00	g/s
BARGE98	Barge	0.00E+00	g/s
BARGE99	Barge	0.00E+00	g/s
BARG100	Barge	0.00E+00	g/s
BARG101	Barge	0.00E+00	g/s
BARG102	Barge	0.00E+00	g/s

BARG103	Barge	0.00E+00	g/s
BARG104	Barge	0.00E+00	g/s
BARG105	Barge	0.00E+00	g/s
BARG106	Barge	0.00E+00	g/s
BARG107	Barge	0.00E+00	g/s
BARG108	Barge	0.00E+00	g/s
BARG109	Barge	0.00E+00	g/s
BARG110	Barge	0.00E+00	g/s
BARG111	Barge	0.00E+00	g/s
BARG112	Barge	0.00E+00	g/s
BARG113	Barge	0.00E+00	g/s
BARG114	Barge	0.00E+00	g/s
BARG115	Barge	0.00E+00	g/s
BARG116	Barge	0.00E+00	g/s
BARG117	Barge	0.00E+00	g/s
BARG118	Barge	0.00E+00	g/s
BARG119	Barge	0.00E+00	g/s
BARG120	Barge	0.00E+00	g/s
BARG121	Barge	0.00E+00	g/s
BARG122	Barge	0.00E+00	g/s
BARG123	Barge	0.00E+00	g/s
BARG124	Barge	0.00E+00	g/s
BARG125	Barge	0.00E+00	g/s
BARG126	Barge	0.00E+00	g/s
NRAILST1	rail switching night	8.27E-04	g/s
NRAILST2	rail switching night	8.27E-04	g/s
NRAILST3	rail switching night	8.27E-04	g/s
NRAILST4	rail switching night	8.27E-04	g/s
NRAILST5	rail switching night	8.27E-04	g/s
NRAILST6	rail switching night	8.27E-04	g/s
NRAILST7	rail switching night	8.27E-04	g/s
NRAILST8	rail switching night	8.27E-04	g/s
NRAILST9	rail switching night	8.27E-04	g/s
NRAILS10	rail switching night	8.27E-04	g/s
NRAILS11	rail switching night	8.27E-04	g/s
NRAILS12	rail switching night	8.27E-04	g/s
NRAILS13	rail switching night	8.27E-04	g/s
NRAILS14	rail switching night	8.27E-04	g/s
NRAILS15	rail switching night	8.27E-04	g/s
NRAILS16	rail switching night	8.27E-04	g/s
NRAILS17	rail switching night	8.27E-04	g/s
NRAILS18	rail switching night	8.27E-04	g/s
NRAILS19	rail switching night	8.27E-04	g/s
NRAILS20	rail switching night	8.27E-04	g/s
NRAILS21	rail switching night	8.27E-04	g/s
NRAILS22	rail switching night	8.27E-04	g/s
NRAILS23	rail switching night	8.27E-04	g/s
NRAILS24	rail switching night	8.27E-04	g/s
NRAILS25	rail switching night	8.27E-04	g/s
NRAILS26	rail switching night	8.27E-04	g/s
NRAILS27	rail switching night	8.27E-04	g/s
NRAILS28	rail switching night	8.27E-04	g/s
NRAILS29	rail switching night	8.27E-04	g/s
NRAILS30	rail switching night	8.27E-04	g/s
NRAILS31	rail switching night	8.27E-04	g/s
NRAILS32	rail switching night	8.27E-04	g/s
NRAILS33	rail switching night	8.27E-04	g/s
NRAILS34	rail switching night	8.27E-04	g/s
NRAILS35	rail switching night	8.27E-04	g/s
NRAILS36	rail switching night	8.27E-04	g/s
NRAILS37	rail switching night	8.27E-04	g/s
NRAILS38	rail switching night	8.27E-04	g/s
NRAILS39	rail switching night	8.27E-04	g/s
NRAILS40	rail switching night	8.27E-04	g/s
NRAILS41	rail switching night	8.27E-04	g/s
NRAILS42	rail switching night	8.27E-04	g/s
NRAILS43	rail switching night	8.27E-04	g/s
NRAILS44	rail switching night	8.27E-04	g/s
NRAILS45	rail switching night	8.27E-04	g/s
NRAILS46	rail switching night	8.27E-04	g/s
NRAILS47	rail switching night	8.27E-04	g/s
NRAILS48	rail switching night	8.27E-04	g/s
NRAILS49	rail switching night	8.27E-04	g/s
NRAILS50	rail switching night	8.27E-04	g/s
NRAILS51	rail switching night	8.27E-04	g/s
NRAILS52	rail switching night	8.27E-04	g/s

NRAILS53	rail switching night	8.27E-04	g/s
NRAILS54	rail switching night	8.27E-04	g/s
NRAILS55	rail switching night	8.27E-04	g/s
NRAILS56	rail switching night	8.27E-04	g/s
NRAILS57	rail switching night	8.27E-04	g/s
NRAILS58	rail switching night	8.27E-04	g/s
NRAILS59	rail switching night	8.27E-04	g/s
NRAILS60	rail switching night	8.27E-04	g/s
NRAILS61	rail switching night	8.27E-04	g/s
NRAILS62	rail switching night	8.27E-04	g/s
NRAILS63	rail switching night	8.27E-04	g/s
NRAILS64	rail switching night	8.27E-04	g/s
NRAILS65	rail switching night	8.27E-04	g/s
NRAILS66	rail switching night	8.27E-04	g/s
NRAILS67	rail switching night	8.27E-04	g/s
NRAILS68	rail switching night	8.27E-04	g/s
NRAILS69	rail switching night	8.27E-04	g/s
NRAILS70	rail switching night	8.27E-04	g/s
NRAILS71	rail switching night	8.27E-04	g/s
NRAILS72	rail switching night	8.27E-04	g/s
NRAILS73	rail switching night	8.27E-04	g/s
NRAILS74	rail switching night	8.27E-04	g/s
NRAILS75	rail switching night	8.27E-04	g/s
NRAILLN1	rail haul night	5.47E-05	g/s
NRAILLN2	rail haul night	5.47E-05	g/s
NRAILLN3	rail haul night	5.47E-05	g/s
NRAILLN4	rail haul night	5.47E-05	g/s
NRAILLN5	rail haul night	5.47E-05	g/s
NRAILLN6	rail haul night	5.47E-05	g/s
NRAILLN7	rail haul night	5.47E-05	g/s
NRAILLN8	rail haul night	5.47E-05	g/s
NRAILLN9	rail haul night	5.47E-05	g/s
NRAILN10	rail haul night	5.47E-05	g/s
NRAILN11	rail haul night	5.47E-05	g/s
NRAILN12	rail haul night	5.47E-05	g/s
NRAILN13	rail haul night	5.47E-05	g/s
NRAILN14	rail haul night	5.47E-05	g/s
NRAILN15	rail haul night	5.47E-05	g/s
NRAILN16	rail haul night	5.47E-05	g/s
NRAILN17	rail haul night	5.47E-05	g/s
NRAILN18	rail haul night	5.47E-05	g/s
NRAILN19	rail haul night	5.47E-05	g/s
NRAILN20	rail haul night	5.47E-05	g/s
NRAILN21	rail haul night	5.47E-05	g/s
NRAILN22	rail haul night	5.47E-05	g/s
NRAILN23	rail haul night	5.47E-05	g/s
NRAILN24	rail haul night	5.47E-05	g/s
NRAILN25	rail haul night	5.47E-05	g/s
NRAILN26	rail haul night	5.47E-05	g/s
NRAILN27	rail haul night	5.47E-05	g/s
NRAILN28	rail haul night	5.47E-05	g/s
NRAILN29	rail haul night	5.47E-05	g/s
NRAILN30	rail haul night	5.47E-05	g/s
NRAILN31	rail haul night	5.47E-05	g/s
NRAILN32	rail haul night	5.47E-05	g/s
NRAILN33	rail haul night	5.47E-05	g/s
NRAILN34	rail haul night	5.47E-05	g/s
NRAILN35	rail haul night	5.47E-05	g/s
NRAILN36	rail haul night	5.47E-05	g/s
NRAILN37	rail haul night	5.47E-05	g/s
NRAILN38	rail haul night	5.47E-05	g/s
NRAILN39	rail haul night	5.47E-05	g/s
NRAILN40	rail haul night	5.47E-05	g/s
NRAILN41	rail haul night	5.47E-05	g/s
NRAILN42	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN43	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN44	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN45	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN46	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN47	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN48	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN49	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN50	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN51	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN52	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN53	rail haul night (15 km/hr)	1.82E-04	g/s

NRAILN54	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN55	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN56	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN57	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN58	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN59	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN60	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN61	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN62	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN63	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN64	rail haul night (15 km/hr)	1.82E-04	g/s
NRAILN65	rail haul night (15 km/hr)	1.82E-04	g/s
NTUG1	Tug Emissions	2.58E-02	g/s
NTUG2	Tug Emissions	2.58E-02	g/s
NTUG3	Tug Emissions	2.58E-02	g/s
NTUG4	Tug Emissions	2.58E-02	g/s
NTUG5	Tug Emissions	2.58E-02	g/s
NTUG6	Tug Emissions	2.58E-02	g/s
NTUG7	Tug Emissions	2.58E-02	g/s
NTUG8	Tug Emissions	2.58E-02	g/s
NTUG9	Tug Emissions	2.58E-02	g/s
NTUG10	Tug Emissions	2.58E-02	g/s
NTUG11	Tug Emissions	2.58E-02	g/s
NTUG12	Tug Emissions	2.58E-02	g/s
NTUG13	Tug Emissions	2.58E-02	g/s
NTUG14	Tug Emissions	2.58E-02	g/s
NTUG15	Tug Emissions	2.58E-02	g/s
NTUG16	Tug Emissions	2.58E-02	g/s
NTUG17	Tug Emissions	2.58E-02	g/s
NTUG18	Tug Emissions	2.58E-02	g/s
NTUG19	Tug Emissions	2.58E-02	g/s
NTUG20	Tug Emissions	2.58E-02	g/s
NTUG21	Tug Emissions	2.58E-02	g/s
NTUG22	Tug Emissions	2.58E-02	g/s
NTUG23	Tug Emissions	2.58E-02	g/s
NTUG24	Tug Emissions	2.58E-02	g/s
NTUG25	Tug Emissions	2.58E-02	g/s
NTUG26	Tug Emissions	2.58E-02	g/s
NTUGB2	Tug Emissions	2.58E-02	g/s
NTUGB3	Tug Emissions	2.58E-02	g/s
NTUGB4	Tug Emissions	2.58E-02	g/s
NTUGB5	Tug Emissions	2.58E-02	g/s
NTUGB6	Tug Emissions	2.58E-02	g/s
NTUGB7	Tug Emissions	2.58E-02	g/s
NTUGB8	Tug Emissions	2.58E-02	g/s
NTUGB9	Tug Emissions	2.58E-02	g/s
NTUGB10	Tug Emissions	2.58E-02	g/s
NTUGB11	Tug Emissions	2.58E-02	g/s
NTUGB12	Tug Emissions	2.58E-02	g/s
NTUGB13	Tug Emissions	2.58E-02	g/s
NTUGB14	Tug Emissions	2.58E-02	g/s
NTUGB15	Tug Emissions	2.58E-02	g/s
NTUGB16	Tug Emissions	2.58E-02	g/s
NTUGB17	Tug Emissions	2.58E-02	g/s
NTUGB18	Tug Emissions	2.58E-02	g/s
NTUGB19	Tug Emissions	2.58E-02	g/s
NTUGB20	Tug Emissions	2.58E-02	g/s
NTUGB21	Tug Emissions	2.58E-02	g/s
NTUGB22	Tug Emissions	2.58E-02	g/s
NTUGB23	Tug Emissions	2.58E-02	g/s
NTUGB24	Tug Emissions	2.58E-02	g/s
NTUGB25	Tug Emissions	2.58E-02	g/s
NTUGB26	Tug Emissions	2.58E-02	g/s
NTUGB1	Tug Emissions	2.58E-02	g/s
TK_VMT1	Truck Loading VMT	6.69E-03	g/s
TK_VMT2	Truck Loading VMT	6.69E-03	g/s
TK_VMT3	Truck Loading VMT	6.69E-03	g/s
TK_VMT4	Truck Loading VMT	6.69E-03	g/s
TK_VMT5	Truck Loading VMT	6.69E-03	g/s
TK_VMT3	Truck Loading VMT	6.69E-03	g/s
TK_VMT4	Truck Loading VMT	6.69E-03	g/s
TK_VMT5	Truck Loading VMT	6.69E-03	g/s
Fork1	Forklift Operations	4.39E-03	g/s

Link	CO Onsite Paved Road	CO Onsite Paved Road	CO Onsite Paved Road	Lemon St West Of Sonoma	Sonoma North of Lemon	Sonoma South of Lemon	Lemon St East Of Sonoma	Sonoma South of Magazine
Contributors	Orcem & VMT On Max Day	Orcem Only	VMT Only	Orcem & VMT On Max Day	Orcem & VMT On Max Day	Orcem & VMT On Max Day	Orcem & VMT On Max Day	Orcem & VMT On Max Day
Hours	**Hourly Emission Rate 1**	**Hourly Emission Rate 2**	**Hourly Emission Rate 3**	**Hourly Emission Rate 4**	**Hourly Emission Rate 5**	**Hourly Emission Rate 6**	**Hourly Emission Rate 7**	**Hourly Emission Rate 8**
1	1.10E-04	6.21E-05	4.81E-05	1.16E-04	5.93E-06	4.60E-05	7.42E-05	4.67E-05
2	3.19E-05	3.19E-05	0.00E+00	5.12E-05	1.38E-06	1.07E-05	3.27E-05	1.08E-05
3	4.79E-05	4.79E-05	0.00E+00	7.68E-05	2.07E-06	1.60E-05	4.90E-05	1.63E-05
4	7.05E-05	5.58E-05	1.47E-05	1.13E-04	3.05E-06	2.36E-05	7.23E-05	2.40E-05
5	8.34E-05	6.38E-05	1.96E-05	1.34E-04	3.60E-06	2.79E-05	8.55E-05	2.84E-05
6	8.34E-05	6.38E-05	1.96E-05	1.34E-04	3.60E-06	2.79E-05	8.55E-05	2.84E-05
7	8.34E-05	6.38E-05	1.96E-05	1.34E-04	3.60E-06	2.79E-05	8.55E-05	2.84E-05
8	1.13E-04	9.33E-05	1.96E-05	1.34E-04	3.60E-06	2.79E-05	8.55E-05	2.84E-05
9	2.86E-04	1.70E-04	1.16E-04	2.90E-04	1.34E-05	1.04E-04	1.85E-04	1.05E-04
10	1.23E-04	9.33E-05	2.94E-05	1.50E-04	4.03E-06	3.12E-05	9.56E-05	3.17E-05
11	1.23E-04	1.03E-04	1.96E-05	1.50E-04	4.03E-06	3.12E-05	9.56E-05	3.17E-05
12	1.13E-04	9.33E-05	1.96E-05	1.34E-04	3.60E-06	2.79E-05	8.55E-05	2.84E-05
13	1.05E-04	8.54E-05	1.96E-05	1.21E-04	3.26E-06	2.53E-05	7.73E-05	2.56E-05
14	8.29E-05	5.34E-05	2.94E-05	8.59E-05	2.31E-06	1.79E-05	5.48E-05	1.82E-05
15	8.29E-05	6.33E-05	1.96E-05	8.59E-05	2.31E-06	1.79E-05	5.48E-05	1.82E-05
16	4.91E-05	2.95E-05	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
17	1.35E-04	6.77E-05	6.77E-05	1.10E-04	5.75E-06	4.46E-05	6.99E-05	4.52E-05
18	1.96E-05	0.00E+00	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
19	1.96E-05	0.00E+00	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
20	1.96E-05	0.00E+00	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
21	1.96E-05	0.00E+00	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
22	1.96E-05	0.00E+00	1.96E-05	3.17E-05	8.50E-07	6.58E-06	2.02E-05	6.68E-06
23	2.76E-05	7.98E-06	1.96E-05	4.45E-05	1.19E-06	9.25E-06	2.84E-05	9.39E-06
24	3.56E-05	1.60E-05	1.96E-05	5.73E-05	1.54E-06	1.19E-05	3.65E-05	1.21E-05
Mean	**7.85E-05**	**5.27E-05**	**2.58E-05**	**9.63E-05**	**3.06E-06**	**2.37E-05**	**6.14E-05**	**2.40E-05**

VMT, Phase 1 (Alternative) - Based On Year 2020			No rail, ships or barge on cumulative maximum day		
Phase 1	1,350,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes			**Cumulative**	
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days		**Maximum Day**	
Duration of ship unloading	132	hrs (5.5 days)		**CO**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
CO **Phase 1 Alternative**	**Shipping (based on 29 trips only rather than 34)**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 1 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	56.4	lbs/day
	Barge (no barge in this scenario)		Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	0.0	lbs/day

VMT, Phase 1 (Alternative) - Based On Year 2016

Phase 1	1,350,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)		**CO**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Phase 1 Alternative	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 1 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	4311.9	lbs/year
	Barge	0	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	0.0	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

YEAR 2020

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**		
Visits Per Year	**29**	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	**59103.9**	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	
Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	5.34	CO at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.93	CO at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2012)	
Maneuvering	0.275	POLA (2012)	
Transit	0.104	POLA (2012)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CO**
Slow	Marine Distillate (0.1% S)	**1.380**
Medium	Marine Distillate (0.1% S)	**1.380**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CO**
Slow	Marine Distillate (0.1% S)	**1.380**
Medium	Marine Distillate (0.1% S)	**1.380**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CO**
Medium	Marine Distillate (0.1% S)	**1.100**
		g/kW-HR

Boiler

	CO
Marine Distillate (0.1% S)	**0.20**
	g/kW-HR

Tug

	CO
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

No Barge For Phase 1 Alternative

Barge Emission Factor

YEAR 2020

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	CO		Time (hrs)	inward	outward	Barge Emission Rate
Main	8599	g/hr	0.540	2.57	3.60	2.477
				m/s	m/s	
Auxiliary	318.4	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

· 3000 hp was assumed as the rated horsepower of the main engine(s).

Year	Engine	Emission Factors (g/kW-hr) ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.6843843	1.3730067	16.486135	0.2501607	0.2441568	0.3508234	0.0005964	0.1955416	0.0017675
2016	Auxiliary	0.5200034	1.1000072	12.791837	0.2500141	0.230013	0.3990026	0.0006626	0.228476	0.0085271
2016	Boiler	0.1100007	0.2000013	1.9950131	0.1333609	0.1300269	1.5015098	0.0002437	0.3051313	0.0012742
2017	Main	0.6872733	1.3805944	16.593573	0.2501188	0.244116	0.3500379	0.0005946	0.1950324	0.0017645
2017	Auxiliary	0.5200034	1.1000072	12.246673	0.2500141	0.230013	0.3990026	0.0006626	0.228476	0.0085271
2017	Boiler	0.1100007	0.2000013	1.9950131	0.1333609	0.1300269	1.5015098	0.0002437	0.3051313	0.0012742
2018	Main	0.6866932	1.3800091	15.165232	0.2500516	0.2440504	0.3512642	0.000594	0.1950324	0.0017642
2018	Auxiliary	0.5200034	1.1000072	11.634006	0.2500141	0.230013	0.3990026	0.0006626	0.228476	0.0085271
2018	Boiler	0.1100007	0.2000013	1.9950131	0.1333609	0.1300269	1.5015098	0.0002437	0.3051313	0.0012742
2019	Main	0.6866932	1.3800091	14.343835	0.2500516	0.2440504	0.3512642	0.000594	0.1950324	0.0017642
2019	Auxiliary	0.5200034	1.1000072	10.984842	0.2500141	0.230013	0.3990026	0.0006626	0.228476	0.0085271
2019	Boiler	0.1100007	0.2000013	1.9950131	0.1333609	0.1300269	1.5015098	0.0002437	0.3051313	0.0012742
2020	Main	0.6866932	1.3800091	13.748153	0.2500516	0.2440504	0.3512642	0.000594	0.1950324	0.0017642
2020	Auxiliary	0.5200034	1.1000072	10.53416	0.2500141	0.230013	0.3990026	0.0006626	0.228476	0.0085271
2020	Boiler	0.1100007	0.2000013	1.9950131	0.1333609	0.1300269	1.5015098	0.0002437	0.3051313	0.0012742

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category
With fuel regulations and MARPOL standards

Golden Gate	Dock	23.13	nm	23.13		AWN	73673	
Sea Buoy	GG	8.72		8.91			1700	
At Buoy		1.5		1.5			1300	
North	Sea Buoy	7.4		6.1	Link not included			
		40.75	nm	39.64			76673	meters
	1.1508	46.8951					41.437025	nm
		75454.216						
		72454.216						
	Out to Sea Buoy	33.35		33.54	nm			
			1.1508	38.597832	statute miles			
				62103.912	meters			
				59103.912	meters - 3000 meters for maneuvering			

Calendar Year	Area	Engine	g/hp-hr NOx	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.4810095	0.1755103	0.5740492	3.7610793	0.0059511	587.17204
2016	Tow Boats	AE	5.7359511	0.2692001	0.8829784	4.184697	0.0059511	587.17204
2016	Tug Boats	ME	5.9931778	0.2215359	0.5927102	3.7419959	0.0059511	587.17204
2016	Tug Boats	AE	5.688221	0.2354288	0.8576122	4.1126283	0.0059511	587.17204
2017	Tow Boats	ME	5.1245501	0.1481971	0.5682942	3.9339711	0.0059511	587.17204
2017	Tow Boats	AE	5.4782014	0.2272745	0.8763318	4.1872845	0.0059511	587.17204
2017	Tug Boats	ME	5.5781172	0.187058	0.5831402	3.9511614	0.0059511	587.17204
2017	Tug Boats	AE	5.3151638	0.2053295	0.8541628	4.1864916	0.0059511	587.17204
2018	Tow Boats	ME	5.1107658	0.1492718	0.571738	3.9717695	0.0059511	587.17204
2018	Tow Boats	AE	5.4898237	0.2288784	0.8836963	4.2086236	0.0059511	587.17204
2018	Tug Boats	ME	5.5441972	0.1868704	0.587547	4.0101284	0.0059511	587.17204
2018	Tug Boats	AE	5.3103539	0.2038819	0.8617042	4.2103862	0.0059511	587.17204
2019	Tow Boats	ME	5.0944928	0.1501616	0.5748329	4.0091258	0.0059511	587.17204
2019	Tow Boats	AE	5.5005311	0.2303366	0.8907715	4.2292124	0.0059511	587.17204
2019	Tug Boats	ME	5.5391557	0.1891781	0.5926383	4.0564961	0.0059511	587.17204
2019	Tug Boats	AE	5.3333946	0.2064771	0.870666	4.2364731	0.0059511	587.17204
2020	Tow Boats	ME	4.6561335	0.1154411	0.5676966	4.2151115	0.0059511	587.17204
2020	Tow Boats	AE	5.4525842	0.2232088	0.891178	4.230997	0.0059511	587.17204
2020	Tug Boats	ME	5.1974297	0.1615162	0.5879548	4.2445689	0.0059511	587.17204
2020	Tug Boats	AE	5.285778	0.2001194	0.8722182	4.2410255	0.0059511	587.17204

Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
http://www.arb.ca.gov/msei/categories.htm#chc_category

Unpaved Road - Industrial (Forklift)

YEAR 2020

OFFROAD2011	Load Factor	HP	CO
Forklift	0.20	100	1.58
		hp	g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1800	hours/year	(capped at 12,000 hrs)
Fuel Correction Factor	1		
Emission Rate	29.07	g/hr	
Activity Factor	0.50	Fractional usage per hour (maximum day)	

CO	**Maximum Day**			
Emission Rate	14.54	g/hr		
Emission Rate	0.0040	g/sec		
Sources	1			
Emissions per sec S1/source	0.0040	g/sec		
	CO			
Emissions per sec S1/source	**0.0040**	g/sec		

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

YEAR 2020

OFFROAD2011	Load Factor	HP	CO (diesel)
Front Loader	0.36	369	0.92
			g/(hp-hr)
Deterioration Rate	1.82E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	123.08	g/hr	

Activity Factor	90%	Fractional usage per hour

Emission Rate / Front Loader	0.0308	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

	Maximum Day	Annual		Hours Of Operation
Emission Rate / Front Loader / Truck Loading	0.00615	0.03077	g/s	5760
Emission Rate / Front Loader / TransLoading	0.00769	0.03077	g/s	1392
Emission Rate / Front Loader / Rail Loading	0.00615	0.03077	g/s	0
Emission Rate / Front Loader / Barge Loading	0.00615	0.03077	g/s	0
				Sum

CO Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

YEAR 2020

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC2007 Categories					Annual			
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run			
						(gms/mile)			
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	3.33	Annual		

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO(g/hr-veh)	
2020	HHDT	D	SF	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (Ann)	g/vkt	2.07	3.33	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.44	0.71	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	1.95	3.13	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	1.050	0.231	1.050
2020	Annual	LDA	DSL	Aggregated	10	2.588	0.000	2.588

LDA Idling Calculation						
2020	Annual	LDA	GAS	Aggregated		CO_RUNEX
						Annual
Speed	5	miles/hr	GAS	Aggregated	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	Aggregated	3.468

		CO_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.972	1.564	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	1.608	2.588	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.953	1.534	sum	
Composite Emission Factor DSL (ann)	g/vkt	1.649	2.654	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.956	1.539	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	CO		CO	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	1.412	g/hr	0.693	
Emission Factor/vehicle	0.0003921	g/sec	0.003851	includes all trips/day
Emissions /vehicle/AERMOD Source	4.90E-06	g/sec	4.81E-05	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	CO Emissions (g/s)	CO Vehicles Per Hour	CO Emissions (g/s)	CO Including LDA
1	4.90E-06	0	0.00E+00	4.81E-05
2	4.90E-06	0	0.00E+00	0.00E+00
3	4.90E-06	0	0.00E+00	0.00E+00
4	4.90E-06	3	1.47E-05	1.47E-05
5	4.90E-06	4	1.96E-05	1.96E-05
6	4.90E-06	4	1.96E-05	1.96E-05
7	4.90E-06	4	1.96E-05	1.96E-05
8	4.90E-06	4	1.96E-05	1.96E-05
9	4.90E-06	4	1.96E-05	1.16E-04
10	4.90E-06	6	2.94E-05	2.94E-05
11	4.90E-06	4	1.96E-05	1.96E-05
12	4.90E-06	4	1.96E-05	1.96E-05
13	4.90E-06	4	1.96E-05	1.96E-05
14	4.90E-06	6	2.94E-05	2.94E-05
15	4.90E-06	4	1.96E-05	1.96E-05
16	4.90E-06	4	1.96E-05	1.96E-05
17	4.90E-06	4	1.96E-05	6.77E-05
18	4.90E-06	4	1.96E-05	1.96E-05
19	4.90E-06	4	1.96E-05	1.96E-05
20	4.90E-06	4	1.96E-05	1.96E-05
21	4.90E-06	4	1.96E-05	1.96E-05
22	4.90E-06	4	1.96E-05	1.96E-05
23	4.90E-06	4	1.96E-05	1.96E-05
24	4.90E-06	4	1.96E-05	1.96E-05

Total HHDT/Day	87.0
	including deliveries (2 per day, 10am, 2pm)
Annual HHDT Based On Max Day	31755
Actual HHDT Based On Tonnage	17542
Ratio	0.5524

Annual HGV Traffic	tonnage	truck tonnage	Based on 21 US ton trucks trucks per year	distance travelled (km)	Maximum Day CO g/trip	Annual Mean CO g/trip	CO lbs/day	CO MTPA	CO tpa	CO lbs/year

Phase 1 Trucks Only	480,000	480000	26445	0.725	1.412	1.412	0.271	0.0373	0.0411	82.30
Phase 1 Trucks & Rail	720,000	240000	13846	0.725	1.412	1.412	0.271	0.0195	0.0215	43.09
Phase 1 Alternative	1,350,000	480000	26445	0.725	1.412	1.412	0.271	0.0373	0.0411	82.30
Phase 2	1,160,000	214400	12503	0.725	1.412	1.412	0.271	0.0176	0.0195	38.91
Phase 2 Alternative	1,160,000	310400	17542	0.725	1.412	1.412	0.271	0.0248	0.0273	54.59
LDA Traffic					CO	CO	CO	CO	CO	CO
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.693	0.693	0.037	0.002595	0.002861	5.72
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.693	0.693	0.037	0.003460	0.003814	7.63
Phase 1 Alternative	1350000	40	10400	0.725	0.693	0.693	0.061	0.007209	0.007946	15.89
Phase 2	1,160,000	80	20800	0.725	0.693	0.693	0.122	0.014417	0.015892	31.78
Phase 2 Alternative	1,160,000	80	20800	0.725	0.693	0.693	0.122	0.014417	0.015892	31.78
									tpa	
							CO			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.3075	0.0399	0.0440	88.0
						Phase 1 Trucks & Rail	0.3075	0.0230	0.0254	50.7
						Phase 1 Alternative	0.3319	0.0445	0.0491	98.2
						Phase 2	0.3931	0.0321	0.0353	70.7
						Phase 2 Alternative	0.3931	0.0392	0.0432	86.4

CO Public Paved Road (Exhaust Emissions)

YEAR 2020

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor CO

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	1.69	Annual	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Cate	Fuel_Type	air_basin	season	CO (g/hr-veh)	
2020	HHDT	D	SV	A		
					3.85	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	1.05	1.69	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.48	0.77	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	1.01	1.62	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.865		0.865
2020	Annual	LDA	DSL	Aggregated	20	0.550		0.550

Idling Calculation					
2020	Annual	LDA	GAS	Aggregated	CO
					Annual
Speed	5	miles/hr	GAS	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	3.468

		CO	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.538	0.865	EMFAC2011	No start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.342	0.550	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.552	0.888	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.478	0.769	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.551	0.888	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of volume sources

		HHDT		LDA	
		CO		CO	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.727	g/hr	0.397	based on Annual
Emission Factor/vehicle		0.00020	g/sec	0.002206	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		3.96E-06	g/sec	4.33E-05	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5	Maximum Day	Annual			Maximum Day
Weekday Hours	CO Emission Factor	Milestone5 VMT	Milestone5 Trucks	CO Emission Factor	CO Including LDA
1	3.96E-06	3.96E-06	0.00	0.00E+00	4.33E-05
2	3.96E-06	3.96E-06	0.00	0.00E+00	0.00E+00
3	3.96E-06	3.96E-06	0.00	0.00E+00	0.00E+00
4	3.96E-06	3.96E-06	3.00	2.37E-05	2.37E-05
5	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
6	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
7	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
8	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
9	3.96E-06	3.96E-06	4.00	3.17E-05	1.18E-04
10	3.96E-06	3.96E-06	6.00	4.75E-05	4.75E-05
11	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
12	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
13	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
14	3.96E-06	3.96E-06	6.00	4.75E-05	4.75E-05
15	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
16	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
17	3.96E-06	3.96E-06	4.00	3.17E-05	7.49E-05
18	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
19	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
20	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
21	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
22	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
23	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
24	3.96E-06	3.96E-06	4.00	3.17E-05	3.17E-05
			87.0		
		including deliveries (2 per day, 10am, 2pm)			

CO Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	1.009	0.5515	Lemon
Controlled Emission factor, E (ANNUAL)	g/VKT	0.3204	0.4106	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		CO		CO	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.168	g/hr	0.216	
Emission Factor/vehicle		0.0000467	g/sec	0.00120	includes shift trips/day
0		2.12E-06	g/sec	5.44E-05	

Sonoma North of Lemon			0.525
Split	0.05		km

phase 2 alternative

Weekday Hours	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Including LDA
1	2.12E-06	0.00	0.00E+00	2.72E-06
2	2.12E-06	0.00	0.00E+00	0.00E+00
3	2.12E-06	0.00	0.00E+00	0.00E+00
4	2.12E-06	0.15	6.37E-07	6.37E-07
5	2.12E-06	0.20	8.50E-07	8.50E-07
6	2.12E-06	0.20	8.50E-07	8.50E-07
7	2.12E-06	0.20	8.50E-07	8.50E-07
8	2.12E-06	0.20	8.50E-07	8.50E-07
9	2.12E-06	0.20	8.50E-07	6.29E-06
10	2.12E-06	0.30	1.27E-06	1.27E-06
11	2.12E-06	0.20	8.50E-07	8.50E-07
12	2.12E-06	0.20	8.50E-07	8.50E-07
13	2.12E-06	0.20	8.50E-07	8.50E-07
14	2.12E-06	0.30	1.27E-06	1.27E-06
15	2.12E-06	0.20	8.50E-07	8.50E-07
16	2.12E-06	0.20	8.50E-07	8.50E-07
17	2.12E-06	0.20	8.50E-07	3.57E-06
18	2.12E-06	0.20	8.50E-07	8.50E-07
19	2.12E-06	0.20	8.50E-07	8.50E-07
20	2.12E-06	0.20	8.50E-07	8.50E-07
21	2.12E-06	0.20	8.50E-07	8.50E-07
22	2.12E-06	0.20	8.50E-07	8.50E-07
23	2.12E-06	0.20	8.50E-07	8.50E-07
24	2.12E-06	0.20	8.50E-07	8.50E-07
				g/sec

4.4
including deliveries (2 per day, 10am, 2pm)

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT CO		LDA CO	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	to junction Sonoma Blvd
Emission Factor/vehicle		0.236	g/hr	0.302	
Emission Factor/vehicle		6.54E-05	g/sec	1.68E-03	includes shift trips/day
0		2.11E-06	g/sec	5.41E-05	

Sonoma South of Lemon			0.735
Split	0.39		km

phase 2 alternative

Weekday Hours	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Including LDA
1	2.11E-06	0.00	0.00E+00	2.11E-05
2	2.11E-06	0.00	0.00E+00	0.00E+00
3	2.11E-06	0.00	0.00E+00	0.00E+00
4	2.11E-06	1.17	4.94E-06	4.94E-06
5	2.11E-06	1.56	6.58E-06	6.58E-06
6	2.11E-06	1.56	6.58E-06	6.58E-06
7	2.11E-06	1.56	6.58E-06	6.58E-06
8	2.11E-06	1.56	6.58E-06	6.58E-06
9	2.11E-06	1.56	6.58E-06	4.88E-05
10	2.11E-06	2.34	9.88E-06	9.88E-06
11	2.11E-06	1.56	6.58E-06	6.58E-06
12	2.11E-06	1.56	6.58E-06	6.58E-06
13	2.11E-06	1.56	6.58E-06	6.58E-06
14	2.11E-06	2.34	9.88E-06	9.88E-06
15	2.11E-06	1.56	6.58E-06	6.58E-06
16	2.11E-06	1.56	6.58E-06	6.58E-06
17	2.11E-06	1.56	6.58E-06	2.77E-05
18	2.11E-06	1.56	6.58E-06	6.58E-06
19	2.11E-06	1.56	6.58E-06	6.58E-06
20	2.11E-06	1.56	6.58E-06	6.58E-06
21	2.11E-06	1.56	6.58E-06	6.58E-06
22	2.11E-06	1.56	6.58E-06	6.58E-06
23	2.11E-06	1.56	6.58E-06	6.58E-06
24	2.11E-06	1.56	6.58E-06	6.58E-06
				g/hr

33.9
including deliveries (2 per day, 10am, 2pm)

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

		HHDT HHDT		LDA HHDT	
Spacing of volume sources		16	m	16	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.828	g/hr	0.452	
Emission Factor/vehicle		0.0002299	g/sec	0.0025124	includes shift trips/day
0		4.51E-06	g/sec	4.93E-05	

Lemon St East Of Sonoma			0.82
Split	0.56		km

phase 2 alternative

Weekday Hours	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Including LDA
1	4.51E-06	0	0.00E+00	2.76E-05
2	4.51E-06	0	0.00E+00	0.00E+00
3	4.51E-06	0	0.00E+00	0.00E+00
4	4.51E-06	2	1.51E-05	1.51E-05

5	4.51E-06	2	2.02E-05	2.02E-05
6	4.51E-06	2	2.02E-05	2.02E-05
7	4.51E-06	2	2.02E-05	2.02E-05
8	4.51E-06	2	2.02E-05	2.02E-05
9	4.51E-06	2	2.02E-05	7.54E-05
10	4.51E-06	3	3.03E-05	3.03E-05
11	4.51E-06	2	2.02E-05	2.02E-05
12	4.51E-06	2	2.02E-05	2.02E-05
13	4.51E-06	2	2.02E-05	2.02E-05
14	4.51E-06	3	3.03E-05	3.03E-05
15	4.51E-06	2	2.02E-05	2.02E-05
16	4.51E-06	2	2.02E-05	2.02E-05
17	4.51E-06	2	2.02E-05	4.78E-05
18	4.51E-06	2	2.02E-05	2.02E-05
19	4.51E-06	2	2.02E-05	2.02E-05
20	4.51E-06	2	2.02E-05	2.02E-05
21	4.51E-06	2	2.02E-05	2.02E-05
22	4.51E-06	2	2.02E-05	2.02E-05
23	4.51E-06	2	2.02E-05	2.02E-05
24	4.51E-06	2	2.02E-05	2.02E-05
				g/hr

48.7
including deliveries (2 per day, 10am, 2pm)

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT		LDA		
	HHDT		HHDT		
Spacing of volume sources	24	m	24	2-way roadway	
AERMOD volume Sources	29		29		
Distance Travelled (Lemon Street)	0.698	km	0.698	to junction Sonoma Blvd	
Emission Factor/vehicle	0.224	g/hr	0.287		
Emission Factor/vehicle	0.0000621	g/sec	0.0015924	includes shift trips/day	
#REF!	2.14E-06	g/sec	5.49E-05		

Sonoma South of Magazine		0.698
Split	0.39	km

phase 2 alternative

Weekday Hours	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Emissions (g/sec)	CO Including LDA
1	2.14E-06	0	0.00E+00	2.14E-05
2	2.14E-06	0	0.00E+00	0.00E+00
3	2.14E-06	0	0.00E+00	0.00E+00
4	2.14E-06	1	5.01E-06	5.01E-06
5	2.14E-06	2	6.68E-06	6.68E-06
6	2.14E-06	2	6.68E-06	6.68E-06
7	2.14E-06	2	6.68E-06	6.68E-06
8	2.14E-06	2	6.68E-06	6.68E-06
9	2.14E-06	2	6.68E-06	4.95E-05
10	2.14E-06	2	1.00E-05	1.00E-05
11	2.14E-06	2	6.68E-06	6.68E-06
12	2.14E-06	2	6.68E-06	6.68E-06
13	2.14E-06	2	6.68E-06	6.68E-06
14	2.14E-06	2	1.00E-05	1.00E-05
15	2.14E-06	2	6.68E-06	6.68E-06
16	2.14E-06	2	6.68E-06	6.68E-06
17	2.14E-06	2	6.68E-06	2.81E-05
18	2.14E-06	2	6.68E-06	6.68E-06
19	2.14E-06	2	6.68E-06	6.68E-06
20	2.14E-06	2	6.68E-06	6.68E-06
21	2.14E-06	2	6.68E-06	6.68E-06
22	2.14E-06	2	6.68E-06	6.68E-06
23	2.14E-06	2	6.68E-06	6.68E-06
24	2.14E-06	2	6.68E-06	6.68E-06
				g/s

33.9
including deliveries (2 per day, 10am, 2pm)

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					CO	CO	CO	CO	CO	CO
		trucks tonnage per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only		480,000	26,445	80.467	81.22	81.22	15.581	2.1479	2.3676	4735.19
Phase 1 Trucks & Rail		240,000	13,846	80.467	81.22	81.22	15.581	1.1246	1.2397	2479.33
Phase 1 Alternative		480,000	26,445	80.467	81.22	81.22	15.581	2.1479	2.3676	4735.19
Phase 2		214,400	12,503	80.467	81.22	81.22	15.581	1.0155	1.1194	2238.70
Phase 2 Alternative		310,400	17,542	80.467	81.22	81.22	15.581	1.4248	1.5705	3141.05
LDA Traffic					CO	CO	CO	CO	CO	CO
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	22.01	22.01	1.165	0.082407	0.090837	181.67
Phase 1 Trucks & Rail	720000	24	4992	39.910	22.01	22.01	1.165	0.109876	0.121116	242.23
Phase 1 Alternative	1350000	40	10400	39.910	22.01	22.01	1.941	0.228907	0.252325	504.65
Phase 2	1160000	80	20800	39.910	22.01	22.01	3.883	0.457815	0.504649	1009.30
Phase 2 Alternative	1160000	80	20800	39.910	22.01	22.01	3.883	0.457815	0.504649	1009.30
									tpa	
							CO			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	16.746	2.2303	2.4584	4917
						Phase 1 Trucks & Rail	16.746	1.2345	1.3608	2722
						Phase 1 Alternative	17.522	2.3768	2.6199	5240

Phase 2	19.464	1.4733	1.6240	3248
Phase 2 Alternative	19.464	1.8826	2.0752	4150

Public Paved Road (Exhaust Emissions)

(Assumed 40 miles/hr for all vehicles on Sonoma Blvd)

YEAR 2020

HHDT Emission Factor CO

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	40	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.500	Annual	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO (g/hr-veh)	
2020	HHDT	D	SV	A		
					3.57	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		CO_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.310	0.500	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.443	0.713	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.320	0.516	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO_RUNEX	CO_STREX	CO_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40	0.6207		0.621
2020	Annual	LDA	DSL	Aggregated	40	0.1939		0.194

Idling Calculation					
2020	Annual	LDA	GAS	Aggregated	(gms/mile)
					Annual
Speed	5	miles/hr	GAS	Aggregated	1.168
	8.046	km/hr	DSL	Aggregated	3.468

		CO	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	0.386	0.621	EMFAC2011	start emissions - 10mins
Tailpipe DSL LDA (ann)	g/vkt	0.121	0.194	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.726	1.168	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	2.155	3.468	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.411	0.662	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.273	0.439	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.411	0.661	sum	Based on 0.38% Diesel

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	CO (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	3.78
1	4.76%	33.32	5.00%	1.67	2.52
2	14.18%	99.26	25.00%	24.82	37.47
3	27.80%	194.6	2.30%	4.48	6.76
4	42.07%	294.49	21.50%	63.32	95.61
5	57.30%	401.1	1.50%	6.02	9.08
6	72.51%	507.57	1.60%	8.12	12.26
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	1.00				

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported		
Production Capacity	100 tons per hour		
Hours Of Operation	7600 hour per year		
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)		
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)		
Ship Unloading Capacity	**303**		
Duration of ship unloading	**132**	**hrs**	

Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508hrs, manuverving & transit = 2hrs x 19 = 38hrs
	Diesel Hoppers/Conveyors	19	In operation when ship unloads only

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaken for 73673m of transit prior to reduced speed transit for 1.7km and maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Orcem California Inc., Mode 1 (Milestone 5)**		
Visits Per Year	19	visits	
Hours Per Visit	**138**	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	**132**	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46	3.70%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36	10.20%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	

Auxilliary Engine		
Hoteling	0.061	POLA (2012)
Maneuvering	0.275	POLA (2012)
Transit	0.104	POLA (2012)

Source: (CARB (2011) Appendix D)

Main Engine

Transit		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.250**
Medium	Marine Distillate (0.1% S)	**0.250**
		g/kW-HR

Maneuvering		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.250**
Medium	Marine Distillate (0.1% S)	**0.250**
		g/kW-HR

Auxiliary Engine		
Engine Speed	**Fuel**	
		PM10
Medium	Marine Distillate (0.1% S)	**0.250**
		g/kW-HR

Boiler	
	PM10
0.1% S	**0.000**
	g/kW-HR

Tug	
	PM10
0.1% S	**See below**
	g/kW-HR

		Emission Factors (g/kW-hr)								
Year	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	0.195542	0.001767
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	0.195032	0.001765
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category
With fuel regulations and MARPOL standards

Golden Gat	Dock		23.13	nm	23.13		AWN	73673	
Sea Buoy	GG		8.72		8.91			1700	
At Buoy			1.5		1.5			1300	
North	Sea Buoy		7.4		6.1	Link not included			
			40.75	nm	39.64			76673	meters
		1.1508	46.8951					41.43703	nm
			75454.22						
			72454.22						
	Out to Sea Buoy		33.35		33.54	nm			
				1.1508	38.59783	statute miles			
					62103.91	meters			
					59103.91	meters - 3000 meters for maneuvering			

			g/hp-hr					
Calendar Y	Area	Engine	NOx	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172

Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
http://www.arb.ca.gov/msei/categories.htm#chc_category

Mobile Hoppers / Conveyors

	Load Factor	hp	PM10
Hopper / Conveyor	0.40	201	0.0100
			g/(hp-hr)
Deterioration Rate	3.70E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.852		
Emission Rate	0.699	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate /Hopper / Conveyor PM10	0.000194	g/s	
PM2.5/PM10 Ratio	0.92		
Emission Rate / Hopper / Conveyor PM2.5	0.000179	g/s	
			Milestone 5

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)

OFFROAD2011	Load Factor	HP	PM10
Excavator	0.3819	175	0.010
			g/(hp-hr)
Deterioration Rate	5.00E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 5 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.85		
Emission Rate	0.63	g/hr	

Activity Factor	0.25	Fractional usage per hour

Emission Rate / Excavator PM10	0.000044	g/s
PM2.5/PM10 Ratio	1.00	
Emission Rate / Excavator PM2.5	0.000044	g/s

Unpaved Road - Industrial (Front Loader (2 CNG / LPG / Propane in operation for Milestone 5))

OFFROAD	Load Factor	HP	PM10 (Diesel)
Front Loader	0.3618	369	0.010
			g/(hp-hr)
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.10	g/hr	

Activity Factor	0.75	Fractional usage per hour		
			Combined	
Emission Rate / Front Loader PM10	0.000229	g/s	0.000273	including excavator exhaust emissions
PM2.5/PM10 Ratio	1.00		1.00	
Emission Rate / Front Loader PM2.5	0.000229	g/s	0.000273	including excavator exhaust emissions

	Maximum 24-hrs	Annual Mean
Sources (Slag Heap N)	12	28
Sources (Slag Heap S)	5	28

Maximum 24-Hours	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	2.27E-05	g/s	2.27E-05	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	5.46E-05	g/s	5.46E-05	including excavator exhaust emissions

Annual Mean	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	9.75E-06	g/s	9.75E-06	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	9.75E-06	g/s	9.75E-06	including excavator exhaust emissions

PM10	Front Loader - Gypsum Loading			
Emission Rate	1.10	g/hr		
	0.00031	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	0.069	g/km		Tonnage / front loader
Gypsum Storage Sources	28			Tons / front loader
Time per trip	0.035	hrs		
Spacing storage	0.010	km		Tonnage
				3,522
Distance Travelled S3	0.560	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.24	14,088
				22,306
Emissions per hour S3	0.0385	g/hr	0.00914	
Emissions per sec S3	0.0000107	g/sec	0.00000254	
	PM10 Maximum Day		PM10 Annual Mean	PM2.5 Maximum Day
Emissions per sec S3/source	3.82E-07	g/sec	9.07E-08	3.51E-07

PM10 Onsite Paved Road (Exhaust Emissions)

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC 2007 Categories					Annual		Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0137		0.0137

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season		PM10 (g/hr-veh)
2020	HHDT	D	SV	A		
					annual	0.002
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0085	0.0137	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0002	0.0003	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0079	0.0127	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM2_5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)		(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10				0.00000
2020	Annual	LDA	DSL	Aggregated	10	0.0320		0.00000	0.03199
LDA Idling Calculation									
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX			
						(gms/mile)	gms/km		
Speed	5	miles/hr	GAS	Aggregated	Aggregated				
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269		

		PM10_run	g/mile		
Gas LDA (ann)	g/vkt	0.00000	0.0000	EMFAC2011	start emissions - one start per day averaged over onsite trip distance (0.755km)
DSL LDA (ann)	g/vkt	0.01988	0.0320	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02692	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00000	0.0000	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.02040	0.0328	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0001	0.0001	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.006	g/hr	5.85E-05	based on annual
Emission Factor/vehicle	1.66E-06	g/sec	2.60E-07	includes all trips/day
Emissions /vehicle/AERMOD Source	1.99E-08	g/sec	3.13E-09	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM10 Emissions (g/s)	Milestone 5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	1.99E-08	5	9.70E-08	1.001E-07
2	1.99E-08	6	1.29E-07	1.293E-07
3	1.99E-08	10	1.94E-07	1.940E-07
4	1.99E-08	11	2.26E-07	2.263E-07
5	1.99E-08	13	2.59E-07	2.586E-07
6	1.99E-08	13	2.59E-07	2.586E-07
7	1.99E-08	13	2.59E-07	2.586E-07
8	1.99E-08	13	2.59E-07	2.586E-07
9	1.99E-08	13	2.59E-07	2.649E-07
10	1.99E-08	13	2.59E-07	2.586E-07
11	1.99E-08	15	2.99E-07	2.985E-07
12	1.99E-08	13	2.59E-07	2.586E-07
13	1.99E-08	11	2.26E-07	2.263E-07
14	1.99E-08	5	9.70E-08	9.699E-08
15	1.99E-08	7	1.37E-07	1.369E-07
16	1.99E-08	0	0.00E+00	0.000E+00
17	1.99E-08	0	0.00E+00	3.135E-09
18	1.99E-08	0	0.00E+00	0.000E+00
19	1.99E-08	0	0.00E+00	0.000E+00
20	1.99E-08	0	0.00E+00	0.000E+00
21	1.99E-08	0	0.00E+00	0.000E+00
22	1.99E-08	0	0.00E+00	0.000E+00
23	1.99E-08	2	3.23E-08	3.233E-08
24	1.99E-08	3	6.47E-08	6.466E-08

166.1

including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	Maximum 24-Hour PM10 Including LDA
1	1.99E-08	5	9.70E-08	1.00E-07
2	1.99E-08	6	1.29E-07	1.29E-07
3	1.99E-08	10	1.94E-07	1.94E-07
4	1.99E-08	11	2.26E-07	2.26E-07
5	1.99E-08	13	2.59E-07	2.59E-07
6	1.99E-08	13	2.59E-07	2.59E-07
7	1.99E-08	13	2.59E-07	2.59E-07

8	1.99E-08	19	3.78E-07	3.78E-07
9	1.99E-08	19	3.78E-07	3.85E-07
10	1.99E-08	19	3.78E-07	3.78E-07
11	1.99E-08	21	4.18E-07	4.18E-07
12	1.99E-08	19	3.78E-07	3.78E-07
13	1.99E-08	17	3.46E-07	3.46E-07
14	1.99E-08	11	2.17E-07	2.17E-07
15	1.99E-08	13	2.57E-07	2.57E-07
16	1.99E-08	6	1.20E-07	1.20E-07
17	1.99E-08	6	1.20E-07	1.23E-07
18	1.99E-08	0	0.00E+00	0.00E+00
19	1.99E-08	0	0.00E+00	0.00E+00
20	1.99E-08	0	0.00E+00	0.00E+00
21	1.99E-08	0	0.00E+00	0.00E+00
22	1.99E-08	0	0.00E+00	0.00E+00
23	1.99E-08	2	3.23E-08	3.23E-08
24	1.99E-08	3	6.47E-08	6.47E-08

226.1

including deliveries (2 per day, 10am, 2pm)

Annual Average Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

	PM10	Milestone5	PM10	Emissions (g/s)
	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	1.99E-08	5	9.70E-08	1.00E-07
2	1.99E-08	6	1.29E-07	1.29E-07
3	1.99E-08	10	1.94E-07	1.94E-07
4	1.99E-08	11	2.26E-07	2.26E-07
5	1.99E-08	13	2.59E-07	2.59E-07
6	1.99E-08	13	2.59E-07	2.59E-07
7	1.99E-08	13	2.59E-07	2.59E-07
8	1.99E-08	14	2.74E-07	2.74E-07
9	1.99E-08	14	2.74E-07	2.81E-07
10	1.99E-08	14	2.74E-07	2.74E-07
11	1.99E-08	16	3.14E-07	3.14E-07
12	1.99E-08	14	2.74E-07	2.74E-07
13	1.99E-08	12	2.42E-07	2.42E-07
14	1.99E-08	6	1.13E-07	1.13E-07
15	1.99E-08	8	1.53E-07	1.53E-07
16	1.99E-08	1	1.57E-08	1.57E-08
17	1.99E-08	1	1.57E-08	1.89E-08
18	1.99E-08	0	0.00E+00	0.00E+00
19	1.99E-08	0	0.00E+00	0.00E+00
20	1.99E-08	0	0.00E+00	0.00E+00
21	1.99E-08	0	0.00E+00	0.00E+00
22	1.99E-08	0	0.00E+00	0.00E+00
23	1.99E-08	2	3.23E-08	3.23E-08
24	1.99E-08	3	6.47E-08	6.47E-08

174.0

including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate	Cumulative
Emissions (g/s)	PM2.5	PM2.5
Including LDA	Including LDA	Including LDA
8.69E-08	3.90E-09	9.08E-08
1.12E-07	0.00E+00	1.12E-07
1.68E-07	0.00E+00	1.68E-07
1.96E-07	1.07E-07	3.04E-07
2.24E-07	1.43E-07	3.68E-07
2.24E-07	1.43E-07	3.68E-07
2.24E-07	1.43E-07	3.68E-07
2.38E-07	2.15E-07	4.53E-07
2.43E-07	1.51E-07	3.95E-07
2.38E-07	1.43E-07	3.81E-07
2.73E-07	1.43E-07	4.16E-07
2.38E-07	1.43E-07	3.81E-07
2.10E-07	1.43E-07	3.53E-07
9.78E-08	2.15E-07	3.13E-07
1.32E-07	1.43E-07	2.76E-07
1.37E-08	1.43E-07	1.57E-07
1.64E-08	1.47E-07	1.64E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
2.80E-08	1.43E-07	1.71E-07
5.61E-08	1.43E-07	1.99E-07

Annualised	Annualised Emission Rate	Annualised Emission Rate
1.26E-07	1.31E-07	2.56E-07

Annual									
HGV Traffic					PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	0.0060	0.0022	0.0001	0.0001	0.11
milestone 2	240000		14578	0.755	0.0060	0.0022	0.0001	0.0001	0.19
milestone 3	360000		20676	0.755	0.0060	0.0022	0.0001	0.0001	0.27
milestone 4	480000		22723	0.755	0.0060	0.0022	0.0001	0.0001	0.30
milestone 5	760000		32534	0.755	0.0060	0.0022	0.0002	0.0002	0.43
LDA Traffic					PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	0.755	5.85E-05	1.81E-06	1.28E-07	1.41E-07	2.82E-04
milestone 2	240000	24	4992	0.755	5.85E-05	3.10E-06	2.92E-07	3.22E-07	6.44E-04
milestone 3	360000	24	6240	0.755	5.85E-05	3.10E-06	3.65E-07	4.03E-07	8.05E-04
milestone 4	480000	64	16640	0.755	5.85E-05	8.26E-06	9.74E-07	1.07E-06	2.15E-03
milestone 5	760000	64	19968	0.755	5.85E-05	8.26E-06	1.17E-06	1.29E-06	2.58E-03
								tpa	
						PM10			
						lbs/day	MTPA	tpa	lbs/year
				Combined	milestone 1	0.0022	0.0001	0.0001	0.11
					milestone 2	0.0022	0.0001	0.0001	0.19
					milestone 3	0.0022	0.0001	0.0001	0.27
					milestone 4	0.0022	0.0001	0.0002	0.30
					milestone 5	0.0022	0.0002	0.0002	0.43

PM10 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor PM$_{10}$

EMFAC2011 Emission Rates							*0.6214*
Region Type:	GAI						*mile to km*
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	20	miles/hr					
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**PM10_run**	**Combined**
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0105	0.0105

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle C**	**Fuel_Type**	**air_basin**	**season**	**PM10 (g/hr-veh)**	
2020	HHDT	D	SV	A		
					0.002	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	**g/mile**		
T7 Single	g/vkt	0.0065	**0.0105**	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0002	**0.0003**	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**0.0061**	**0.0097**	Sum	**Assumption - Based On Idling for 7.5% of time**

0.00E+00

LDA Emission Factor PM$_{2.5}$

CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM10_RUNEX**		**PM10_Combined**
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	**20**			**0.0000**
2020	Annual	LDA	DSL	Aggregated	**20**	**0.0191**		**0.0191**
Idling Calculation								
2020	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM10_RUNEX**		
						(gms/mile)	**gms/km**	
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated			
	8.046	**km/hr**	DSL	Aggregated	Aggregated	**0.0433**	0.0269	

		PM10	**g/mile**		
Gas LDA (ann)	g/vkt	0.00000	**0.0000**	EMFAC2011	
DSL LDA (ann)	g/vkt	0.01187	**0.0191**	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	**0.0000**	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02692	**0.0433**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00000	**0.0000**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.01299	**0.0209**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**4.94E-05**	**7.95E-05**	sum	**Based on 0.38% Diesel**

AERMOD Model Inputs

Paved road modelled as a series of volume sources

Lemon St West Of Sonoma		**HHDT**		**LDA**	
		PM10		**PM10**	
Spacing of volume sources		**14**	**m**	**14**	2-way roadway
AERMOD volume Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**0.004**	**g/hr**	**3.56E-05**	based on annual
Emission Factor/vehicle		**0.0000012**	**g/sec**	**1.58E-07**	includes shift trips/day
Emissions /vehicle/AERMOD Source		**2.37E-08**	g/sec	**3.10E-09**	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	**PM10 Emissions (g/s)**	**Milestone5 Vehicles Per Hour**	**PM10 Emissions (g/s)**	**PM10 Including LDA**	**Annualised Emission Rate PM10 Including LDA**	**Annualised Emission Rate PM2.5 Including LDA**	**Cumulative PM2.5 Including LDA**
1	2.37E-08	5	2.31E-07	2.34E-07	2.03E-07	3.87E-09	2.07E-07
2	2.37E-08	6	3.08E-07	3.08E-07	2.67E-07	0.00E+00	2.67E-07
3	2.37E-08	10	4.62E-07	4.62E-07	4.01E-07	0.00E+00	4.01E-07
4	2.37E-08	11	5.39E-07	5.39E-07	4.68E-07	2.57E-07	7.25E-07
5	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	3.43E-07	8.77E-07
6	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	3.43E-07	8.77E-07
7	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	3.43E-07	8.77E-07
8	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	5.14E-07	1.05E-06
9	2.37E-08	13	6.16E-07	6.22E-07	5.40E-07	3.50E-07	8.90E-07
10	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	3.43E-07	8.77E-07
11	2.37E-08	15	7.11E-07	7.11E-07	6.17E-07	3.43E-07	9.59E-07
12	2.37E-08	13	6.16E-07	6.16E-07	5.34E-07	3.43E-07	8.77E-07
13	2.37E-08	11	5.39E-07	5.39E-07	4.68E-07	3.43E-07	8.10E-07
14	2.37E-08	5	2.31E-07	2.31E-07	2.00E-07	5.14E-07	7.14E-07
15	2.37E-08	7	3.26E-07	3.26E-07	2.83E-07	3.43E-07	6.25E-07
16	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
17	2.37E-08	0	0.00E+00	3.10E-09	2.69E-09	3.47E-07	3.49E-07
18	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
19	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
20	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
21	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
22	2.37E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
23	2.37E-08	2	7.70E-08	7.70E-08	6.68E-08	3.43E-07	4.09E-07
24	2.37E-08	3	1.54E-07	1.54E-07	1.34E-07	3.43E-07	4.76E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	**Annualised Emission Rate**	**Annualised Emission Rate**
2.86E-07	3.11E-07	5.97E-07

PM10 Public Paved Road (Exhaust Emissions)		**HHDT**	**LDA**	
Emission factor, E	**g/VKT**	**0.006**	**4.94E-05**	**Lemon**
Emission factor, E (annual)	**g/VKT**	**0.0044**	**3.10E-05**	**Sonoma Blvd**

		Length	**Width**
SONOM_S	**Sonoma South of Lemon**	735	24
SONOM_N	**Sonoma North of Lemon**	525	24
LEMON_E	**Lemon East of Sonoma**	820	16
SONOM_S2	**Sonoma South of Magazine**	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT		**LDA**	
		PM10		**PM10**	
Spacing of volume sources		**24**	**m**	**24**	2-way roadway
AERMOD volume Sources		**22**		**22**	
Distance Travelled (Lemon Street)		**0.525**	**km**	**0.525**	to junction Sonoma Blvd
Emission Factor/vehicle		**0.002**	**g/hr**	**1.63E-05**	based on annual
Emission Factor/vehicle		**0.00000064**	**g/sec**	**7.23E-08**	includes shift trips/day
Emissions /vehicle/AERMOD Source		**2.92E-08**	g/sec	**3.29E-09**	

Sonoma North of Lemon		**0.525**
Split	**0.05**	km

Milestone 5

Annualised Emission Rate	**Annualised Emission Rate**	**Cumulative**

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Emissions (g/sec)	PM2.5 Including LDA	PM2.5 Including LDA
1	2.92E-08	0.24	1.42E-08	1.44E-08	1.25E-08	2.05E-10	1.27E-08
2	2.92E-08	0.32	1.89E-08	1.89E-08	1.64E-08	0.00E+00	1.64E-08
3	2.92E-08	0.49	2.84E-08	2.84E-08	2.47E-08	0.00E+00	2.47E-08
4	2.92E-08	0.57	3.32E-08	3.32E-08	2.88E-08	1.58E-08	4.46E-08
5	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	2.11E-08	5.40E-08
6	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	2.11E-08	5.40E-08
7	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	2.11E-08	5.40E-08
8	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	3.17E-08	6.46E-08
9	2.92E-08	0.65	3.79E-08	3.82E-08	3.32E-08	2.15E-08	5.47E-08
10	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	2.11E-08	5.40E-08
11	2.92E-08	0.75	4.37E-08	4.37E-08	3.79E-08	2.11E-08	5.91E-08
12	2.92E-08	0.65	3.79E-08	3.79E-08	3.29E-08	2.11E-08	5.40E-08
13	2.92E-08	0.57	3.32E-08	3.32E-08	2.88E-08	2.11E-08	4.99E-08
14	2.92E-08	0.24	1.42E-08	1.42E-08	1.23E-08	3.17E-08	4.40E-08
15	2.92E-08	0.34	2.01E-08	2.01E-08	1.74E-08	2.11E-08	3.85E-08
16	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
17	2.92E-08	0.00	0.00E+00	1.64E-10	1.43E-10	2.13E-08	2.15E-08
18	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
19	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
20	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
21	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
22	2.92E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.11E-08	2.11E-08
23	2.92E-08	0.08	4.74E-09	4.74E-09	4.11E-09	2.11E-08	2.52E-08
24	2.92E-08	0.16	9.47E-09	9.47E-09	8.22E-09	2.11E-08	2.93E-08
				g/sec	g/sec		
		8.3			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			1.76E-08	1.92E-08	3.67E-08

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	
Emission Factor/vehicle		0.003	g/hr	2.28E-05	based on annual
Emission Factor/vehicle		0.0000009	g/sec	1.01E-07	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.90E-08	g/sec	3.26E-09	

Sonoma South of Lemon			0.735
Split	0.39		km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.90E-08	2	1.10E-07	1.11E-07	9.66E-08	1.59E-09	9.82E-08
2	2.90E-08	3	1.47E-07	1.47E-07	1.27E-07	0.00E+00	1.27E-07
3	2.90E-08	4	2.20E-07	2.20E-07	1.91E-07	0.00E+00	1.91E-07
4	2.90E-08	4	2.57E-07	2.57E-07	2.23E-07	1.23E-07	3.46E-07
5	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	1.64E-07	4.18E-07
6	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	1.64E-07	4.18E-07
7	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	1.64E-07	4.18E-07
8	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	2.46E-07	5.00E-07
9	2.90E-08	5	2.94E-07	2.96E-07	2.57E-07	1.67E-07	4.24E-07
10	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	1.64E-07	4.18E-07
11	2.90E-08	6	3.39E-07	3.39E-07	2.94E-07	1.64E-07	4.58E-07
12	2.90E-08	5	2.94E-07	2.94E-07	2.55E-07	1.64E-07	4.18E-07
13	2.90E-08	4	2.57E-07	2.57E-07	2.23E-07	1.64E-07	3.87E-07
14	2.90E-08	2	1.10E-07	1.10E-07	9.55E-08	2.46E-07	3.41E-07
15	2.90E-08	3	1.55E-07	1.55E-07	1.35E-07	1.64E-07	2.99E-07
16	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
17	2.90E-08	0	0.00E+00	1.27E-09	1.10E-09	1.65E-07	1.66E-07
18	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
19	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
20	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
21	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
22	2.90E-08	0	0.00E+00	0.00E+00	0.00E+00	1.64E-07	1.64E-07
23	2.90E-08	1	3.67E-08	3.67E-08	3.18E-08	1.64E-07	1.96E-07
24	2.90E-08	1	7.34E-08	7.34E-08	6.37E-08	1.64E-07	2.27E-07
				g/hr	g/sec		
		64.8			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			1.36E-07	1.49E-07	2.85E-07

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		16	m	16	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.005	g/hr	4.05E-05	based on annual
Emission Factor/vehicle		0.00000138	g/sec	1.80E-07	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.70E-08	g/sec	3.53E-09	

Lemon St East Of Sonoma			0.82
Split	0.56		km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.70E-08	3	1.47E-07	1.49E-07	1.30E-07	2.47E-09	1.32E-07
2	2.70E-08	4	1.96E-07	1.96E-07	1.70E-07	0.00E+00	1.70E-07
3	2.70E-08	5	2.95E-07	2.95E-07	2.56E-07	0.00E+00	2.56E-07
4	2.70E-08	6	3.44E-07	3.44E-07	2.98E-07	1.64E-07	4.62E-07
5	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	2.19E-07	5.59E-07

6	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	2.19E-07	5.59E-07
7	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	2.19E-07	5.59E-07
8	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	3.28E-07	6.69E-07
9	2.70E-08	7	3.93E-07	3.97E-07	3.44E-07	2.23E-07	5.68E-07
10	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	2.19E-07	5.59E-07
11	2.70E-08	8	4.53E-07	4.53E-07	3.93E-07	2.19E-07	6.12E-07
12	2.70E-08	7	3.93E-07	3.93E-07	3.41E-07	2.19E-07	5.59E-07
13	2.70E-08	6	3.44E-07	3.44E-07	2.98E-07	2.19E-07	5.17E-07
14	2.70E-08	3	1.47E-07	1.47E-07	1.28E-07	3.28E-07	4.56E-07
15	2.70E-08	4	2.08E-07	2.08E-07	1.80E-07	2.19E-07	3.99E-07
16	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
17	2.70E-08	0	0.00E+00	1.98E-09	1.71E-09	2.21E-07	2.23E-07
18	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
19	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
20	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
21	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
22	2.70E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
23	2.70E-08	1	4.91E-08	4.91E-08	4.26E-08	2.19E-07	2.61E-07
24	2.70E-08	2	9.82E-08	9.82E-08	8.52E-08	2.19E-07	3.04E-07
				g/hr	g/sec		
		93.0			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			1.82E-07	1.98E-07	3.81E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	
Emission Factor/vehicle		0.003	g/hr	2.16E-05	based on annual
Emission Factor/vehicle		0.0000009	g/sec	9.61E-08	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.95E-08	g/sec	3.31E-09	

Sonoma South of Magazine				0.698
Split	0.39			km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.95E-08	2	1.12E-07	1.13E-07	9.81E-08	1.62E-09	9.97E-08
2	2.95E-08	3	1.49E-07	1.49E-07	1.29E-07	0.00E+00	1.29E-07
3	2.95E-08	4	2.24E-07	2.24E-07	1.94E-07	0.00E+00	1.94E-07
4	2.95E-08	4	2.61E-07	2.61E-07	2.26E-07	1.25E-07	3.51E-07
5	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	1.66E-07	4.25E-07
6	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	1.66E-07	4.25E-07
7	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	1.66E-07	4.25E-07
8	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	2.49E-07	5.08E-07
9	2.95E-08	5	2.98E-07	3.01E-07	2.61E-07	1.69E-07	4.30E-07
10	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	1.66E-07	4.25E-07
11	2.95E-08	6	3.44E-07	3.44E-07	2.99E-07	1.66E-07	4.65E-07
12	2.95E-08	5	2.98E-07	2.98E-07	2.59E-07	1.66E-07	4.25E-07
13	2.95E-08	4	2.61E-07	2.61E-07	2.26E-07	1.66E-07	3.92E-07
14	2.95E-08	2	1.12E-07	1.12E-07	9.70E-08	2.49E-07	3.46E-07
15	2.95E-08	3	1.58E-07	1.58E-07	1.37E-07	1.66E-07	3.03E-07
16	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
17	2.95E-08	0	0.00E+00	1.29E-09	1.12E-09	1.68E-07	1.69E-07
18	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
19	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
20	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
21	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
22	2.95E-08	0	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07
23	2.95E-08	1	3.73E-08	3.73E-08	3.23E-08	1.66E-07	1.99E-07
24	2.95E-08	1	7.45E-08	7.45E-08	6.47E-08	1.66E-07	2.31E-07
				g/s	g/s		
		64.8			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			1.38E-07	1.51E-07	2.89E-07

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.467	0.49	0.49	0.178	0.0041	0.0046	9.11
milestone 2	240000		14578	80.467	0.49	0.49	0.178	0.0071	0.0078	15.66
milestone 3	360000		20676	80.467	0.49	0.49	0.178	0.0101	0.0111	22.21
milestone 4	480000		22723	80.467	0.49	0.49	0.178	0.0111	0.0122	24.41
milestone 5	760000		32534	80.467	0.49	0.49	0.178	0.0159	0.0175	34.95
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	39.910	1.97E-03	1.97E-03	6.08E-05	4.30E-06	4.74E-06	9.49E-03
milestone 2	240000	24	4992	39.910	1.97E-03	1.97E-03	1.04E-04	9.84E-06	1.08E-05	2.17E-02
milestone 3	360000	24	6240	39.910	1.97E-03	1.97E-03	1.04E-04	1.23E-05	1.36E-05	2.71E-02
milestone 4	480000	64	16640	39.910	1.97E-03	1.97E-03	2.78E-04	3.28E-05	3.61E-05	7.23E-02
milestone 5	760000	64	19968	39.910	1.97E-03	1.97E-03	2.78E-04	3.94E-05	4.34E-05	8.68E-02
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	0.179	0.0041	0.0046	9
						milestone 2	0.179	0.0071	0.0078	16
						milestone 3	0.179	0.0101	0.0111	22
						milestone 4	0.179	0.0111	0.0122	24
						milestone 5	0.179	0.0159	0.0175	35

PM10 Public Paved Road (Exhaust Emissions)

HHDT Emission Factor PM_{10}

EMFAC2011 Emission Rates							*0.6214*
Region Type:	GAI						*mile to km*
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	40	miles/hr					
Vehicle Classification:	EMFAC2011 Categories					Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run	Combined
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.00764	0.0076

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM10 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.002	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0047	0.0076	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0002	0.0003	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0044	0.0071	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor $PM_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM10_Combined
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40			0.00000
2020	Annual	LDA	DSL	Aggregated	40	0.0107		0.01067
Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX		
						(gms/mile)	gms/km	
Speed	5	miles/hr	GAS	Aggregated	Aggregated			
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269	

		PM2.5	g/mile		
Gas LDA (ann)	g/vkt	0.00000	0.00000	EMFAC2011	
DSL LDA (ann)	g/vkt	0.00663	0.01067	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.00000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02692	0.04332	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00000	0.00000	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00815	0.01312	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	3.10E-05	4.99E-05	sum	Based on 0.38% Diesel

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	PM (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.86**				

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

Project PM2.5
Annual Average

Shipping (48 Movements)	Emission Rates	Units	Sources	Contributors
Transit (greater than 3km from port)	7.28E-06	g/s/source	65	Orcem & VMT Cumulative
Transit (within 3km of port)	3.93E-06	g/s/source	34	Orcem & VMT Cumulative
Maneuvering	1.86E-05	g/s/source	26	Orcem & VMT Cumulative
Hoteling (Aux Eng)	0.00377	g/s/source	2	Orcem & VMT Cumulative
Hoteling (Boiler)	0.00000	g/s/source	2	Orcem & VMT Cumulative
Tugs (Ship Assist)	1.13E-05	g/s/source	26	Orcem & VMT Cumulative

Barge (No barge for Phase 1 alternative)	Emission Rates	Units	Sources	Contributors
Barge	0.00E+00	g/s/source	126	VMT Only

Diesel Hoppers	Emission Rates	Units	Sources	Contributors
Diesel Hopper 1	0.000025	g/s	1	Orcem Only
Diesel Hopper 2	0.000025	g/s	1	Orcem Only
Diesel Conveyor 1	0.000025	g/s	1	Orcem Only
Diesel Conveyor 2	0.000025	g/s	1	Orcem Only
Diesel Conveyor 3	0.000025	g/s	1	Orcem Only
Diesel Conveyor 4	0.000025	g/s	1	Orcem Only
Diesel Conveyor 5	0.000025	g/s	1	Orcem Only
Diesel Conveyor 6	0.000025	g/s	1	Orcem Only
Diesel Conveyor 7	0.000025	g/s	1	Orcem Only

Excavators / Front Loaders (Orcem)	Emission Rates	Units	Sources	Contributors
S1 Front Loader & Excavtor Combined	9.13E-06	g/s/source	28	Orcem Only
S2 Front Loader & Excavtor Combined	9.13E-06	g/s/source	28	Orcem Only
S3 Front Loader & Excavtor Combined	9.13E-06	g/s/source	28	Orcem Only

Front Loaders (VMT)	Emission Rates	Units	Sources	Contributors
Front Loader	5.18E-04	g/s/source	1	VMT Only

Forklift	Emission Rates	Units	Sources	Contributors
Forklift	2.57E-05	g/s	1	VMT Only

Industrial Paved (Onsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors
PM10 Onsite Paved Road (Exhaust Emissions)	2.56E-07	g/s/source	61	Orcem & VMT Cumulative
PM10 Onsite Paved Road (Exhaust Emissions)	1.26E-07	g/s/source	22	Orcem Only
PM10 Onsite Paved Road (Exhaust Emissions)	1.31E-07	g/s/source	19	VMT Only

Public Paved Rd (Offsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors
Lemon St West Of Sonoma	5.97E-07	g/s/source	51	Orcem & VMT Cumulative
Sonoma North of Lemon	3.67E-08	g/s/source	22	Orcem & VMT Cumulative
Sonoma South of Lemon	2.85E-07	g/s/source	31	Orcem & VMT Cumulative
Lemon St East Of Sonoma	3.81E-07	g/s/source	51	Orcem & VMT Cumulative
Sonoma South of Magazine	2.89E-07	g/s/source	29	Orcem & VMT Cumulative

Railways (Milestone 5 & Phase 1 Alternative)	Emission Rates	Units	Sources	Contributors
Switching (average)	2.07E-06	g/s/source	75	Orcem & VMT Cumulative
Line Haul idling	5.64E-07	g/s/source	3	Orcem & VMT Cumulative
Line Haul (10 kph)	8.95E-08	g/s/source	41	Orcem & VMT Cumulative
Line Haul (15 kph)	2.98E-07	g/s/source	24	Orcem & VMT Cumulative

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

Project PM2.5
Annual Average

Point Sources

Source	Description	Emission Rate	Units	
RAIL_ID	Rail Idling	5.639E-07	g/s	**RAILID**
RAILID2	Rail Idling	5.639E-07	g/s	RAILID
RAILID3	Rail Idling	5.639E-07	g/s	RAILID
SHPHTAX1	ship auxiliary engine1	3.767E-03	g/s	SHPHTAX
SHPHBR1	Auxiliary Boiler 1	0.000E+00	g/s	SHPHBR
SHPHTAX2	ship auxiliary engine 2	3.767E-03	g/s	SHPHTAX
SHPHBR2	Auxiliary Boiler 2	0.000E+00	g/s	SHPHBR
MOB_HOP1	mobile hopper 1	2.526E-05	g/s	MOB_HOP
MOB_HOP2	mobile hopper 2	2.526E-05	g/s	MOB_HOP
CONVY4	conveyor	2.526E-05	g/s	CONVY
CONVY3	Mobile Conveyor Drop	2.526E-05	g/s	CONVY
CONVY1	conveyor	2.526E-05	g/s	CONVY
CONVY6	conveyor	2.526E-05	g/s	CONVY
CONVY5	conveyor	2.526E-05	g/s	CONVY
CONVY7	conveyor	2.526E-05	g/s	CONVY
CONVY2	conveyor	2.526E-05	g/s	CONVY

Volume Sources

Source	Description	Emission Rate	Units	
ONFUG1	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG2	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG3	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG4	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG5	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG6	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG7	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG8	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG9	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG10	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG11	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG12	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG13	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG14	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG15	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG16	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG17	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG18	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG19	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG20	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG21	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG22	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG23	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG24	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG25	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG26	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG27	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG28	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG29	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG30	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG31	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG32	Onsite Exh	2.564E-07	g/s	ONFUG

ONFUG33	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG34	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG35	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG36	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG37	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG38	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG39	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG40	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG41	Onsite Exh	2.564E-07	g/s	ONFUG
ORFUG42	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG43	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG44	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG45	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG46	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG47	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG48	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG49	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG50	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG51	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG52	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG53	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG54	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG55	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG56	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG57	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG58	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG59	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG60	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG61	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG62	Orcem Only Exh	1.259E-07	g/s	ORFUG
ORFUG63	Orcem Only Exh	1.259E-07	g/s	ORFUG
ONFUG64	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG65	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG66	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG67	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG68	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG69	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG70	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG71	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG72	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG73	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG74	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG75	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG76	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG77	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG78	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG79	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG80	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG81	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG82	Onsite Exh	2.564E-07	g/s	ONFUG
ONFUG83	Onsite Exh	2.564E-07	g/s	ONFUG
LMFUG1	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG2	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG3	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG4	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG5	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG6	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG7	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG8	Lemon St Exh	5.969E-07	g/s	LMFUG

LMFUG9	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG10	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG11	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG12	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG13	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG14	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG15	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG16	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG17	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG18	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG19	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG20	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG21	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG22	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG23	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG24	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG25	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG26	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG27	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG28	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG29	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG30	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG31	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG32	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG33	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG34	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG35	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG36	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG37	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG38	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG39	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG40	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG41	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG42	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG43	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG44	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG45	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG46	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG47	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG48	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG49	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG50	Lemon St Exh	5.969E-07	g/s	LMFUG
LMFUG51	Lemon St Exh	5.969E-07	g/s	LMFUG
SNFUG1	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG2	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG3	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG4	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG5	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG6	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG7	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG8	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG9	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG10	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG11	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG12	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG13	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG14	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG15	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG16	Sonona Blvd North	3.675E-08	g/s	SNFUG

SNFUG17	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG18	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG19	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG20	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG21	Sonona Blvd North	3.675E-08	g/s	SNFUG
SNFUG22	Sonona Blvd North	3.675E-08	g/s	SNFUG
SSFUG1	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG2	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG3	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG4	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG5	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG6	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG7	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG8	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG9	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG10	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG11	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG12	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG13	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG14	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG15	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG16	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG17	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG18	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG19	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG20	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG21	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG22	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG23	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG24	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG25	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG26	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG27	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG28	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG29	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG30	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SSFUG31	Sonoma Blvd South	3.675E-08	g/s	SSFUG
SMFUG1	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG2	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG3	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG4	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG5	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG6	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG7	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG8	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG9	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG10	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG11	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG12	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG13	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG14	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG15	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG16	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG17	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG18	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG19	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG20	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG21	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG22	Sonona South Of Magazine	2.891E-07	g/s	SMFUG

SMFUG23	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG24	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG25	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG26	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG27	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG28	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
SMFUG29	Sonona South Of Magazine	2.891E-07	g/s	SMFUG
LEFUG1	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG2	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG3	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG4	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG5	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG6	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG7	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG8	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG9	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG10	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG11	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG12	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG13	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG14	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG15	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG16	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG17	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG18	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG19	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG20	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG21	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG22	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG23	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG24	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG25	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG26	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG27	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG28	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG29	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG30	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG31	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG32	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG33	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG34	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG35	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG36	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG37	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG38	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG39	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG40	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG41	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG42	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG43	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG44	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG45	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG46	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG47	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG48	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG49	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG50	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
LEFUG51	Lemon East Of Sonoma	3.807E-07	g/s	LEFUG
VMTFUG1	VMT Only Exh	1.305E-07	g/s	VMTFUG

VMTFUG2	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG3	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG4	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG5	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG6	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG7	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG8	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG9	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG10	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG11	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG12	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG13	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG14	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG15	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG16	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG17	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG18	VMT Only Exh	1.305E-07	g/s	VMTFUG
VMTFUG19	VMT Only Exh	1.305E-07	g/s	VMTFUG
FLS1F1	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F2	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F3	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F4	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F5	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F6	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F7	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F8	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F9	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F10	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F11	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F12	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F13	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F14	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F15	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F16	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F17	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F18	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F19	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F20	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F21	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F22	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F23	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F24	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F25	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS1F26	RMSP1 to Mhopper Exh	9.130E-06	g/s	FLS1F
FLS2F1	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F2	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F3	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F4	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F5	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F6	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F7	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F8	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F9	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F10	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F11	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F12	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FLS2F13	RMSP2 to Mhopper Exh	9.130E-06	g/s	FLS2F
FORK1	Forklift Operations	2.574E-05	g/s	FORK
TUG1	Tug Emissions	1.129E-05	g/s	TUG

TUG2	Tug Emissions	1.129E-05	g/s	TUG
TUG3	Tug Emissions	1.129E-05	g/s	TUG
TUG4	Tug Emissions	1.129E-05	g/s	TUG
TUG5	Tug Emissions	1.129E-05	g/s	TUG
TUG6	Tug Emissions	1.129E-05	g/s	TUG
TUG7	Tug Emissions	1.129E-05	g/s	TUG
TUG8	Tug Emissions	1.129E-05	g/s	TUG
TUG9	Tug Emissions	1.129E-05	g/s	TUG
TUG10	Tug Emissions	1.129E-05	g/s	TUG
TUG11	Tug Emissions	1.129E-05	g/s	TUG
TUG12	Tug Emissions	1.129E-05	g/s	TUG
TUG13	Tug Emissions	1.129E-05	g/s	TUG
TUG14	Tug Emissions	1.129E-05	g/s	TUG
TUG15	Tug Emissions	1.129E-05	g/s	TUG
TUG16	Tug Emissions	1.129E-05	g/s	TUG
TUG17	Tug Emissions	1.129E-05	g/s	TUG
TUG18	Tug Emissions	1.129E-05	g/s	TUG
TUG19	Tug Emissions	1.129E-05	g/s	TUG
TUG20	Tug Emissions	1.129E-05	g/s	TUG
TUG21	Tug Emissions	1.129E-05	g/s	TUG
TUG22	Tug Emissions	1.129E-05	g/s	TUG
TUG23	Tug Emissions	1.129E-05	g/s	TUG
TUG24	Tug Emissions	1.129E-05	g/s	TUG
TUG25	Tug Emissions	1.129E-05	g/s	TUG
TUG26	Tug Emissions	1.129E-05	g/s	TUG
RAILST1	rail switching	2.074E-06	g/s	RAILST
RAILST2	rail switching	2.074E-06	g/s	RAILST
RAILST3	rail switching	2.074E-06	g/s	RAILST
RAILST4	rail switching	2.074E-06	g/s	RAILST
RAILST5	rail switching	2.074E-06	g/s	RAILST
RAILST6	rail switching	2.074E-06	g/s	RAILST
RAILST7	rail switching	2.074E-06	g/s	RAILST
RAILST8	rail switching	2.074E-06	g/s	RAILST
RAILST9	rail switching	2.074E-06	g/s	RAILST
RAILST10	rail switching	2.074E-06	g/s	RAILST
RAILST11	rail switching	2.074E-06	g/s	RAILST
RAILST12	rail switching	2.074E-06	g/s	RAILST
RAILST13	rail switching	2.074E-06	g/s	RAILST
RAILST14	rail switching	2.074E-06	g/s	RAILST
RAILST15	rail switching	2.074E-06	g/s	RAILST
RAILST16	rail switching	2.074E-06	g/s	RAILST
RAILST17	rail switching	2.074E-06	g/s	RAILST
RAILST18	rail switching	2.074E-06	g/s	RAILST
RAILST19	rail switching	2.074E-06	g/s	RAILST
RAILST20	rail switching	2.074E-06	g/s	RAILST
RAILST21	rail switching	2.074E-06	g/s	RAILST
RAILST22	rail switching	2.074E-06	g/s	RAILST
RAILST23	rail switching	2.074E-06	g/s	RAILST
RAILST24	rail switching	2.074E-06	g/s	RAILST
RAILST25	rail switching	2.074E-06	g/s	RAILST
RAILST26	rail switching	2.074E-06	g/s	RAILST
RAILST27	rail switching	2.074E-06	g/s	RAILST
RAILST28	rail switching	2.074E-06	g/s	RAILST
RAILST29	rail switching	2.074E-06	g/s	RAILST
RAILST30	rail switching	2.074E-06	g/s	RAILST
RAILST31	rail switching	2.074E-06	g/s	RAILST
RAILST32	rail switching	2.074E-06	g/s	RAILST
RAILST33	rail switching	2.074E-06	g/s	RAILST
RAILST34	rail switching	2.074E-06	g/s	RAILST

RAILST35	rail switching	2.074E-06	g/s	RAILST
RAILST36	rail switching	2.074E-06	g/s	RAILST
RAILST37	rail switching	2.074E-06	g/s	RAILST
RAILST38	rail switching	2.074E-06	g/s	RAILST
RAILST39	rail switching	2.074E-06	g/s	RAILST
RAILST40	rail switching	2.074E-06	g/s	RAILST
RAILST41	rail switching	2.074E-06	g/s	RAILST
RAILST42	rail switching	2.074E-06	g/s	RAILST
RAILST43	rail switching	2.074E-06	g/s	RAILST
RAILST44	rail switching	2.074E-06	g/s	RAILST
RAILST45	rail switching	2.074E-06	g/s	RAILST
RAILST46	rail switching	2.074E-06	g/s	RAILST
RAILST47	rail switching	2.074E-06	g/s	RAILST
RAILST48	rail switching	2.074E-06	g/s	RAILST
RAILST49	rail switching	2.074E-06	g/s	RAILST
RAILST50	rail switching	2.074E-06	g/s	RAILST
RAILST51	rail switching	2.074E-06	g/s	RAILST
RAILST52	rail switching	2.074E-06	g/s	RAILST
RAILST53	rail switching	2.074E-06	g/s	RAILST
RAILST54	rail switching	2.074E-06	g/s	RAILST
RAILST55	rail switching	2.074E-06	g/s	RAILST
RAILST56	rail switching	2.074E-06	g/s	RAILST
RAILST57	rail switching	2.074E-06	g/s	RAILST
RAILST58	rail switching	2.074E-06	g/s	RAILST
RAILST59	rail switching	2.074E-06	g/s	RAILST
RAILST60	rail switching	2.074E-06	g/s	RAILST
RAILST61	rail switching	2.074E-06	g/s	RAILST
RAILST62	rail switching	2.074E-06	g/s	RAILST
RAILST63	rail switching	2.074E-06	g/s	RAILST
RAILST64	rail switching	2.074E-06	g/s	RAILST
RAILST65	rail switching	2.074E-06	g/s	RAILST
RAILST66	rail switching	2.074E-06	g/s	RAILST
RAILST67	rail switching	2.074E-06	g/s	RAILST
RAILST68	rail switching	2.074E-06	g/s	RAILST
RAILST69	rail switching	2.074E-06	g/s	RAILST
RAILST70	rail switching	2.074E-06	g/s	RAILST
RAILST71	rail switching	2.074E-06	g/s	RAILST
RAILST72	rail switching	2.074E-06	g/s	RAILST
RAILST73	rail switching	2.074E-06	g/s	RAILST
RAILST74	rail switching	2.074E-06	g/s	RAILST
RAILST75	rail switching	2.074E-06	g/s	RAILST
RAILLN1	rail haul	8.948E-08	g/s	RAILLN
RAILLN2	rail haul	8.948E-08	g/s	RAILLN
RAILLN3	rail haul	8.948E-08	g/s	RAILLN
RAILLN4	rail haul	8.948E-08	g/s	RAILLN
RAILLN5	rail haul	8.948E-08	g/s	RAILLN
RAILLN6	rail haul	8.948E-08	g/s	RAILLN
RAILLN7	rail haul	8.948E-08	g/s	RAILLN
RAILLN8	rail haul	8.948E-08	g/s	RAILLN
RAILLN9	rail haul	8.948E-08	g/s	RAILLN
RAILLN10	rail haul	8.948E-08	g/s	RAILLN
RAILLN11	rail haul	8.948E-08	g/s	RAILLN
RAILLN12	rail haul	8.948E-08	g/s	RAILLN
RAILLN13	rail haul	8.948E-08	g/s	RAILLN
RAILLN14	rail haul	8.948E-08	g/s	RAILLN
RAILLN15	rail haul	8.948E-08	g/s	RAILLN
RAILLN16	rail haul	8.948E-08	g/s	RAILLN
RAILLN17	rail haul	8.948E-08	g/s	RAILLN
RAILLN18	rail haul	8.948E-08	g/s	RAILLN

RAILLN19	rail haul	8.948E-08	g/s	RAILLN
RAILLN20	rail haul	8.948E-08	g/s	RAILLN
RAILLN21	rail haul	8.948E-08	g/s	RAILLN
RAILLN22	rail haul	8.948E-08	g/s	RAILLN
RAILLN23	rail haul	8.948E-08	g/s	RAILLN
RAILLN24	rail haul	8.948E-08	g/s	RAILLN
RAILLN25	rail haul	8.948E-08	g/s	RAILLN
RAILLN26	rail haul	8.948E-08	g/s	RAILLN
RAILLN27	rail haul	8.948E-08	g/s	RAILLN
RAILLN28	rail haul	8.948E-08	g/s	RAILLN
RAILLN29	rail haul	8.948E-08	g/s	RAILLN
RAILLN30	rail haul	8.948E-08	g/s	RAILLN
RAILLN31	rail haul	8.948E-08	g/s	RAILLN
RAILLN32	rail haul	8.948E-08	g/s	RAILLN
RAILLN33	rail haul	8.948E-08	g/s	RAILLN
RAILLN34	rail haul	8.948E-08	g/s	RAILLN
RAILLN35	rail haul	8.948E-08	g/s	RAILLN
RAILLN36	rail haul	8.948E-08	g/s	RAILLN
RAILLN37	rail haul	8.948E-08	g/s	RAILLN
RAILLN38	rail haul	8.948E-08	g/s	RAILLN
RAILLN39	rail haul	8.948E-08	g/s	RAILLN
RAILLN40	rail haul	8.948E-08	g/s	RAILLN
RAILLN41	rail haul	8.948E-08	g/s	RAILLN
RAILLN42	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN43	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN44	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN45	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN46	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN47	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN48	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN49	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN50	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN51	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN52	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN53	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN54	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN55	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN56	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN57	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN58	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN59	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN60	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN61	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN62	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN63	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN64	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
RAILLN65	rail haul (15km/hr)	2.983E-07	g/s	RAIL15LN
TUGB2	Tug Emissions	1.129E-05	g/s	TUGB
TUGB3	Tug Emissions	1.129E-05	g/s	TUGB
TUGB4	Tug Emissions	1.129E-05	g/s	TUGB
TUGB5	Tug Emissions	1.129E-05	g/s	TUGB
TUGB6	Tug Emissions	1.129E-05	g/s	TUGB
TUGB7	Tug Emissions	1.129E-05	g/s	TUGB
TUGB8	Tug Emissions	1.129E-05	g/s	TUGB
TUGB9	Tug Emissions	1.129E-05	g/s	TUGB
TUGB10	Tug Emissions	1.129E-05	g/s	TUGB
TUGB11	Tug Emissions	1.129E-05	g/s	TUGB
TUGB12	Tug Emissions	1.129E-05	g/s	TUGB
TUGB13	Tug Emissions	1.129E-05	g/s	TUGB

TUGB14	Tug Emissions	1.129E-05	g/s	TUGB
TUGB15	Tug Emissions	1.129E-05	g/s	TUGB
TUGB16	Tug Emissions	1.129E-05	g/s	TUGB
TUGB17	Tug Emissions	1.129E-05	g/s	TUGB
TUGB18	Tug Emissions	1.129E-05	g/s	TUGB
TUGB19	Tug Emissions	1.129E-05	g/s	TUGB
TUGB20	Tug Emissions	1.129E-05	g/s	TUGB
TUGB21	Tug Emissions	1.129E-05	g/s	TUGB
TUGB22	Tug Emissions	1.129E-05	g/s	TUGB
TUGB23	Tug Emissions	1.129E-05	g/s	TUGB
TUGB24	Tug Emissions	1.129E-05	g/s	TUGB
TUGB25	Tug Emissions	1.129E-05	g/s	TUGB
TUGB26	Tug Emissions	1.129E-05	g/s	TUGB
TUGB1	Tug Emissions	1.129E-05	g/s	TUGB
BARGE1	Barge	0.000E+00	g/s	BARGE
BARGE2	Barge	0.000E+00	g/s	BARGE
BARGE3	Barge	0.000E+00	g/s	BARGE
BARGE4	Barge	0.000E+00	g/s	BARGE
BARGE5	Barge	0.000E+00	g/s	BARGE
BARGE6	Barge	0.000E+00	g/s	BARGE
BARGE7	Barge	0.000E+00	g/s	BARGE
BARGE8	Barge	0.000E+00	g/s	BARGE
BARGE9	Barge	0.000E+00	g/s	BARGE
BARGE10	Barge	0.000E+00	g/s	BARGE
BARGE11	Barge	0.000E+00	g/s	BARGE
BARGE12	Barge	0.000E+00	g/s	BARGE
BARGE13	Barge	0.000E+00	g/s	BARGE
BARGE14	Barge	0.000E+00	g/s	BARGE
BARGE15	Barge	0.000E+00	g/s	BARGE
BARGE16	Barge	0.000E+00	g/s	BARGE
BARGE17	Barge	0.000E+00	g/s	BARGE
BARGE18	Barge	0.000E+00	g/s	BARGE
BARGE19	Barge	0.000E+00	g/s	BARGE
BARGE20	Barge	0.000E+00	g/s	BARGE
BARGE21	Barge	0.000E+00	g/s	BARGE
BARGE22	Barge	0.000E+00	g/s	BARGE
BARGE23	Barge	0.000E+00	g/s	BARGE
BARGE24	Barge	0.000E+00	g/s	BARGE
BARGE25	Barge	0.000E+00	g/s	BARGE
BARGE26	Barge	0.000E+00	g/s	BARGE
BARGE27	Barge	0.000E+00	g/s	BARGE
BARGE28	Barge	0.000E+00	g/s	BARGE
BARGE29	Barge	0.000E+00	g/s	BARGE
BARGE30	Barge	0.000E+00	g/s	BARGE
BARGE31	Barge	0.000E+00	g/s	BARGE
BARGE32	Barge	0.000E+00	g/s	BARGE
BARGE33	Barge	0.000E+00	g/s	BARGE
BARGE34	Barge	0.000E+00	g/s	BARGE
BARGE35	Barge	0.000E+00	g/s	BARGE
BARGE36	Barge	0.000E+00	g/s	BARGE
BARGE37	Barge	0.000E+00	g/s	BARGE
BARGE38	Barge	0.000E+00	g/s	BARGE
BARGE39	Barge	0.000E+00	g/s	BARGE
BARGE40	Barge	0.000E+00	g/s	BARGE
BARGE41	Barge	0.000E+00	g/s	BARGE
BARGE42	Barge	0.000E+00	g/s	BARGE
BARGE43	Barge	0.000E+00	g/s	BARGE
BARGE44	Barge	0.000E+00	g/s	BARGE
BARGE45	Barge	0.000E+00	g/s	BARGE

BARGE46	Barge	0.000E+00	g/s	BARGE
BARGE47	Barge	0.000E+00	g/s	BARGE
BARGE48	Barge	0.000E+00	g/s	BARGE
BARGE49	Barge	0.000E+00	g/s	BARGE
BARGE50	Barge	0.000E+00	g/s	BARGE
BARGE51	Barge	0.000E+00	g/s	BARGE
BARGE52	Barge	0.000E+00	g/s	BARGE
BARGE53	Barge	0.000E+00	g/s	BARGE
BARGE54	Barge	0.000E+00	g/s	BARGE
BARGE55	Barge	0.000E+00	g/s	BARGE
BARGE56	Barge	0.000E+00	g/s	BARGE
BARGE57	Barge	0.000E+00	g/s	BARGE
BARGE58	Barge	0.000E+00	g/s	BARGE
BARGE59	Barge	0.000E+00	g/s	BARGE
BARGE60	Barge	0.000E+00	g/s	BARGE
BARGE61	Barge	0.000E+00	g/s	BARGE
BARGE62	Barge	0.000E+00	g/s	BARGE
BARGE63	Barge	0.000E+00	g/s	BARGE
BARGE64	Barge	0.000E+00	g/s	BARGE
BARGE65	Barge	0.000E+00	g/s	BARGE
BARGE66	Barge	0.000E+00	g/s	BARGE
BARGE67	Barge	0.000E+00	g/s	BARGE
BARGE68	Barge	0.000E+00	g/s	BARGE
BARGE69	Barge	0.000E+00	g/s	BARGE
BARGE70	Barge	0.000E+00	g/s	BARGE
BARGE71	Barge	0.000E+00	g/s	BARGE
BARGE72	Barge	0.000E+00	g/s	BARGE
BARGE73	Barge	0.000E+00	g/s	BARGE
BARGE74	Barge	0.000E+00	g/s	BARGE
BARGE75	Barge	0.000E+00	g/s	BARGE
BARGE76	Barge	0.000E+00	g/s	BARGE
BARGE77	Barge	0.000E+00	g/s	BARGE
BARGE78	Barge	0.000E+00	g/s	BARGE
BARGE79	Barge	0.000E+00	g/s	BARGE
BARGE80	Barge	0.000E+00	g/s	BARGE
BARGE81	Barge	0.000E+00	g/s	BARGE
BARGE82	Barge	0.000E+00	g/s	BARGE
BARGE83	Barge	0.000E+00	g/s	BARGE
BARGE84	Barge	0.000E+00	g/s	BARGE
BARGE85	Barge	0.000E+00	g/s	BARGE
BARGE86	Barge	0.000E+00	g/s	BARGE
BARGE87	Barge	0.000E+00	g/s	BARGE
BARGE88	Barge	0.000E+00	g/s	BARGE
BARGE89	Barge	0.000E+00	g/s	BARGE
BARGE90	Barge	0.000E+00	g/s	BARGE
BARGE91	Barge	0.000E+00	g/s	BARGE
BARGE92	Barge	0.000E+00	g/s	BARGE
BARGE93	Barge	0.000E+00	g/s	BARGE
BARGE94	Barge	0.000E+00	g/s	BARGE
BARGE95	Barge	0.000E+00	g/s	BARGE
BARGE96	Barge	0.000E+00	g/s	BARGE
BARGE97	Barge	0.000E+00	g/s	BARGE
BARGE98	Barge	0.000E+00	g/s	BARGE
BARGE99	Barge	0.000E+00	g/s	BARGE
BARG100	Barge	0.000E+00	g/s	BARGE
BARG101	Barge	0.000E+00	g/s	BARGE
BARG102	Barge	0.000E+00	g/s	BARGE
BARG103	Barge	0.000E+00	g/s	BARGE
BARG104	Barge	0.000E+00	g/s	BARGE

BARG105	Barge	0.000E+00	g/s	BARGE
BARG106	Barge	0.000E+00	g/s	BARGE
BARG107	Barge	0.000E+00	g/s	BARGE
BARG108	Barge	0.000E+00	g/s	BARGE
BARG109	Barge	0.000E+00	g/s	BARGE
BARG110	Barge	0.000E+00	g/s	BARGE
BARG111	Barge	0.000E+00	g/s	BARGE
BARG112	Barge	0.000E+00	g/s	BARGE
BARG113	Barge	0.000E+00	g/s	BARGE
BARG114	Barge	0.000E+00	g/s	BARGE
BARG115	Barge	0.000E+00	g/s	BARGE
BARG116	Barge	0.000E+00	g/s	BARGE
BARG117	Barge	0.000E+00	g/s	BARGE
BARG118	Barge	0.000E+00	g/s	BARGE
BARG119	Barge	0.000E+00	g/s	BARGE
BARG120	Barge	0.000E+00	g/s	BARGE
BARG121	Barge	0.000E+00	g/s	BARGE
BARG122	Barge	0.000E+00	g/s	BARGE
BARG123	Barge	0.000E+00	g/s	BARGE
BARG124	Barge	0.000E+00	g/s	BARGE
BARG125	Barge	0.000E+00	g/s	BARGE
BARG126	Barge	0.000E+00	g/s	BARGE
NRAILST1	rail switching night	2.074E-06	g/s	NRAILST
NRAILST2	rail switching night	2.074E-06	g/s	NRAILST
NRAILST3	rail switching night	2.074E-06	g/s	NRAILST
NRAILST4	rail switching night	2.074E-06	g/s	NRAILST
NRAILST5	rail switching night	2.074E-06	g/s	NRAILST
NRAILST6	rail switching night	2.074E-06	g/s	NRAILST
NRAILST7	rail switching night	2.074E-06	g/s	NRAILST
NRAILST8	rail switching night	2.074E-06	g/s	NRAILST
NRAILST9	rail switching night	2.074E-06	g/s	NRAILST
NRAILS10	rail switching night	2.074E-06	g/s	NRAILST
NRAILS11	rail switching night	2.074E-06	g/s	NRAILST
NRAILS12	rail switching night	2.074E-06	g/s	NRAILST
NRAILS13	rail switching night	2.074E-06	g/s	NRAILST
NRAILS14	rail switching night	2.074E-06	g/s	NRAILST
NRAILS15	rail switching night	2.074E-06	g/s	NRAILST
NRAILS16	rail switching night	2.074E-06	g/s	NRAILST
NRAILS17	rail switching night	2.074E-06	g/s	NRAILST
NRAILS18	rail switching night	2.074E-06	g/s	NRAILST
NRAILS19	rail switching night	2.074E-06	g/s	NRAILST
NRAILS20	rail switching night	2.074E-06	g/s	NRAILST
NRAILS21	rail switching night	2.074E-06	g/s	NRAILST
NRAILS22	rail switching night	2.074E-06	g/s	NRAILST
NRAILS23	rail switching night	2.074E-06	g/s	NRAILST
NRAILS24	rail switching night	2.074E-06	g/s	NRAILST
NRAILS25	rail switching night	2.074E-06	g/s	NRAILST
NRAILS26	rail switching night	2.074E-06	g/s	NRAILST
NRAILS27	rail switching night	2.074E-06	g/s	NRAILST
NRAILS28	rail switching night	2.074E-06	g/s	NRAILST
NRAILS29	rail switching night	2.074E-06	g/s	NRAILST
NRAILS30	rail switching night	2.074E-06	g/s	NRAILST
NRAILS31	rail switching night	2.074E-06	g/s	NRAILST
NRAILS32	rail switching night	2.074E-06	g/s	NRAILST
NRAILS33	rail switching night	2.074E-06	g/s	NRAILST
NRAILS34	rail switching night	2.074E-06	g/s	NRAILST
NRAILS35	rail switching night	2.074E-06	g/s	NRAILST
NRAILS36	rail switching night	2.074E-06	g/s	NRAILST
NRAILS37	rail switching night	2.074E-06	g/s	NRAILST

NRAILS38	rail switching night	2.074E-06	g/s	NRAILST
NRAILS39	rail switching night	2.074E-06	g/s	NRAILST
NRAILS40	rail switching night	2.074E-06	g/s	NRAILST
NRAILS41	rail switching night	2.074E-06	g/s	NRAILST
NRAILS42	rail switching night	2.074E-06	g/s	NRAILST
NRAILS43	rail switching night	2.074E-06	g/s	NRAILST
NRAILS44	rail switching night	2.074E-06	g/s	NRAILST
NRAILS45	rail switching night	2.074E-06	g/s	NRAILST
NRAILS46	rail switching night	2.074E-06	g/s	NRAILST
NRAILS47	rail switching night	2.074E-06	g/s	NRAILST
NRAILS48	rail switching night	2.074E-06	g/s	NRAILST
NRAILS49	rail switching night	2.074E-06	g/s	NRAILST
NRAILS50	rail switching night	2.074E-06	g/s	NRAILST
NRAILS51	rail switching night	2.074E-06	g/s	NRAILST
NRAILS52	rail switching night	2.074E-06	g/s	NRAILST
NRAILS53	rail switching night	2.074E-06	g/s	NRAILST
NRAILS54	rail switching night	2.074E-06	g/s	NRAILST
NRAILS55	rail switching night	2.074E-06	g/s	NRAILST
NRAILS56	rail switching night	2.074E-06	g/s	NRAILST
NRAILS57	rail switching night	2.074E-06	g/s	NRAILST
NRAILS58	rail switching night	2.074E-06	g/s	NRAILST
NRAILS59	rail switching night	2.074E-06	g/s	NRAILST
NRAILS60	rail switching night	2.074E-06	g/s	NRAILST
NRAILS61	rail switching night	2.074E-06	g/s	NRAILST
NRAILS62	rail switching night	2.074E-06	g/s	NRAILST
NRAILS63	rail switching night	2.074E-06	g/s	NRAILST
NRAILS64	rail switching night	2.074E-06	g/s	NRAILST
NRAILS65	rail switching night	2.074E-06	g/s	NRAILST
NRAILS66	rail switching night	2.074E-06	g/s	NRAILST
NRAILS67	rail switching night	2.074E-06	g/s	NRAILST
NRAILS68	rail switching night	2.074E-06	g/s	NRAILST
NRAILS69	rail switching night	2.074E-06	g/s	NRAILST
NRAILS70	rail switching night	2.074E-06	g/s	NRAILST
NRAILS71	rail switching night	2.074E-06	g/s	NRAILST
NRAILS72	rail switching night	2.074E-06	g/s	NRAILST
NRAILS73	rail switching night	2.074E-06	g/s	NRAILST
NRAILS74	rail switching night	2.074E-06	g/s	NRAILST
NRAILS75	rail switching night	2.074E-06	g/s	NRAILST
NRAILLN1	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN2	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN3	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN4	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN5	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN6	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN7	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN8	rail haul night	8.948E-08	g/s	NRAILLN
NRAILLN9	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN10	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN11	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN12	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN13	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN14	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN15	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN16	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN17	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN18	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN19	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN20	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN21	rail haul night	8.948E-08	g/s	NRAILLN

NRAILN22	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN23	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN24	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN25	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN26	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN27	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN28	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN29	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN30	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN31	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN32	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN33	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN34	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN35	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN36	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN37	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN38	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN39	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN40	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN41	rail haul night	8.948E-08	g/s	NRAILLN
NRAILN42	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN43	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN44	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN45	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN46	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN47	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN48	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN49	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN50	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN51	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN52	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN53	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN54	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN55	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN56	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN57	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN58	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN59	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN60	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN61	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN62	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN63	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN64	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NRAILN65	rail haul (15km/hr)	2.983E-07	g/s	NRAIL5LN
NTUG1	Tug Emissions	1.129E-05	g/s	NTUG
NTUG2	Tug Emissions	1.129E-05	g/s	NTUG
NTUG3	Tug Emissions	1.129E-05	g/s	NTUG
NTUG4	Tug Emissions	1.129E-05	g/s	NTUG
NTUG5	Tug Emissions	1.129E-05	g/s	NTUG
NTUG6	Tug Emissions	1.129E-05	g/s	NTUG
NTUG7	Tug Emissions	1.129E-05	g/s	NTUG
NTUG8	Tug Emissions	1.129E-05	g/s	NTUG
NTUG9	Tug Emissions	1.129E-05	g/s	NTUG
NTUG10	Tug Emissions	1.129E-05	g/s	NTUG
NTUG11	Tug Emissions	1.129E-05	g/s	NTUG
NTUG12	Tug Emissions	1.129E-05	g/s	NTUG
NTUG13	Tug Emissions	1.129E-05	g/s	NTUG
NTUG14	Tug Emissions	1.129E-05	g/s	NTUG
NTUG15	Tug Emissions	1.129E-05	g/s	NTUG

NTUG16	Tug Emissions	1.129E-05	g/s	NTUG
NTUG17	Tug Emissions	1.129E-05	g/s	NTUG
NTUG18	Tug Emissions	1.129E-05	g/s	NTUG
NTUG19	Tug Emissions	1.129E-05	g/s	NTUG
NTUG20	Tug Emissions	1.129E-05	g/s	NTUG
NTUG21	Tug Emissions	1.129E-05	g/s	NTUG
NTUG22	Tug Emissions	1.129E-05	g/s	NTUG
NTUG23	Tug Emissions	1.129E-05	g/s	NTUG
NTUG24	Tug Emissions	1.129E-05	g/s	NTUG
NTUG25	Tug Emissions	1.129E-05	g/s	NTUG
NTUG26	Tug Emissions	1.129E-05	g/s	NTUG
NTUGB2	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB3	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB4	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB5	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB6	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB7	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB8	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB9	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB10	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB11	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB12	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB13	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB14	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB15	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB16	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB17	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB18	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB19	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB20	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB21	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB22	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB23	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB24	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB25	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB26	Tug Emissions	1.129E-05	g/s	NTUGB
NTUGB1	Tug Emissions	1.129E-05	g/s	NTUGB
TRANS33	transit33	3.927E-06	g/s	TRANS34
TRANS32	transit32	3.927E-06	g/s	TRANS34
TRANS31	transit31	3.927E-06	g/s	TRANS34
TRANS30	transit30	3.927E-06	g/s	TRANS34
TRANS29	transit29	3.927E-06	g/s	TRANS34
TRANS28	transit28	3.927E-06	g/s	TRANS34
TRANS27	transit27	3.927E-06	g/s	TRANS34
TRANS26	transit26	3.927E-06	g/s	TRANS34
TRANS25	transit25	3.927E-06	g/s	TRANS34
TRANS24	transit24	3.927E-06	g/s	TRANS34
TRANS23	transit23	3.927E-06	g/s	TRANS34
TRANS22	transit22	3.927E-06	g/s	TRANS34
TRANS21	transit21	3.927E-06	g/s	TRANS34
TRANS20	transit20	3.927E-06	g/s	TRANS34
TRANS19	transit19	3.927E-06	g/s	TRANS34
TRANS18	transit18	3.927E-06	g/s	TRANS34
TRANS17	transit17	3.927E-06	g/s	TRANS34
TRANS16	transit16	3.927E-06	g/s	TRANS34
TRANS15	transit15	3.927E-06	g/s	TRANS34
TRANS14	transit14	3.927E-06	g/s	TRANS34
TRANS13	transit13	3.927E-06	g/s	TRANS34
TRANS12	transit12	3.927E-06	g/s	TRANS34

TRANS11	transit11	3.927E-06	g/s	TRANS34
TRANS10	transit10	3.927E-06	g/s	TRANS34
TRANS9	transit9	3.927E-06	g/s	TRANS34
TRANS8	transit8	3.927E-06	g/s	TRANS34
TRANS7	transit7	3.927E-06	g/s	TRANS34
TRANS6	transit6	3.927E-06	g/s	TRANS34
TRANS5	transit5	3.927E-06	g/s	TRANS34
TRANS4	transit4	3.927E-06	g/s	TRANS34
TRANS3	transit3	3.927E-06	g/s	TRANS34
TRANS2	transit2	3.927E-06	g/s	TRANS34
TRANS1	transit1	3.927E-06	g/s	TRANS34
TRANS34	transit34	3.927E-06	g/s	TRANS34
TRANS35	transit35	7.280E-06	g/s	TRANS99
TRANS36	transit36	7.280E-06	g/s	TRANS99
TRANS37	transit37	7.280E-06	g/s	TRANS99
TRANS38	transit38	7.280E-06	g/s	TRANS99
TRANS39	transit39	7.280E-06	g/s	TRANS99
TRANS40	transit40	7.280E-06	g/s	TRANS99
TRANS41	transit41	7.280E-06	g/s	TRANS99
TRANS42	transit42	7.280E-06	g/s	TRANS99
TRANS43	transit43	7.280E-06	g/s	TRANS99
TRANS44	transit44	7.280E-06	g/s	TRANS99
TRANS45	transit45	7.280E-06	g/s	TRANS99
TRANS46	transit46	7.280E-06	g/s	TRANS99
TRANS47	transit47	7.280E-06	g/s	TRANS99
TRANS48	transit48	7.280E-06	g/s	TRANS99
TRANS49	transit49	7.280E-06	g/s	TRANS99
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TRANS67	transit67	7.280E-06	g/s	TRANS99
TRANS68	transit68	7.280E-06	g/s	TRANS99
TRANS69	transit69	7.280E-06	g/s	TRANS99
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TRANS76	transit76	7.280E-06	g/s	TRANS99
TRANS77	transit77	7.280E-06	g/s	TRANS99
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TRANS79	transit79	7.280E-06	g/s	TRANS99
TRANS80	transit80	7.280E-06	g/s	TRANS99
TRANS81	transit81	7.280E-06	g/s	TRANS99

TRANS82	transit82	7.280E-06	g/s	TRANS99
TRANS83	transit83	7.280E-06	g/s	TRANS99
TRANS84	transit84	7.280E-06	g/s	TRANS99
TRANS85	transit85	7.280E-06	g/s	TRANS99
TRANS86	transit86	7.280E-06	g/s	TRANS99
TRANS87	transit87	7.280E-06	g/s	TRANS99
TRANS88	transit88	7.280E-06	g/s	TRANS99
TRANS89	transit89	7.280E-06	g/s	TRANS99
TRANS90	transit90	7.280E-06	g/s	TRANS99
TRANS91	transit91	7.280E-06	g/s	TRANS99
TRANS92	transit92	7.280E-06	g/s	TRANS99
TRANS93	transit93	7.280E-06	g/s	TRANS99
TRANS94	transit94	7.280E-06	g/s	TRANS99
TRANS95	transit95	7.280E-06	g/s	TRANS99
TRANS96	transit96	7.280E-06	g/s	TRANS99
TRANS97	transit97	7.280E-06	g/s	TRANS99
TRANS98	transit98	7.280E-06	g/s	TRANS99
TRANS99	transit99	7.280E-06	g/s	TRANS99
MANV1	maneuv1	1.859E-05	g/s	MANV
MANV2	maneuv2	1.859E-05	g/s	MANV
MANV3	maneuv3	1.859E-05	g/s	MANV
MANV4	maneuv4	1.859E-05	g/s	MANV
MANV5	maneuv5	1.859E-05	g/s	MANV
MANV6	maneuv6	1.859E-05	g/s	MANV
MANV7	maneuv7	1.859E-05	g/s	MANV
MANV8	maneuv8	1.859E-05	g/s	MANV
MANV9	maneuv9	1.859E-05	g/s	MANV
MANV10	maneuv10	1.859E-05	g/s	MANV
MANV11	maneuv11	1.859E-05	g/s	MANV
MANV12	maneuv12	1.859E-05	g/s	MANV
MANV13	maneuv13	1.859E-05	g/s	MANV
MANV14	maneuv14	1.859E-05	g/s	MANV
MANV15	maneuv15	1.859E-05	g/s	MANV
MANV16	MANV16	1.859E-05	g/s	MANV
MANV17	MANV17	1.859E-05	g/s	MANV
MANV18	MANV18	1.859E-05	g/s	MANV
MANV19	MANV19	1.859E-05	g/s	MANV
MANV20	MANV20	1.859E-05	g/s	MANV
MANV21	MANV21	1.859E-05	g/s	MANV
MANV22	MANV22	1.859E-05	g/s	MANV
MANV23	MANV23	1.859E-05	g/s	MANV
MANV24	MANV24	1.859E-05	g/s	MANV
MANV25	MANV25	1.859E-05	g/s	MANV
MANV26	MANV26	1.859E-05	g/s	MANV
FL_PH1	Front Loader Phase1	5.177E-04	g/s	FL_PH1
FL_PH2	Front Loaders Phase 2	0.000E+00	g/s	FL_PH2
GYPSFUG1	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG2	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG3	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG4	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG5	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG6	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG7	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG8	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPSFUG9	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPFUG10	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPFUG11	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG
GYPFUG12	Gypsum to MHopper Exh	9.130E-06	g/s	GYPSFUG

BARGE	0
CONVY	2.52562E-05
FL_PH1	0.000517676
FL_PH2	0
FLS1F	9.12989E-06
FLS2F	9.12989E-06
FORK	2.57443E-05
GYPSFUG	9.12989E-06
LEFUG	3.8066E-07
LMFUG	5.96853E-07
MANV	1.8595E-05
MOB_HOP	2.52562E-05
NRAIL5LN	2.98256E-07
NRAILLN	8.94769E-08
NRAILST	2.0736E-06
NTUG	1.12916E-05
NTUGB	1.12916E-05
ONFUG	2.56414E-07
ORFUG	1.25895E-07
RAIL15LN	2.98256E-07
RAILID	5.63907E-07
RAILLN	8.94769E-08
RAILST	2.0736E-06
SHPHBR	0
SHPHTAX	0.003767311
SMFUG	2.89082E-07
SNFUG	3.67457E-08
SSFUG	3.67457E-08
STACK	0
TRANS34	3.92658E-06
TRANS99	7.28037E-06
TUG	1.12916E-05
TUGB	1.12916E-05
VMTFUG	1.30519E-07

VMT, Phase 1 (Alternative) - Based On Year 2020

Phase 1	1,350,000	metric tonnes per year of sand / aggregate imported	
Hours Of Operation	5760		
Operational Details	24 days per month, 2 10-hour shift		
Shipment Load	40,0000 metric tonnes		
Ship Unloading Capacity	303	tonnes per hour averaged over 3 days	
Duration of ship unloading	132	hrs (5.5 days)	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
#REF!	**Shipping (based on 29 trips only rather than 34)**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132 hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs
	Barge (no barge in this scenario)	0	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**VMT, Phase 2 (Alternative) - Based On Year 2016**		
Visits Per Year	29	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.0	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46	3.70%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36	10.20%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	

Auxilliary Engine		
Hoteling	0.06	POLA (2012)
Maneuvering	0.275	POLA (2012)
Transit	0.104	POLA (2012)

Source: (CARB (2011) Appendix D)

Main Engine

Transit		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR

Maneuvering		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	
		PM10
Medium	Marine Distillate (0.1% S)	**0.25001414**
		g/kW-HR

Boiler

	PM10
Marine Distillate (0.1% S)	**0.00**
	g/kW-HR

Tug

	PM10
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

No Barge For Phase 1 Alternative

Barge Emission Factor 2020

Assumption	Phase 1 Alternative	
Visits Per Year	0	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	PM10		Time (hrs)	inward	outward	Barge Emission Rate
Main	235	g/hr	0.540	2.57	3.60	0.070
				m/s	m/s	
Auxiliary	16.8	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine(s).

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	PM10	
Forklift	0.20	100	0.010	diesel
		hp	g/(hp-hr)	
Deterioration Rate	4.55E-07	g/(hr-hr^2)		
Age	5	years	(2015 Model)	
Activity	1800	hours/year		
	(capped at 12,000 hrs)			
Fuel Correction Factor	0.852			
Emission Rate	0.197	g/hr		

Activity Factor	0.5	Fractional usage per hour

Emission Rate / fork lift PM10	0.000027	g/s
PM2.5/PM10 Ratio	0.92	
Emission Rate / fork lift PM2.5	0.000025	g/s

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

OFFROAD2011	Load Factor	HP	PM10 (Diesel)
Front Loader	0.3618	369	0.010
			g/(hp-hr)
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	3 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.10	g/hr	

Activity Factor	90%	Fractional usage per hour
PM2.5/PM10 Ratio	1	
PM10 Emission Rate / Front Loader	0.000275	g/s
PM2.5 Emission Rate / Front Loader	0.000275	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

PM10 (Diesel)	Maximum Day		Hours Of Operation	Tonnage/annum
Emission Rate / Front Loader / Truck Loading	0.0000550	g/s	5760	0.00570
Emission Rate / Front Loader / TransLoading	0.0000688	g/s	1392	0.00138
Emission Rate / Front Loader / Rail Loading	0.0000550	g/s	2038	0.00202
Emission Rate / Front Loader / Barge Loading	0.0000550	g/s	288	0.00029
			Sum	0.0094

PM10 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

Year 2020

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC 2007 Categories					Annual		0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0297		0.0297

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season		PM10 (g/hr-veh)
2020	HHDT	D	SV	A		
					annual	0.0037
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0184	0.0297	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0005	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0171	0.0275	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_run	PM10_STREX	PM10_Combined
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10			0.0000
2020	Annual	LDA	DSL	Aggregated	10	0.0320		0.0320

LDA Idling Calculation							
2020	Annual	LDA	GAS	Aggregated		PM10_run	
						(gms/mile)	gms/km
Speed	5	miles/hr	GAS	Aggregated	Aggregated		
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269

		PM10_run	g/mile		
Gas LDA (ann)	g/vkt	0.0000	0.0000	EMFAC2011	start emissions - 10mins
DSL LDA (ann)	g/vkt	0.0199	0.0320	EMFAC2011	
Idling Gas LDA	g/vkt	0.0000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0269	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.0000	0.0000	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.0204	0.0328	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	7.75E-05	1.25E-04	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.012	g/hr	0.000	based on annual
Emission Factor/vehicle	3.44E-06	g/sec	3.12E-07	includes all trips/day
Composite Emission Factor (Ann)	4.30E-08	g/sec	3.90E-09	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	2 shifts	80
Phase 2	20	2 shifts	80
Phase 2 Alternative	20	2 shifts	80

Diurnal Emission Factors Based On Truck Movement Breakdown

phase 2 alternative

Weekday Hours	PM10 Emissions (g/s)	phase 2 alternative Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	Vehicles Per Hour	PM10 Including LDA	Annualised Emission Rate PM10 Including LDA
1	4.30E-08	0	0.00E+00	3.904E-09	0	0.00E+00	3.90E-09
2	4.30E-08	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
3	4.30E-08	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
4	4.30E-08	3	1.29E-07	1.291E-07	2	1.07E-07	1.07E-07
5	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
6	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
7	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
8	4.30E-08	6	2.58E-07	2.581E-07	5	2.15E-07	2.15E-07
9	4.30E-08	4	1.72E-07	1.799E-07	3	1.43E-07	1.51E-07
10	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
11	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
12	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
13	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
14	4.30E-08	6	2.58E-07	2.581E-07	5	2.15E-07	2.15E-07
15	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
16	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
17	4.30E-08	4	1.72E-07	1.760E-07	3	1.43E-07	1.47E-07
18	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
19	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
20	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
21	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
22	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
23	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
24	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07

Total HHDT/Day	87.0		72.5	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)				1.31E-07

Annual HHDT Based C	31755	
Actual HHDT Based O	26445	**Phase 1 Alternative**
Ratio	0.8328	

Annual									
HGV Traffic			Based on 21 US ton trucks		PM10	PM10	PM10	PM10	PM10
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.725	0.0124	0.002	0.0003	0.0004	0.72
Phase 1 Trucks & Rail	720000	240000	13846	0.725	0.0124	0.002	0.0002	0.0002	0.38
Phase 1 Alternative	1350000	480000	26445	0.725	0.0124	0.002	0.0003	0.0004	0.72
Phase 2	1,160,000	214400	12503	0.725	0.0124	0.002	0.0002	0.0002	0.34
Phase 2 Alternative	1,160,000	310400	17542	0.725	0.0124	0.002	0.0002	0.0002	0.48
LDA Traffic					PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.0001	0.000	0.000000	0.000000	0.00
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.0001	0.000	0.000000	0.000000	0.00
Phase 1 Alternative	1350000	40	10400	0.725	0.0001	0.000	0.000001	0.000001	0.00
Phase 2	1,160,000	80	20800	0.725	0.0001	0.000	0.000001	0.000001	0.00
Phase 2 Alternative	1,160,000	80	20800	0.725	0.0001	0.000	0.000001	0.000001	0.00
								tpa	
						PM10			
						lbs/day	MTPA	tpa	lbs/year
				Combined	Phase 1 Trucks Only	0.002	0.0003	0.0004	0.72
					Phase 1 Trucks & Rail	0.002	0.0002	0.0002	0.38
					Phase 1 Alternative	0.002	0.0003	0.0004	0.72
					Phase 2	0.002	0.0002	0.0002	0.34
					Phase 2 Alternative	0.0024	0.0002	0.0002	0.48

PM10 Public Paved Road (Exhaust Emissions)

Year 2020

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor PM_{10}

EMFAC2011 Emission Rates								*0.6214*
Region Type:	**GAI**							*mile to km*
Region:	**Solano (SV)**							
Calendar Year:	**2020**							
Season:	**Annual**							
Speed:	**20**	**miles/hr**						
Vehicle Classification:	**EMFAC 2007 Categories**						**Annual**	**Annual**
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**		**PM10_run**	**Combined**
							(gms/mile)	**(gms/mile)**
Solano (SF)	**2020**	**Annual**	**HHDT**	**DSL**	**Aggregated**		**0.0228**	**0.023**

HHDT Idling Emission Factors						
CY	**EMFAC2007 Vehicle Ca**	**Fuel_Type**	**air_basin**	**season**	**PM10 (g/hr-veh)**	
2020	**HHDT**	**D**	**SV**	**A**		
					0.004	**annual**
	Speed	**5**	**miles/hr**			
		8.046	**km/hr**			

HHDT Emission Factor					
		PM10_run	**g/mile**		
T7 Single	g/vkt	0.014	**0.023**	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.000	**0.001**	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**0.0131**	**0.0211**	Sum	**Assumption - Based On Idling for 7.5% of time**

LDA Emission Factor PM_{10}

CalYr	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**Speed**	**PM10_RUNEX**		**PM10_Combined**
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	**20**			**0.000**
2020	Annual	LDA	DSL	Aggregated	**20**	**0.0191**		**0.019**
Idling Calculation								
2020	**Annual**	**LDA**	**GAS**	**Aggregated**		**PM10_RUNEX**		
						(gms/mile)	**gms/km**	
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated			
	8.046	**km/hr**	DSL	Aggregated	Aggregated	**0.0433**	0.0269	

		PM10	**g/mile**		
Gas LDA (ann)	g/vkt	0.0000	**0.0000**	EMFAC2011	
DSL LDA (ann)	g/vkt	0.0119	**0.0191**	EMFAC2011	
Idling Gas LDA	g/vkt	0.0000	**0.0000**	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0269	**0.0433**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.0000	**0.0000**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.0130	**0.0209**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**4.94E-05**	**7.95E-05**	sum	**Based on 0.38% Diesel**

#REF!

AERMOD Model Inputs
Paved road modelled as a series of volume sources

		HHDT		**LDA**	
		PM10		**PM10**	
Spacing of volume sources		**14**	**m**	**14**	2-way roadway
AERMOD volume Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**0.009**	**g/hr**	**3.56E-05**	based on annual
Emission Factor/vehicle		**0.0000026**	**g/sec**	**1.98E-07**	includes shift trips/day
#REF!		**5.14E-08**	g/sec	**3.87E-09**	

Staff Numbers			**Trips**
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 1 Alternative

Weekday Hours	**PM10 Emissions (g/s)**	**Phase 2 Alternative Vehicles Per Hour**	**PM10 Emissions (g/s)**	**PM10 Including LDA**	**PM10 Vehicles Per Hour**	**PM10 Including LDA**	**PM10 Including LDA**
1	**5.14E-08**	**0**	**0.00E+00**	**3.87E-09**	**0**	**0.00E+00**	**3.87E-09**
2	**5.14E-08**	**0**	**0.00E+00**	**0.00E+00**	**0**	**0.00E+00**	**0.00E+00**
3	**5.14E-08**	**0**	**0.00E+00**	**0.00E+00**	**0**	**0.00E+00**	**0.00E+00**
4	**5.14E-08**	**3**	**3.09E-07**	**3.09E-07**	**2**	**2.57E-07**	**2.57E-07**
5	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
6	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
7	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
8	**5.14E-08**	**6**	**6.17E-07**	**6.17E-07**	**5**	**5.14E-07**	**5.14E-07**
9	**5.14E-08**	**4**	**4.12E-07**	**4.19E-07**	**3**	**3.43E-07**	**3.50E-07**
10	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
11	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
12	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
13	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
14	**5.14E-08**	**6**	**6.17E-07**	**6.17E-07**	**5**	**5.14E-07**	**5.14E-07**
15	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
16	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
17	**5.14E-08**	**4**	**4.12E-07**	**4.15E-07**	**3**	**3.43E-07**	**3.47E-07**
18	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
19	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
20	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
21	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
22	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
23	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**
24	**5.14E-08**	**4**	**4.12E-07**	**4.12E-07**	**3**	**3.43E-07**	**3.43E-07**

Maximum Day	**Annual Mean**	**Annualised Emission Rate**
87.0	**72.5**	**3.11E-07**
including deliveries (2 per day, 10am, 2pm)	**including deliveries (2 per day, 10am, 2pm)**	

PM10 Public Paved Road (Exhaust Emissions)		**HHDT**	**LDA**	
Controlled Emission factor, E	**g/VKT**	**0.013**	**4.94E-05**	**Lemon**
Controlled Emission factor, E (winter)	**g/VKT**			
Controlled Emission factor, E (annual)	**g/VKT**	**0.0096**	**3.10E-05**	**Sonoma Blvd**

		Length	**Width**
SONOM_S	**Sonoma South of Lemon**	735	24
SONOM_N	**Sonoma North of Lemon**	525	24
LEMON_E	**Lemon East of Sonoma**	820	16
SONOM_S2	**Sonoma South of Magazine**	698	24

Sonoma North of Lemon
Paved road modelled as a series of volume sources

		HHDT		**LDA**	
		PM10		**PM10**	
Spacing of volume sources		**24**	**m**	**24**	2-way roadway
AERMOD volume Sources		**22**		**22**	

Distance Travelled (Lemon Street)	**0.525**	**km**	**0.525**	to junction Sonoma Blvd
Emission Factor/vehicle	**0.005**	**g/hr**	**0.0000**	based on annual
Emission Factor/vehicle	**1.40E-06**	**g/sec**	**9.04E-08**	includes shift trips/day
Composite Emission Factor (Ann)	**6.34E-08**	g/sec	**4.11E-09**	

Sonoma North of Lemon		**0.525**
Split	**0.05**	km

Phase 1 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	6.34E-08	0.00	0.00E+00	2.05E-10	0	0.00E+00	2.05E-10
2	6.34E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	6.34E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	6.34E-08	0.15	1.90E-08	1.90E-08	0	1.58E-08	1.58E-08
5	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
6	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
7	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
8	6.34E-08	0.30	3.80E-08	3.80E-08	0	3.17E-08	3.17E-08
9	6.34E-08	0.20	2.54E-08	2.58E-08	0	2.11E-08	2.15E-08
10	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
11	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
12	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
13	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
14	6.34E-08	0.30	3.80E-08	3.80E-08	0	3.17E-08	3.17E-08
15	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
16	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
17	6.34E-08	0.20	2.54E-08	2.56E-08	0	2.11E-08	2.13E-08
18	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
19	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
20	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
21	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
22	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
23	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
24	6.34E-08	0.20	2.54E-08	2.54E-08	0	2.11E-08	2.11E-08
				g/sec			
		4.4			3.6		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		1.92E-08

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	**24**	**m**	**24**	2-way roadway
AERMOD volume Sources	**31**		**31**	
Distance Travelled (Lemon Street)	**0.735**	**km**	**0.735**	
Emission Factor/vehicle	**0.007**	**g/hr**	**0.000**	based on annual
Emission Factor/vehicle	**0.0000020**	**g/sec**	**0.0000001**	includes shift trips/day
Composite Emission Factor (Ann)	**6.30E-08**	g/sec	**4.08E-09**	

Sonoma South of Lemon		**0.735**
Split	**0.39**	km

Phase 1 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	6.30E-08	0	0.00E+00	1.59E-09	0.00	0.00E+00	1.59E-09
2	6.30E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	6.30E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	6.30E-08	1	1.47E-07	1.47E-07	0.97	1.23E-07	1.23E-07
5	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
6	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
7	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
8	6.30E-08	2	2.95E-07	2.95E-07	1.95	2.46E-07	2.46E-07
9	6.30E-08	2	1.97E-07	2.00E-07	1.30	1.64E-07	1.67E-07
10	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
11	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
12	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
13	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
14	6.30E-08	2	2.95E-07	2.95E-07	1.95	2.46E-07	2.46E-07
15	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
16	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
17	6.30E-08	2	1.97E-07	1.98E-07	1.30	1.64E-07	1.65E-07
18	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
19	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
20	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
21	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
22	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
23	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
24	6.30E-08	2	1.97E-07	1.97E-07	1.30	1.64E-07	1.64E-07
				g/hr			
		33.9			28.3		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		1.49E-07
				Distance			

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

		HHDT PM10		LDA PM10	
Spacing of volume sources		16	m	16	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.011	g/hr	0.000	based on annual
Emission Factor/vehicle		0.00000299	g/sec	0.00000022	includes shift trips/day
Composite Emission Factor (Ann)		5.86E-08	g/sec	4.41E-09	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Phase 1 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	5.86E-08	0	0.00E+00	2.47E-09	0.00	0.00E+00	2.47E-09
2	5.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	5.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	5.86E-08	2	1.97E-07	1.97E-07	1.40	1.64E-07	1.64E-07
5	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
6	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
7	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
8	5.86E-08	3	3.94E-07	3.94E-07	2.80	3.28E-07	3.28E-07
9	5.86E-08	2	2.62E-07	2.67E-07	1.87	2.19E-07	2.23E-07
10	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
11	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
12	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
13	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
14	5.86E-08	3	3.94E-07	3.94E-07	2.80	3.28E-07	3.28E-07
15	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
16	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
17	5.86E-08	2	2.62E-07	2.65E-07	1.87	2.19E-07	2.21E-07
18	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
19	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
20	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
21	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
22	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
23	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
24	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
				g/hr			
		48.7			40.6		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		1.98E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

		HHDT PM10		LDA PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	
Emission Factor/vehicle		0.007	g/hr	0.000	based on annual
Emission Factor/vehicle		0.0000019	g/sec	0.0000001	includes shift trips/day
Composite Emission Factor (Ann)		6.40E-08	g/sec	4.14E-09	

Sonoma South of Magazine		0.698
Split	0.39	km

Phase 1 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	6.40E-08	0	0.00E+00	1.62E-09	0.00	0.00E+00	1.62E-09
2	6.40E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	6.40E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	6.40E-08	1	1.50E-07	1.50E-07	0.97	1.25E-07	1.25E-07
5	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
6	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
7	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
8	6.40E-08	2	2.99E-07	2.99E-07	1.95	2.49E-07	2.49E-07
9	6.40E-08	2	2.00E-07	2.03E-07	1.30	1.66E-07	1.69E-07
10	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
11	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
12	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
13	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
14	6.40E-08	2	2.99E-07	2.99E-07	1.95	2.49E-07	2.49E-07
15	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
16	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
17	6.40E-08	2	2.00E-07	2.01E-07	1.30	1.66E-07	1.68E-07
18	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
19	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
20	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
21	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
22	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
23	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07
24	6.40E-08	2	2.00E-07	2.00E-07	1.30	1.66E-07	1.66E-07

		g/s		
	33.9		28.3	Annualised Emission Rate
	including deliveries (2 per day, 10am, 2pm)		including deliveries (2 per day, 10am, 2pm)	1.51E-07
check	87.0		72.5	

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	trucks per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.467	1.06	1.06	2.02E-01	0.0279	0.0308	61.53
Phase 1 Trucks & Rail	720000	240000	13846	80.467	1.06	1.06	2.02E-01	0.0146	0.0161	32.22
Phase 1 Alternative	1350000	480000	26445	80.467	1.06	1.06	2.02E-01	0.0279	0.0308	61.53
Phase 2	1,160,000	214400	12503	80.467	1.06	1.06	2.02E-01	0.0132	0.0145	29.09
Phase 2 Alternative	1,160,000	310400	17542	80.467	1.06	1.06	2.02E-01	0.0185	0.0204	40.82
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	1.97E-03	1.24E-03	6.54E-05	0.0000	0.0000	0.01
Phase 1 Trucks & Rail	720000	24	4992	39.910	1.97E-03	1.24E-03	6.54E-05	0.0000	0.0000	0.01
Phase 1 Alternative	1350000	40	10400	39.910	1.97E-03	1.24E-03	1.09E-04	0.0000	0.0000	0.03
Phase 2	1,160,000	80	20800	39.910	1.97E-03	1.24E-03	2.18E-04	0.0000	0.0000	0.06
Phase 2 Alternative	1,160,000	80	20800	39.910	1.97E-03	1.24E-03	2.18E-04	0.0000	0.0000	0.06
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	2.03E-01	0.0279	0.0308	61.5
						Phase 1 Trucks & Rail	2.03E-01	0.0146	0.0161	32.2
						Phase 1 Alternative	2.03E-01	0.0279	0.0308	61.6
						Phase 2	2.03E-01	0.0132	0.0146	29.1
						Phase 2 Alternative	2.03E-01	0.0185	0.0204	40.9

PM10 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

Year 2020

HHDT Emission Factor PM_{10}

EMFAC2011 Emission Rates							0.6214
Region Type:	GAI						mile to km
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	40	miles/hr					
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run	Combined
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.01658	0.0166

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM10 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.004	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.010	0.0166	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.000	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0096	0.0154	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor PM_{10}

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM10_Combined
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40			0.0000
2020	Annual	LDA	DSL	Aggregated	40	0.0107		0.0107
Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX		
						(gms/mile)	gms/km	
Speed	5	miles/hr	GAS	Aggregated	Aggregated			
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269	

		PM10	g/mile		
Gas LDA (ann)	g/vkt	0.000	0.000	EMFAC2011	
DSL LDA (ann)	g/vkt	0.007	0.011	EMFAC2011	
Idling Gas LDA	g/vkt	0.000	0.000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.027	0.043	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.000	0.000	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.008	0.013	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	3.10E-05	4.99E-05	sum	Based on 0.38% Diesel

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	PM (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.86**				

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported		
Production Capacity	100 tons per hour		
Hours Of Operation	7600	per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)		
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)		
Ship Unloading Capacity	**303**		
Duration of ship unloading	**132**	**hrs**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508hrs, manuverving & transit = 2hrs x 19 = 38hrs
	Material Handling	Ongoing	303 tons per hrs using grab crane via two mobile hoppers. 3 Onsite Hoppers based on 100 tons per hour for 7600 hour per year. Includes ship uploading, conveyor drops, excavator upload & drop and front loader upload and drop.
	Raw Material Storage Piles	Variable (depending on year)	All Year Stockpiling Assumed At Both RMSPs

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported		
Production Capacity	100 tons per hour		
Hours Of Operation	7600	per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)		
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)		
Ship Unloading Capacity	**303**		
Duration of ship unloading	**132**	**hrs**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508hrs, manuverving & transit = 2hrs x 19 = 38hrs
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	Raw Material Storage Piles	Variable (depending on year)	All Year Stockpiling Assumed At Both RMSPs

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 59103.9m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Orcem California Inc., Mode 1 (Milestone 5)**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	**59103.9**	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46	3.70%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36	10.20%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	

Auxilliary Engine	
Hoteling	0.06
Maneuvering	0.275
Transit	0.104

Source: (CARB (2011) Appendix D)

Main Engine

Transit		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR

Maneuvering		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	
		PM10
Medium	Marine Distillate (0.1% S)	**0.25001**
		g/kW-HR

Boiler

	PM10
Marine Distillate (0.1% S)	**0.133**
	g/kW-HR

Tug

	PM10
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

	PM2.5 Emissions (g/yr)	Milestone 5 Emissions/Sec
ship upload 1	468.7	1.49E-05
ship upload 2	468.7	1.49E-05
mobile hopper 1	468.7	1.49E-05
mobile hopper 2	468.7	1.49E-05
conveyor1	937.5	2.97E-05
intake hopper	937.5	2.97E-05
front loading upload 1	468.7	1.49E-05
front loading upload 2	468.7	1.49E-05
excavator upload & drop1	937.5	2.97E-05
excavator upload & drop2	937.5	2.97E-05
millfeed	965.6	3.06E-05
elevator drop	965.6	3.06E-05
main silo	937.5	2.97E-05
gypsum silo	28.1	8.92E-07
main silo conveyor	937.5	2.97E-05
gypsum silo conveyor	28.1	8.92E-07
mill intake	965.6	3.06E-05
conveyor drop 1	468.7	1.49E-05
conveyor drop 2	468.7	1.49E-05
gypsum handling (drop & upload)	28.1	8.92E-07

Stockpile Wind Erosian

Based on worst-case shape B3 AP42 13.2.5 Industrial Wind Erosian

Slag Heap 1				
Area ID	us/u_r	%		Milestone 5
A	1.1	4		57.6
B	0.9	14		201.6
C	0.6	54		777.6
D	0.2	28		403.2
				Milestones 1-3
		100	1440	Milestones 4-5

Slag Heap 2			
Area ID	us/u_r	%	Area (m2)
A	1.1	4	155.20
B	0.9	14	543.20
C	0.6	54	2095.20
D	0.2	28	1086.40
		100	3880

Slag Heap 3			
Area ID	us/u_r	%	Area (m2)
A	1.1	4	45.56
B	0.9	14	159.46
C	0.6	54	615.06
D	0.2	28	318.92
		100	1139

Note: Stockpile area changes between Milestone 1-3 & 4-5

U_t^* 1.12 UNCRUSTED COAL PILE (AP42)

		Elevated Piles -surface wind speeds						Erosian Potenti	g/m2			Slag Heap 1			Slag Heap 2 - milestone 4 & 5			Slag Heap 3 - gypsum		
	Flat Piles	u_s/u_r =0.2	u_s/u_r =0.6	$u^* > u^*_t$	$u^* > u^*_t$	$u^* > u^*_t$	$u^* > u^*_t$	u_s/u_r =0.2	u_s/u_r =0.6	u_s/u_r =0.9	u_s/u_r = 1.1	u_s/u_r =0.9	u_s/u_r = 1.1	Total	u_s/u_r =0.9	u_s/u_r = 1.1	Total	u_s/u_r =0.9	u_s/u_r = 1.1	Total
$U^* - U^*_t$	$U^* > U^*t$	U_s^+	U_s^+	>0?	>0?	>0?	>0?	u*	u*	u*	u*	g	g	g	g	g	g	g	g	g
-0.788	0	1.25	3.76																		
-0.812	0	1.16	3.49																		
-0.930	0	0.72	2.15																		
-0.930	0	0.72	2.15																		
-0.788	0	1.25	3.76																		
-0.883	0	0.89	2.68																		
-0.599	0	1.97	5.90																		
-0.765	0	1.34	4.02																		
-0.883	0	0.89	2.68																		
-0.907	0	0.80	2.41																		
-0.883	0	0.89	2.68																		
-0.836	0	1.07	3.22																		
-0.883	0	0.89	2.68																		
-0.907	0	0.80	2.41																		
-0.599	0	1.97	5.90																		
-0.883	0	0.89	2.68																		
-0.836	0	1.07	3.22																		
-0.836	0	1.07	3.22																		
-0.812	0	1.16	3.49																		
-0.575	0	2.06	6.17				1.131				0.282		16.26	16.26		43.81	43.81		12.86	12.86
-0.457	0	2.50	7.51			1.127	1.377			0.166	10.249	33.47	590.37	623.83	90.17	1590.71	1680.89	26.47	466.96	493.44
-0.646	0	1.79	5.36																		
-0.599	0	1.97	5.90																		
-0.930	0	0.72	2.15																		
-0.883	0	0.89	2.68																		
-0.717	0	1.52	4.56																		
-0.836	0	1.07	3.22																		
-0.741	0	1.43	4.29																		
-0.883	0	0.89	2.68																		
-0.883	0	0.89	2.68																		
-0.765	0	1.34	4.02																		
-0.741	0	1.43	4.29																		
-0.883	0	0.89	2.68																		
-0.812	0	1.16	3.49																		
-0.836	0	1.07	3.22																		
-0.741	0	1.43	4.29																		
-0.812	0	1.16	3.49																		
-0.883	0	0.89	2.68																		
-0.883	0	0.89	2.68																		
-0.836	0	1.07	3.22																		
-0.717	0	1.52	4.56																		
-0.812	0	1.16	3.49																		
-0.599	0	1.97	5.90																		
-0.599	0	1.97	5.90																		
-0.741	0	1.43	4.29																		
-0.575	0	2.06	6.17				1.131				0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.765	0	1.34	4.02																		
-0.812	0	1.16	3.49																		
-0.717	0	1.52	4.56																		
-0.765	0	1.34	4.02																		
-0.907	0	0.80	2.41																		
-0.622	0	1.88	5.63																		
-0.788	0	1.25	3.76																		
-0.599	0	1.97	5.90																		
-0.622	0	1.88	5.63																		
-0.622	0	1.88	5.63																		
-0.765	0	1.34	4.02																		
-0.788	0	1.25	3.76																		
-0.551	0	2.15	6.44				1.180				1.715	0.00	98.77	98.77		266.13	266.13		78.12	78.12
-0.575	0	2.06	6.17				1.131				0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.646	0	1.79	5.36																		
-0.788	0	1.25	3.76																		
-0.836	0	1.07	3.22																		
-0.836	0	1.07	3.22																		
-0.646	0	1.79	5.36																		
-0.457	0	2.50	7.51			1.127	1.377			0.166	10.249	33.47	590.37	623.83	90.17	1590.71	1680.89	26.47	466.96	493.44
-0.741	0	1.43	4.29																		
-0.907	0	0.80	2.41																		
-0.741	0	1.43	4.29																		
-0.694	0	1.61	4.83																		
-0.694	0	1.61	4.83																		
-0.599	0	1.97	5.90																		
-0.575	0	2.06	6.17				1.131				0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.788	0	1.25	3.76																		
-0.717	0	1.52	4.56																		
-0.622	0	1.88	5.63																		
-0.646	0	1.79	5.36																		
-0.457	0	2.50	7.51			1.127	1.377			0.166	10.249	33.47	590.37	623.83	90.17	1590.71	1680.89	26.47	466.96	493.44
-0.883	0	0.89	2.68																		
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-0.765	0	1.34	4.02																		
-0.599	0	1.97	5.90																		
-0.765	0	1.34	4.02																		
-0.599	0	1.97	5.90																		
-0.883	0	0.89	2.68																		
-0.717	0	1.52	4.56																		
-0.457	0	2.50	7.51			1.127	1.377			0.166	10.249	33.47	590.37	623.83	90.17	1590.71	1680.89	26.47	466.96	493.44
-0.646	0	1.79	5.36																		
-0.788	0	1.25	3.76																		
-0.741	0	1.43	4.29																		
-0.409	0	2.68	8.05			1.207	1.475			2.614	16.200	527.04	933.11	1460.15	1420.08	2514.21	3934.29	416.87	738.06	1154.94
-0.551	0	2.15	6.44									0.00	0.00							
-0.717	0	1.52	4.56									0.00	0.00							
-0.528	0	2.24	6.71				1.229				3.428	0.00	197.43	197.43		531.97	531.97		156.16	156.16
-0.551	0	2.15	6.44				1.180				1.715	0.00	98.77	98.77		266.13	266.13		78.12	78.12
-0.646	0	1.79	5.36									0.00	0.00							
-0.836	0	1.07	3.22									0.00	0.00							
-0.812	0	1.16	3.49									0.00	0.00							
-0.646	0	1.79	5.36									0.00	0.00							
-0.717	0	1.52	4.56									0.00	0.00							
-0.883	0	0.89	2.68									0.00	0.00							
-0.599	0	1.97	5.90									0.00	0.00							
-0.528	0	2.24	6.71				1.229				3.428	0.00	197.43	197.43		531.97	531.97		156.16	156.16
-0.575	0	2.06	6.17				1.131				0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.717	0	1.52	4.56									0.00	0.00							
-0.788	0	1.25	3.76									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.694	0	1.61	4.83									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.812	0	1.16	3.49									0.00	0.00							
-0.907	0	0.80	2.41									0.00	0.00							
-0.717	0	1.52	4.56									0.00	0.00							
-0.575	0	2.06	6.17				1.131				0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.765	0	1.34	4.02									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.599	0	1.97	5.90									0.00	0.00							
-0.812	0	1.16	3.49									0.00	0.00							
-0.812	0	1.16	3.49									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.599	0	1.97	5.90									0.00	0.00							
-0.622	0	1.88	5.63									0.00	0.00							
-0.599	0	1.97	5.90									0.00	0.00							
-0.694	0	1.61	4.83									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.646	0	1.79	5.36									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.765	0	1.34	4.02									0.00	0.00							
-0.788	0	1.25	3.76									0.00	0.00							
-0.646	0	1.79	5.36									0.00	0.00							
-0.717	0	1.52	4.56									0.00	0.00							
-0.741	0	1.43	4.29									0.00	0.00							
-0.694	0	1.61	4.83									0.00	0.00							

Annual Average

Slag Heap South			Slag Heap North			Slag Heap 3 - Gypsum		
Count	39	hr	Count	39	hr	Count	39	hr
Total	10699.0	g	Average / event	28784.1	g	Average / event	8462.6	g

Mass Emission			Mass Emission			Mass Emission		
PM10	5.35E-04	Tonnes	PM10	3.60E-04	Tonnes	PM10	1.06E-04	Tonnes
PM2.5	8.02E-05	Tonnes	PM2.5	5.40E-05	Tonnes	PM2.5	1.59E-05	Tonnes

Annualised Emission Rate

Mass Emission			Mass Emission			Mass Emission		
PM10	1.70E-05	g/s	PM10	1.14E-05	g/s	PM10	3.35E-06	g/s
PM2.5	2.54E-06	g/s	PM2.5	1.71E-06	g/s	PM2.5	5.03E-07	g/s

Mass Emission			Mass Emission			Mass Emission		
PM10	1.18E-08	g/s*m2	PM10	2.94E-09	g/s*m2	PM10	2.94E-09	g/s*m2
PM2.5	1.77E-09	g/s*m2	PM2.5	4.41E-10	g/s*m2	PM2.5	4.42E-10	g/s*m2

PM10			PM10	PM10	PM10	PM10
	tonnage	hours of operation	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	1200	0.0191	0.00016	0.00017	0.348
milestone 2	240000	2400	0.0191	0.00016	0.00017	0.348
milestone 3	360000	3600	0.0191	0.00032	0.00035	0.697
milestone 4	480000	4800	0.0191	0.00047	0.00052	1.045
milestone 5	760000	7600	0.0191	0.00063	0.0007	1.393

PM2.5			PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	hours of operation	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	1200	0.00287	0.00002	0.00002	0.047
milestone 2	240000	2400	0.00287	0.00004	0.00005	0.093
milestone 3	360000	3600	0.00287	0.00006	0.00007	0.140
milestone 4	480000	4800	0.00287	0.00008	0.00009	0.187
milestone 5	760000	7600	0.00287	0.00013	0.0001	0.296

-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13		78.12	78.12
-0.717	0	1.52	4.56					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.599	0	1.97	5.90					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.694	0	1.61	4.83					0.00	0.00							
-0.409	0	2.68	8.05	1.207	1.475	2.614	16.200	527.04	933.11	1460.15	1420.08	2514.21	3934.29	416.87	738.06	1154.94
-0.622	0	1.88	5.63					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.694	0	1.61	4.83					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81		12.86	12.86
-0.646	0	1.79	5.36					0.00	0.00							
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13		78.12	78.12
-0.694	0	1.61	4.83					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		0.00	0.00		12.86	12.86
-0.622	0	1.88	5.63					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.599	0	1.97	5.90					0.00	0.00							
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13		78.12	78.12
-0.741	0	1.43	4.29					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.433	0	2.59	7.78	1.167	1.426	1.296	13.084	261.33	753.66	1014.98	704.13	2030.69	2734.82	206.70	596.12	802.82
-0.694	0	1.61	4.83					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13	0.00	78.12	78.12
-0.599	0	1.97	5.90					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81	0.00	12.86	12.86
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13	0.00	78.12	78.12
-0.646	0	1.79	5.36					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13	0.00	78.12	78.12
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81	0.00	12.86	12.86
-0.717	0	1.52	4.56					0.00	0.00							
-0.504	0	2.32	6.97		1.279		5.421	0.00	312.25	312.25		841.35	841.35	0.00	246.98	246.98
-0.694	0	1.61	4.83					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
	0	0.00	0.00					0.00	0.00							
-0.575	0	2.06	6.17		1.131		0.282	0.00	16.26	16.26		43.81	43.81	0.00	12.86	12.86
-0.694	0	1.61	4.83					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.528	0	2.24	6.71		1.229		3.428	0.00	197.43	197.43		531.97	531.97	0.00	156.16	156.16
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77		266.13	266.13	0.00	78.12	78.12
-0.646	0	1.79	5.36					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.646	0	1.79	5.36					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.622	0	1.88	5.63					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.836	0	1.07	3.22					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.930	0	0.72	2.15					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.907	0	0.80	2.41					0.00	0.00							
-0.836	0	1.07	3.22					0.00	0.00							
-0.883	0	0.89	2.68					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.717	0	1.52	4.56					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.765	0	1.34	4.02					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.788	0	1.25	3.76					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.741	0	1.43	4.29					0.00	0.00							
-0.694	0	1.61	4.83					0.00	0.00							
-0.907	0	0.80	2.41					0.00	0.00							

-0.788	0	1.25	3.76					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.717	0	1.52	4.56					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.765	0	1.34	4.02					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.622	0	1.88	5.63					0.00	0.00										
-0.717	0	1.52	4.56					0.00	0.00										
-0.646	0	1.79	5.36					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.765	0	1.34	4.02					0.00	0.00										
-0.812	0	1.16	3.49					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.765	0	1.34	4.02					0.00	0.00										
-0.741	0	1.43	4.29					0.00	0.00										
-0.812	0	1.16	3.49					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.954	0	0.63	1.88					0.00	0.00										
-0.812	0	1.16	3.49					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.622	0	1.88	5.63					0.00	0.00										
-0.646	0	1.79	5.36					0.00	0.00										
-0.765	0	1.34	4.02					0.00	0.00										
-0.812	0	1.16	3.49					0.00	0.00										
-0.883	0	0.89	2.68					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.622	0	1.88	5.63					0.00	0.00										
-0.883	0	0.89	2.68					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.622	0	1.88	5.63					0.00	0.00										
-0.788	0	1.25	3.76					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.883	0	0.89	2.68					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.954	0	0.63	1.88					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.741	0	1.43	4.29					0.00	0.00										
-0.551	0	2.15	6.44		1.180		1.715	0.00	98.77	98.77			266.13	266.13			78.12	78.12	
-0.528	0	2.24	6.71		1.229		3.428	0.00	197.43	197.43			531.97	531.97			156.16	156.16	
-0.646	0	1.79	5.36					0.00	0.00										
-0.457	0	2.50	7.51	1.127	1.377	0.166	10.249	33.47	590.37	623.83		90.17	1590.71	1680.89		26.47	466.96	493.44	
-0.930	0	0.72	2.15					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.765	0	1.34	4.02					0.00	0.00										
-0.883	0	0.89	2.68					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.930	0	0.72	2.15					0.00	0.00										
-0.883	0	0.89	2.68					0.00	0.00										
-0.694	0	1.61	4.83					0.00	0.00										
-0.741	0	1.43	4.29					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.836	0	1.07	3.22					0.00	0.00										
-0.694	0	1.61	4.83					0.00	0.00										
-0.717	0	1.52	4.56					0.00	0.00										
-0.599	0	1.97	5.90					0.00	0.00										
-0.907	0	0.80	2.41					0.00	0.00										
-0.599	0	1.97	5.90					0.00	0.00										
-0.504	0	2.32	6.97		1.279		5.421	0.00	312.25	312.25			841.35	841.35		0.00	246.98	246.98	
-0.622	0	1.88	5.63					0.00	0.00										
-0.433	0	2.59	7.78	1.167	1.426	1.296	13.084	261.33	753.66	1014.98		704.13	2030.69	2734.82		206.70	596.12	802.82	
-0.883	0	0.89	2.68																
-0.694	0	1.61	4.83																
-0.599	0	1.97	5.90																
-0.954	0	0.63	1.88																
-0.883	0	0.89	2.68																
-0.907	0	0.80	2.41																
-0.907	0	0.80	2.41																
-0.907	0	0.80	2.41																
SUM	0							**Slag Heap South**		**Annual Emission**		**Slag Heap North**		**Annual Emission**		**Slag Heap 3 - Gypsum**		**Annual Emission**	
								1744.1	**8955.0**	**10.7**	**Kg**	**4699.3**	**24084.8**	**28.8**	**Kg**	**1379.5**	**7083.1**	**8.5**	**Kg**

Mobile Hoppers / Conveyors

	Load Factor	kw	PM10
Hopper / Conveyor	0.40	201	0.0100
			g/(hp-hr)
Deterioration Rate	3.70E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.852		
Emission Rate	0.699	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate /Hopper / Conveyor PM10	0.000194	g/s	
			Milestone 5

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)

OFFROAD2011	Load Factor	HP	PM10
Excavator	0.3819	175	0.010
			g/(hp-hr)
Deterioration Rate	5.00E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 5 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	0.630	g/hr	

Activity Factor	0.25	Fractional usage per hour

Emission Rate / Excavator PM10	0.000044	g/s

tonnes to ton	*1.1023*
ton to tonnes	*0.9072*

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)

Maximum 24-Hour Scenario

Project: Orcem, Vallejo

Unpaved Roads (Chapter 13.2.2 AP42 Dated 11/2006)

$$E = [281.9 * k * (s/12)^a (W/3)^b \text{ g/veh km}$$

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	20	20	Assumption for excavator
Wet Days Per Year	Days	0	0	24-Maximum Scenario
Constant, k	lb/VMT	1.5	0.15	AP42 Table 13.2.2-2
Constant, a		0.9	0.9	AP42 Table 13.2.2-2
Constant, b		0.45	0.45	AP42 Table 13.2.2-2
Silt content, s	%	4.8	4.8	AP42 Table 13.2.2-1
Uncontrolled Emission factor, E	lb/VMT	1.54	0.15	Calculation
Uncontrolled Emission factor, E	g/VKT	435.31	43.53	Calculation
Control Efficiency for Watering	Factor	0.968	0.968	Cumulative efficiency based on dust suppression using MgCl2, frequent watering & 15 mph speed limit
Controlled Emission factor, E	g/VKT	**13.93**	**1.39**	Calculation

AERMOD Model Inputs

PM10				**Front Loader Trips**		
				Volume of front loader		**12.2**
Speed	**16**	**km/hr**	**(10 miles/hr)**	**Density of GGBS**		**1.20**
	Maximum 24-Hr			**Tonnage / front loader**		**14.64**
Slag Heap North Sources	**12**			**Tons / front loader**		**16.14**
Slag Heap South Sources	**5**					
Spacing Slag Heap North	**0.010**			**Tonnage**	**Hours of operation**	**Trips/annum**
Spacing Slag Heap South	**0.009**			**120000**	**1105.263158**	**8197**
Distance Travelled Slag Heap N	**0.120**			**240000**	**2210.526316**	**16393**
Distance Travelled Slag Heap S	**0.045**			**360000**	**3315.789474**	**24590**
Trips / hour	**7.4**	**split 50:50 S1 & S2**		**480000**	**4421.052632**	**32787**
				760000	**7000**	**51913**

Slag Heap North	**Maximum 24-Hr**		
Distance	**0.120**	**km**	
			Trips per hour
Tonnage	**380,000**	**milestone 5**	**1.0**
			Traverses the slag heap once per hour
PM10 Emission Rate	**0.000464**	**g/sec**	

Unpaved Road - Industrial (Front Loader (2 CNG / LPG / Propane in operation for Milestone 5))

OFFROAD	Load Factor	HP	PM10 (Diesel)
Front Loader	0.3618	369	0.010
			g/(hp-hr)
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.10	g/hr	

Activity Factor	0.75	Fractional usage per hour		
Front Loader Hours Of Operation	7000.0	hrs (milestone 5)	Combined	
Emission Rate / Front Loader PM10	0.000229	g/s	0.000273	including excavator exhaust emissions
PM2.5/PM10 Ratio	0.92		0.92	
Emission Rate / Front Loader PM2.5	0.000211	g/s	0.000251	including excavator exhaust emissions

	Maximum 24-hrs	Annual Mean
Sources (Slag Heap N)	12	28
Sources (Slag Heap S)	5	28

Maximum 24-Hours	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	2.27E-05	g/s	2.09E-05	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	5.46E-05	g/s	5.02E-05	including excavator exhaust emissions

Annual Mean	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	9.75E-06	g/s	8.97E-06	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	9.75E-06	g/s	8.97E-06	including excavator exhaust emissions

PM10	Front Loader - Gypsum Loading			
Emission Rate	1.10	g/hr		
	0.00031	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	0.069	g/km		Tonnage / front loader
Gypsum Storage Sources	28			Tons / front loader
Time per trip	0.035	hrs		
Spacing storage	0.010	km		Tonnage
				3,522
Distance Travelled S3	0.560	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.24	14,088
				22,306
Emissions per hour S3	0.0385	g/hr	0.00914	
Emissions per sec S3	0.0000107	g/sec	0.00000254	
	PM10 Maximum Day		PM10 Annual Mean	PM2.5 Maximum Day
Emissions per sec S3/source	3.82E-07	g/sec	9.07E-08	3.51E-07

tonnes to ton	*1.1023*
ton to tonnes	*0.9072*

Unpaved Road - Industrial (Front Loader stockpile to hopper)

Maximum 24-Hour Scenario

Project: Orcem, Vallejo

Unpaved Roads (Chapter 13.2.2 AP42 Dated 11/2006)

$E = [281.9 * k * (s/12)^a (W/3)^b$ g/veh km

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	**tons**	**42.5**	**42.5**	**CAT980 (34.43 empty, 16.14 tons load)**
Wet Days Per Year	**Days**	**0**	**0**	**24-Maximum**
Constant, k	**lb/VMT**	**1.5**	**0.15**	**AP42 Table 13.2.2-2**
Constant, a		**0.9**	**0.9**	**AP42 Table 13.2.2-2**
Constant, b		**0.45**	**0.45**	**AP42 Table 13.2.2-2**
Silt content, s	**%**	**4.8**	**4.8**	**AP42 Table 13.2.2-1**
Uncontrolled Emission factor, E	**lb/VMT**	**2.17**	**0.22**	**Calculation**
Uncontrolled Emission factor, E	**g/VKT**	**611.10**	**61.11**	**Calculation**
Control Efficiency for Watering	**Factor**	**0.968**	**0.968**	**Cumulative efficiency based on dust suppression using MgCl2, frequent watering & 15 mph speed limit**
Controlled Emission factor, E	**g/VKT**	**19.56**	**1.96**	**Calculation**

AERMOD Model Inputs

Unpaved road modelled as a series of adjacent volume sources

Front loader will take material from each raw material storage pile and load the hopper during normal operating hours.

Slag Heap North	**Maximum 24-hr**				
Average Distance Per Trip	**0.120**	**km**	(one-way)		
Volume of front loader	**12.20**	**m3**			
Density of GGBS	**1.20**				
Tonnage / front loader	**14.64**	**tonnes**			
Tons / front loader	**16.14**	**tons**	**Trips/annum**	**Hours Of operation**	**Trips per hour**
Tonnage Deposited In SHN	**380,000**	**milestone 5**	25956	7000.0	3.7
PM10 Emission Rate	**0.00483**	**g/sec**			(one-way)

EMFAC2011 Emission Rates							*0.6214*
Region Type:	GAI						*mile to km*
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	10	miles/hr					
Vehicle Classification:	EMFAC2007 Categories					Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run	Combined
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0297	0.0297

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	PM10 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.004	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0184	0.0297	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0005	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0171	0.0275	Sum	Assumption - Based On Idling for 7.5% of time

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX	PM10_STREX	PM10_Combined
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.0075	0.00043	0.00752
2020	Annual	LDA	DSL	Aggregated	10	0.0320	0.00000	0.03199

LDA Idling Calculation							
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX	
						(gms/mile)	gms/km
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0119	0.0074
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269

		PM10_run	g/mile		
Gas LDA (ann)	g/vkt	0.00524	0.0084	EMFAC2011	start emissions - one start per day averaged over onsite trip distance (0.756km)
DSL LDA (ann)	g/vkt	0.01988	0.0320	EMFAC2011	
Idling Gas LDA	0	0.00740	0.0119	EMFAC2011	
Idling Diesel LDA	0	0.02692	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	0	0.00540	0.0087	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	0	0.02040	0.0328	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	0	0.0055	0.0088	sum	Based on 0.38% Diesel

Note: Emission Factor Includes tire & brake wear

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.013	g/hr	0.004	based on winter
Emission Factor/vehicle	0.0000036	g/sec	0.000018	includes all trips/day
Emissions /vehicle/AERMOD Source	4.32E-08	g/sec	2.21E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Weekday Hours	PM10 Emissions (g/s)	PM10 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	4.32E-08	5	2.10E-07	4.307E-07
2	4.32E-08	6	2.80E-07	2.800E-07
3	4.32E-08	10	4.20E-07	4.201E-07
4	4.32E-08	11	4.90E-07	4.901E-07
5	4.32E-08	13	5.60E-07	5.601E-07
6	4.32E-08	13	5.60E-07	5.601E-07
7	4.32E-08	13	5.60E-07	5.601E-07
8	4.32E-08	13	5.60E-07	5.601E-07
9	4.32E-08	13	5.60E-07	1.001E-06
10	4.32E-08	13	5.60E-07	5.601E-07
11	4.32E-08	15	6.46E-07	6.464E-07
12	4.32E-08	13	5.60E-07	5.601E-07
13	4.32E-08	11	4.90E-07	4.901E-07
14	4.32E-08	5	2.10E-07	2.100E-07
15	4.32E-08	7	2.96E-07	2.964E-07
16	4.32E-08	0	0.00E+00	0.000E+00
17	4.32E-08	0	0.00E+00	2.207E-07
18	4.32E-08	0	0.00E+00	0.000E+00
19	4.32E-08	0	0.00E+00	0.000E+00
20	4.32E-08	0	0.00E+00	0.000E+00
21	4.32E-08	0	0.00E+00	0.000E+00
22	4.32E-08	0	0.00E+00	0.000E+00
23	4.32E-08	2	7.00E-08	7.001E-08
24	4.32E-08	3	1.40E-07	1.400E-07

Total HHDT/Day	166.1
	including deliveries (2 per day, 10am, 2pm)

	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	Maximum 24-Hour PM10 Including LDA
1	4.32E-08	5	2.10E-07	4.31E-07
2	4.32E-08	6	2.80E-07	2.80E-07
3	4.32E-08	10	4.20E-07	4.20E-07
4	4.32E-08	11	4.90E-07	4.90E-07
5	4.32E-08	13	5.60E-07	5.60E-07
6	4.32E-08	13	5.60E-07	5.60E-07
7	4.32E-08	13	5.60E-07	5.60E-07
8	4.32E-08	19	8.19E-07	8.19E-07
9	4.32E-08	19	8.19E-07	1.26E-06
10	4.32E-08	19	8.19E-07	8.19E-07
11	4.32E-08	21	9.06E-07	9.06E-07
12	4.32E-08	19	8.19E-07	8.19E-07
13	4.32E-08	17	7.49E-07	7.49E-07
14	4.32E-08	11	4.69E-07	4.69E-07
15	4.32E-08	13	5.55E-07	5.55E-07
16	4.32E-08	6	2.59E-07	2.59E-07
17	4.32E-08	6	2.59E-07	4.80E-07
18	4.32E-08	0	0.00E+00	0.00E+00
19	4.32E-08	0	0.00E+00	0.00E+00
20	4.32E-08	0	0.00E+00	0.00E+00
21	4.32E-08	0	0.00E+00	0.00E+00
22	4.32E-08	0	0.00E+00	0.00E+00
23	4.32E-08	2	7.00E-08	7.00E-08
24	4.32E-08	3	1.40E-07	1.40E-07

Total HHDT/Day	226.1
	including deliveries (2 per day, 10am, 2pm)

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

Rail Loading	1000	Hrs		
	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	4.32E-08	5	2.10E-07	4.31E-07
2	4.32E-08	6	2.80E-07	2.80E-07
3	4.32E-08	10	4.20E-07	4.20E-07
4	4.32E-08	11	4.90E-07	4.90E-07
5	4.32E-08	13	5.60E-07	5.60E-07
6	4.32E-08	13	5.60E-07	5.60E-07
7	4.32E-08	13	5.60E-07	5.60E-07
8	4.32E-08	14	5.94E-07	5.94E-07
9	4.32E-08	14	5.94E-07	1.04E-06
10	4.32E-08	14	5.94E-07	5.94E-07
11	4.32E-08	16	6.81E-07	6.81E-07
12	4.32E-08	14	5.94E-07	5.94E-07
13	4.32E-08	12	5.24E-07	5.24E-07
14	4.32E-08	6	2.44E-07	2.44E-07
15	4.32E-08	8	3.30E-07	3.30E-07
16	4.32E-08	1	3.41E-08	3.41E-08
17	4.32E-08	1	3.41E-08	2.55E-07
18	4.32E-08	0	0.00E+00	0.00E+00
19	4.32E-08	0	0.00E+00	0.00E+00
20	4.32E-08	0	0.00E+00	0.00E+00
21	4.32E-08	0	0.00E+00	0.00E+00
22	4.32E-08	0	0.00E+00	0.00E+00
23	4.32E-08	2	7.00E-08	7.00E-08
24	4.32E-08	3	1.40E-07	1.40E-07
		174.0		
		including deliveries (2 per day, 10am, 2pm)		

PM10 Including LDA	PM10 Including LDA	PM10 Including LDA
3.74E-07	2.76E-07	6.50E-07
2.43E-07	0.00E+00	2.43E-07
3.64E-07	0.00E+00	3.64E-07
4.25E-07	1.07E-07	5.33E-07
4.86E-07	1.43E-07	6.29E-07
4.86E-07	1.43E-07	6.29E-07
4.86E-07	1.43E-07	6.29E-07
5.15E-07	2.15E-07	7.30E-07
8.98E-07	6.95E-07	1.59E-06
5.15E-07	1.43E-07	6.59E-07
5.90E-07	1.43E-07	7.34E-07
5.15E-07	1.43E-07	6.59E-07
4.55E-07	1.43E-07	5.98E-07
2.12E-07	2.15E-07	4.27E-07
2.87E-07	1.43E-07	4.30E-07
2.96E-08	1.43E-07	1.73E-07
2.21E-07	4.19E-07	6.40E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
0.00E+00	1.43E-07	1.43E-07
6.07E-08	1.43E-07	2.04E-07
1.21E-07	1.43E-07	2.65E-07

Annualised	Annualised Emission Rate	Annualised Emission Rate
3.04E-07	1.76E-07	4.79E-07

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	0.0129	0.0129	0.005	0.0001	0.0001	0.24
milestone 2	240000		14578	0.755	0.0129	0.0129	0.005	0.0002	0.0002	0.41
milestone 3	360000		20676	0.755	0.0129	0.0129	0.005	0.0003	0.0003	0.59
milestone 4	480000		22723	0.755	0.0129	0.0129	0.005	0.0003	0.0003	0.65
milestone 5	760000		32534	0.755	0.0129	0.0129	0.005	0.0004	0.0005	0.93
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	0.755	0.00412	0.00412	0.000	0.000009	0.000010	0.02
milestone 2	240000	24	4992	0.755	0.00412	0.00412	0.000	0.000021	0.000023	0.05
milestone 3	360000	24	6240	0.755	0.00412	0.00412	0.000	0.000026	0.000028	0.06
milestone 4	480000	64	16640	0.755	0.00412	0.00412	0.001	0.000069	0.000076	0.15
milestone 5	760000	64	19968	0.755	0.00412	0.00412	0.001	0.000082	0.000091	0.18
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	0.0049	0.0001	0.0001	0.26
						milestone 2	0.0049	0.0002	0.0002	0.46
						milestone 3	0.0049	0.0003	0.0003	0.64
						milestone 4	0.0053	0.0004	0.0004	0.80
						milestone 5	0.0053	0.0005	0.0006	1.11

0.06174	0.02646	0.036	0.009
PMBW			PMTW

PM2.5 Onsite Paved Road (TW & BW Emissions)

HHDT Emission Factor

EMFAC2011 Emission Rates									0.6214
Region Type:	GAI								mile to km
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr		PM10_TW	PM10_BW	Combined
						(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0360	0.0617	0.0977

HHDT Idling Emission Factors					
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	
2020	HHDT	D	SV	A	
					annual
	Speed	5	miles/hr		
		8.046	km/hr		

HHDT Emission Factor					
			g/mile		
T7 Single	g/vkt	0.0607	0.0977	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0562	0.0904	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed		PM10_TW	PM10_BW	PM2_5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10		0.00800	0.03675		0.04475
2020	Annual	LDA	DSL	Aggregated	10		0.00800	0.03675		0.04475
LDA Idling Calculation										
2020	Annual	LDA	GAS	Aggregated		0				
						(gms/mile)	gms/km			
Speed	5	miles/hr	GAS	Aggregated	Aggregated		0.0000			
	8.046	km/hr	DSL	Aggregated	Aggregated		0.0000			

			g/mile		
Gas LDA (ann)	g/vkt	0.02781	0.0448	EMFAC2011	start emissions - one start per day averaged over onsite trip distance (0.755km)
DSL LDA (ann)	g/vkt	0.02781	0.0448	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.02572	0.0414	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.02572	0.0414	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0257	0.0414	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.042	g/hr	0.019	based on annual
Emission Factor/vehicle	1.18E-05	g/sec	8.63E-05	includes all trips/day
Emissions /vehicle/AERMOD Source	1.42E-07	g/sec	1.04E-06	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM10 Emissions (g/s)	Milestone 5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	1.42E-07	5	6.90E-07	1.730E-06
2	1.42E-07	6	9.21E-07	9.206E-07
3	1.42E-07	10	1.38E-06	1.381E-06
4	1.42E-07	11	1.61E-06	1.611E-06
5	1.42E-07	13	1.84E-06	1.841E-06
6	1.42E-07	13	1.84E-06	1.841E-06
7	1.42E-07	13	1.84E-06	1.841E-06
8	1.42E-07	13	1.84E-06	1.841E-06
9	1.42E-07	13	1.84E-06	3.921E-06
10	1.42E-07	13	1.84E-06	1.841E-06
11	1.42E-07	15	2.13E-06	2.125E-06
12	1.42E-07	13	1.84E-06	1.841E-06
13	1.42E-07	11	1.61E-06	1.611E-06
14	1.42E-07	5	6.90E-07	6.905E-07
15	1.42E-07	7	9.74E-07	9.744E-07
16	1.42E-07	0	0.00E+00	0.000E+00
17	1.42E-07	0	0.00E+00	1.040E-06
18	1.42E-07	0	0.00E+00	0.000E+00
19	1.42E-07	0	0.00E+00	0.000E+00
20	1.42E-07	0	0.00E+00	0.000E+00
21	1.42E-07	0	0.00E+00	0.000E+00
22	1.42E-07	0	0.00E+00	0.000E+00
23	1.42E-07	2	2.30E-07	2.302E-07
24	1.42E-07	3	4.60E-07	4.603E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	Maximum 24-Hour PM10 Including LDA
1	1.42E-07	5	6.90E-07	1.73E-06
2	1.42E-07	6	9.21E-07	9.21E-07
3	1.42E-07	10	1.38E-06	1.38E-06
4	1.42E-07	11	1.61E-06	1.61E-06
5	1.42E-07	13	1.84E-06	1.84E-06
6	1.42E-07	13	1.84E-06	1.84E-06
7	1.42E-07	13	1.84E-06	1.84E-06
8	1.42E-07	19	2.69E-06	2.69E-06
9	1.42E-07	19	2.69E-06	4.77E-06
10	1.42E-07	19	2.69E-06	2.69E-06
11	1.42E-07	21	2.98E-06	2.98E-06
12	1.42E-07	19	2.69E-06	2.69E-06
13	1.42E-07	17	2.46E-06	2.46E-06
14	1.42E-07	11	1.54E-06	1.54E-06
15	1.42E-07	13	1.83E-06	1.83E-06
16	1.42E-07	6	8.52E-07	8.52E-07
17	1.42E-07	6	8.52E-07	1.89E-06
18	1.42E-07	0	0.00E+00	0.00E+00
19	1.42E-07	0	0.00E+00	0.00E+00
20	1.42E-07	0	0.00E+00	0.00E+00
21	1.42E-07	0	0.00E+00	0.00E+00
22	1.42E-07	0	0.00E+00	0.00E+00
23	1.42E-07	2	2.30E-07	2.30E-07
24	1.42E-07	3	4.60E-07	4.60E-07

226.1

including deliveries (2 per day, 10am, 2pm)

Annual Average Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	Emissions (g/s) Including LDA	Annualised Emission Rate Emissions (g/s) Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	1.42E-07	5	6.90E-07	1.73E-06	1.50E-06	5.14E-07	2.01E-06
2	1.42E-07	6	9.21E-07	9.21E-07	7.99E-07	0.00E+00	7.99E-07
3	1.42E-07	10	1.38E-06	1.38E-06	1.20E-06	0.00E+00	1.20E-06
4	1.42E-07	11	1.61E-06	1.61E-06	1.40E-06	1.28E-07	1.53E-06
5	1.42E-07	13	1.84E-06	1.84E-06	1.60E-06	1.71E-07	1.77E-06
6	1.42E-07	13	1.84E-06	1.84E-06	1.60E-06	1.71E-07	1.77E-06
7	1.42E-07	13	1.84E-06	1.84E-06	1.60E-06	1.71E-07	1.77E-06
8	1.42E-07	14	1.95E-06	1.95E-06	1.69E-06	2.56E-07	1.95E-06
9	1.42E-07	14	1.95E-06	4.03E-06	3.50E-06	1.20E-06	4.70E-06
10	1.42E-07	14	1.95E-06	1.95E-06	1.69E-06	1.71E-07	1.87E-06
11	1.42E-07	16	2.24E-06	2.24E-06	1.94E-06	1.71E-07	2.11E-06
12	1.42E-07	14	1.95E-06	1.95E-06	1.69E-06	1.71E-07	1.87E-06
13	1.42E-07	12	1.72E-06	1.72E-06	1.49E-06	1.71E-07	1.67E-06
14	1.42E-07	6	8.03E-07	8.03E-07	6.96E-07	2.56E-07	9.53E-07
15	1.42E-07	8	1.09E-06	1.09E-06	9.43E-07	1.71E-07	1.11E-06
16	1.42E-07	1	1.12E-07	1.12E-07	9.72E-08	1.71E-07	2.68E-07
17	1.42E-07	1	1.12E-07	1.15E-06	9.99E-07	6.85E-07	1.68E-06
18	1.42E-07	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
19	1.42E-07	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
20	1.42E-07	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
21	1.42E-07	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
22	1.42E-07	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
23	1.42E-07	2	2.30E-07	2.30E-07	2.00E-07	1.71E-07	3.71E-07
24	1.42E-07	3	4.60E-07	4.60E-07	3.99E-07	1.71E-07	5.70E-07

174.0

including deliveries (2 per day, 10am, 2pm)

Annualised	Annualised Emission Rate	Annualised Emission Rate
1.04E-06	2.41E-07	1.28E-06

Annual									
HGV Traffic					PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	0.0424	0.016	0.0004	0.0004	0.79
milestone 2	240000		14578	0.755	0.0424	0.016	0.0006	0.0007	1.36
milestone 3	360000		20676	0.755	0.0424	0.016	0.0009	0.0010	1.93
milestone 4	480000		22723	0.755	0.0424	0.016	0.0010	0.0011	2.12
milestone 5	760000		32534	0.755	0.0424	0.016	0.0014	0.0015	3.04
LDA Traffic					PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	0.755	0.0194	0.001	0.000042	0.000047	0.09
milestone 2	240000	24	4992	0.755	0.0194	0.001	0.000097	0.000107	0.21
milestone 3	360000	24	6240	0.755	0.0194	0.001	0.000121	0.000134	0.27
milestone 4	480000	64	16640	0.755	0.0194	0.003	0.000323	0.000356	0.71
milestone 5	760000	64	19968	0.755	0.0194	0.003	0.000388	0.000427	0.85
								tpa	
						PM10			
						lbs/day	MTPA	tpa	lbs/year
				Combined	milestone 1	0.016	0.0004	0.0004	0.89
					milestone 2	0.017	0.0007	0.0008	1.58
					milestone 3	0.017	0.0010	0.0011	2.20
					milestone 4	0.018	0.0013	0.0014	2.84
					milestone 5	0.018	0.0018	0.0019	3.90

Paved Road - Industrial (Finished Product & Roadway Raw Materials)
HHDT

Project: Orcem, Vallejo

Paved Roads (Chapter 13.2.1 AP42 Dated 01/2011)

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	25	25	Assumption
Wet Days Per Year	Days	0	0	24-Hr Maximum Scenario
Constant, k	g/VKT	0.62	0.15	AP42 Table 13.2.1-1
Constant, a		0.91	0.91	AP42 Equation 13.2.1-1
Constant, b		1.02	1.02	AP42 Equation 13.2.1-2
Silt Loading, Sl	g/m2	0.32	0.32	CARB
Uncontrolled Emission factor, E	g/VKT	5.86	1.42	Calculation
Control Efficiency for Watering	Factor	0.80	0.80	SCAQMD (2007)
Controlled Emission factor, E	g/VKT	1.17	0.28	Calculation

Paved Roads (Chapter 13.2.1 AP42 Date
LDA

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter
Mean Vehicle Weight
Wet Days Per Year
Constant, k
Constant, a
Constant, b
Silt Loading, Sl
Uncontrolled Emission factor, E
Control Efficiency for Watering
Controlled Emission factor, E

AERMOD Model Inputs
Paved road modelled as a series of 9m spaced volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
Emission Factor/vehicle	0.885	g/hr	0.067	
Emission Factor/vehicle	0.00024584	g/sec	0.000299	includes all trips/day
Emission Factor/vehicle/Source	2.96E-06	g/sec	3.60E-06	

AERMOD Model Inputs
Paved road modelled as a series of 9m spaced volume sources

	HHDT PM2.5		LDA PM2.5	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
Emission Factor/vehicle	0.214	g/hr	0.016	
Emission Factor/vehicle	0.00005948	g/sec	0.00007238	includes all trips/day
Emissions /vehicle/AERMOD Source	7.17E-07	g/sec	8.72E-07	

Diurnal Emission Factors Based On Truck Movement Breakdown
No Rail Loading

Hour Of Day	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	2.96E-06	5	1.44E-05	1.80E-05
2	2.96E-06	6	1.92E-05	1.92E-05
3	2.96E-06	10	2.88E-05	2.88E-05
4	2.96E-06	11	3.36E-05	3.36E-05
5	2.96E-06	13	3.84E-05	3.84E-05
6	2.96E-06	13	3.84E-05	3.84E-05
7	2.96E-06	13	3.84E-05	3.84E-05
8	2.96E-06	13	3.84E-05	3.84E-05
9	2.96E-06	13	3.84E-05	4.56E-05
10	2.96E-06	13	3.84E-05	3.84E-05
11	2.96E-06	15	4.43E-05	4.43E-05
12	2.96E-06	13	3.84E-05	3.84E-05
13	2.96E-06	11	3.36E-05	3.36E-05
14	2.96E-06	5	1.44E-05	1.44E-05

PM2.5 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor PM$_{2.5}$

EMFAC2011 Emission Rates							0.6214
Region Type:	GAI						mile to km
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	20	miles/hr					
Vehicle Classification:	EMFAC 2007 Categories				Annual		Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run	Combined
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0228	0.0228

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM2.5 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.004	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0141	0.0228	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0005	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0131	0.0211	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor PM$_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM2.5_Combined
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.0035		0.0035
2020	Annual	LDA	DSL	Aggregated	20	0.0191		0.0191
Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX		
						(gms/mile)	gms/km	
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0119	0.0074	
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269	

		PM10	g/mile		
Gas LDA (ann)	g/vkt	0.00219	0.0035	EMFAC2011	
DSL LDA (ann)	g/vkt	0.01187	0.0191	EMFAC2011	
Idling Gas LDA	g/vkt	0.00740	0.0119	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02692	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00258	0.0041	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01299	0.0209	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0026	0.0042	sum	Based on 0.38% Diesel

0.00E+00

AERMOD Model Inputs

Paved road modelled as a series of volume sources

Lemon St West Of Sonoma	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	14	m	14	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle	0.009	g/hr	0.0019	based on annual
Emission Factor/vehicle	0.0000026	g/sec	0.0000084	includes shift trips/day
Emissions /vehicle/AERMOD Source	5.14E-08	g/sec	1.64E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	Annualised Emission Rate PM10 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	5.14E-08	5	5.00E-07	6.65E-07	5.77E-07	2.05E-07	7.82E-07
2	5.14E-08	6	6.67E-07	6.67E-07	5.79E-07	0.00E+00	5.79E-07
3	5.14E-08	10	1.00E-06	1.00E-06	8.68E-07	0.00E+00	8.68E-07
4	5.14E-08	11	1.17E-06	1.17E-06	1.01E-06	2.57E-07	1.27E-06
5	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	3.43E-07	1.50E-06
6	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	3.43E-07	1.50E-06
7	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	3.43E-07	1.50E-06
8	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	5.14E-07	1.67E-06
9	5.14E-08	13	1.33E-06	1.66E-06	1.44E-06	7.53E-07	2.20E-06
10	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	3.43E-07	1.50E-06
11	5.14E-08	15	1.54E-06	1.54E-06	1.34E-06	3.43E-07	1.68E-06
12	5.14E-08	13	1.33E-06	1.33E-06	1.16E-06	3.43E-07	1.50E-06
13	5.14E-08	11	1.17E-06	1.17E-06	1.01E-06	3.43E-07	1.36E-06
14	5.14E-08	5	5.00E-07	5.00E-07	4.34E-07	5.14E-07	9.48E-07
15	5.14E-08	7	7.06E-07	7.06E-07	6.13E-07	3.43E-07	9.55E-07
16	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
17	5.14E-08	0	0.00E+00	1.64E-07	1.43E-07	5.48E-07	6.91E-07
18	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
19	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
20	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
21	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
22	5.14E-08	0	0.00E+00	0.00E+00	0.00E+00	3.43E-07	3.43E-07
23	5.14E-08	2	1.67E-07	1.67E-07	1.45E-07	3.43E-07	4.87E-07
24	5.14E-08	3	3.34E-07	3.34E-07	2.89E-07	3.43E-07	6.32E-07
		166.1			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			6.4157E-07	3.45E-07	9.86E-07

PM2.5 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Emission factor, E	g/VKT	0.013	0.0026	Lemon
Emission factor, E (annual)	g/VKT	0.0044	0.0014	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	22		22	
Distance Travelled (Lemon Street)	0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle	0.002	g/hr	0.0007	based on annual
Emission Factor/vehicle	0.00000065	g/sec	0.00000331	includes shift trips/day
Emissions /vehicle/AERMOD Source	2.93E-08	g/sec	1.50E-07	

Sonoma North of Lemon		0.525
Split	0.05	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.93E-08	0.24	1.43E-08	2.18E-08	1.89E-08	9.40E-09	2.83E-08
2	2.93E-08	0.32	1.90E-08	1.90E-08	1.65E-08	0.00E+00	1.65E-08
3	2.93E-08	0.49	2.85E-08	2.85E-08	2.48E-08	0.00E+00	2.48E-08
4	2.93E-08	0.57	3.33E-08	3.33E-08	2.89E-08	7.33E-09	3.62E-08
5	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	9.77E-09	4.28E-08
6	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	9.77E-09	4.28E-08
7	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	9.77E-09	4.28E-08
8	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	1.47E-08	4.77E-08
9	2.93E-08	0.65	3.81E-08	5.31E-08	4.61E-08	2.86E-08	7.46E-08
10	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	9.77E-09	4.28E-08
11	2.93E-08	0.75	4.39E-08	4.39E-08	3.81E-08	9.77E-09	4.79E-08
12	2.93E-08	0.65	3.81E-08	3.81E-08	3.30E-08	9.77E-09	4.28E-08
13	2.93E-08	0.57	3.33E-08	3.33E-08	2.89E-08	9.77E-09	3.87E-08
14	2.93E-08	0.24	1.43E-08	1.43E-08	1.24E-08	1.47E-08	2.70E-08
15	2.93E-08	0.34	2.01E-08	2.01E-08	1.75E-08	9.77E-09	2.72E-08
16	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09
17	2.93E-08	0.00	0.00E+00	7.52E-09	6.52E-09	1.92E-08	2.57E-08
18	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09
19	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09

20	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09
21	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09
22	2.93E-08	0.00	0.00E+00	0.00E+00	0.00E+00	9.77E-09	9.77E-09
23	2.93E-08	0.08	4.76E-09	4.76E-09	4.13E-09	9.77E-09	1.39E-08
24	2.93E-08	0.16	9.51E-09	9.51E-09	8.25E-09	9.77E-09	1.80E-08
				g/sec	g/sec		

8.3
including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
1.87E-08	1.04E-08	2.91E-08

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	31		31	
Distance Travelled (Lemon Street)	0.735	km	0.735	
Emission Factor/vehicle	0.003	g/hr	0.001	based on winter
Emission Factor/vehicle	0.0000009	g/sec	0.0000046	includes shift trips/day
Emissions /vehicle/AERMOD Source	2.91E-08	g/sec	1.49E-07	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.91E-08	2	1.11E-07	1.69E-07	1.47E-07	7.28E-08	2.19E-07
2	2.91E-08	3	1.47E-07	1.47E-07	1.28E-07	0.00E+00	1.28E-07
3	2.91E-08	4	2.21E-07	2.21E-07	1.92E-07	0.00E+00	1.92E-07
4	2.91E-08	4	2.58E-07	2.58E-07	2.24E-07	5.68E-08	2.81E-07
5	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	7.57E-08	3.32E-07
6	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	7.57E-08	3.32E-07
7	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	7.57E-08	3.32E-07
8	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	1.14E-07	3.69E-07
9	2.91E-08	5	2.95E-07	4.11E-07	3.57E-07	2.21E-07	5.78E-07
10	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	7.57E-08	3.32E-07
11	2.91E-08	6	3.40E-07	3.40E-07	2.95E-07	7.57E-08	3.71E-07
12	2.91E-08	5	2.95E-07	2.95E-07	2.56E-07	7.57E-08	3.32E-07
13	2.91E-08	4	2.58E-07	2.58E-07	2.24E-07	7.57E-08	3.00E-07
14	2.91E-08	2	1.11E-07	1.11E-07	9.59E-08	1.14E-07	2.10E-07
15	2.91E-08	3	1.56E-07	1.56E-07	1.35E-07	7.57E-08	2.11E-07
16	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
17	2.91E-08	0	0.00E+00	5.83E-08	5.06E-08	1.49E-07	1.99E-07
18	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
19	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
20	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
21	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
22	2.91E-08	0	0.00E+00	0.00E+00	0.00E+00	7.57E-08	7.57E-08
23	2.91E-08	1	3.69E-08	3.69E-08	3.20E-08	7.57E-08	1.08E-07
24	2.91E-08	1	7.37E-08	7.37E-08	6.40E-08	7.57E-08	1.40E-07
				g/hr	g/sec		

64.8
including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate
8.08E-08	2.26E-07

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle	0.011	g/hr	0.002	based on annual
Emission Factor/vehicle	0.00000299	g/sec	0.00000954	includes shift trips/day
Emissions /vehicle/AERMOD Source	5.86E-08	g/sec	1.87E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	5.86E-08	3	3.19E-07	4.24E-07	3.68E-07	1.31E-07	4.99E-07
2	5.86E-08	4	4.26E-07	4.26E-07	3.69E-07	0.00E+00	3.69E-07
3	5.86E-08	5	6.38E-07	6.38E-07	5.54E-07	0.00E+00	5.54E-07
4	5.86E-08	6	7.45E-07	7.45E-07	6.46E-07	1.64E-07	8.10E-07
5	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	2.19E-07	9.57E-07
6	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	2.19E-07	9.57E-07
7	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	2.19E-07	9.57E-07
8	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	3.28E-07	1.07E-06
9	5.86E-08	7	8.51E-07	1.06E-06	9.20E-07	4.80E-07	1.40E-06
10	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	2.19E-07	9.57E-07
11	5.86E-08	8	9.82E-07	9.82E-07	8.52E-07	2.19E-07	1.07E-06
12	5.86E-08	7	8.51E-07	8.51E-07	7.38E-07	2.19E-07	9.57E-07
13	5.86E-08	6	7.45E-07	7.45E-07	6.46E-07	2.19E-07	8.65E-07
14	5.86E-08	3	3.19E-07	3.19E-07	2.77E-07	3.28E-07	6.05E-07
15	5.86E-08	4	4.50E-07	4.50E-07	3.91E-07	2.19E-07	6.09E-07
16	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
17	5.86E-08	0	0.00E+00	1.05E-07	9.09E-08	3.50E-07	4.40E-07
18	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
19	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
20	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
21	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
22	5.86E-08	0	0.00E+00	0.00E+00	0.00E+00	2.19E-07	2.19E-07
23	5.86E-08	1	1.06E-07	1.06E-07	9.23E-08	2.19E-07	3.11E-07
24	5.86E-08	2	2.13E-07	2.13E-07	1.85E-07	2.19E-07	4.03E-07
				g/hr	g/sec		

93.0
including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate
2.20E-07	6.29E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	
Emission Factor/vehicle	0.003	g/hr	0.001	based on annual
Emission Factor/vehicle	0.0000009	g/sec	0.0000044	includes shift trips/day
Emissions /vehicle/AERMOD Source	2.96E-08	g/sec	1.52E-07	

Sonoma South of Magazine		0.698
Split	0.39	km

Milestone 5

	PM10	PM10	PM10	PM10	Annualised Emission Rate PM10	Annualised Emission Rate PM2.5	Cumulative PM2.5

Weekday Hours	Emissions (g/sec)	Vehicles Per Hour	Emissions (g/sec)	Including LDA	Emissions (g/sec)	Including LDA	Including LDA
1	2.96E-08	2	1.12E-07	1.71E-07	1.49E-07	7.40E-08	2.23E-07
2	2.96E-08	3	1.50E-07	1.50E-07	1.30E-07	0.00E+00	1.30E-07
3	2.96E-08	4	2.25E-07	2.25E-07	1.95E-07	0.00E+00	1.95E-07
4	2.96E-08	4	2.62E-07	2.62E-07	2.27E-07	5.77E-08	2.85E-07
5	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	7.69E-08	3.37E-07
6	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	7.69E-08	3.37E-07
7	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	7.69E-08	3.37E-07
8	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	1.15E-07	3.75E-07
9	2.96E-08	5	2.99E-07	4.18E-07	3.62E-07	2.25E-07	5.87E-07
10	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	7.69E-08	3.37E-07
11	2.96E-08	6	3.46E-07	3.46E-07	3.00E-07	7.69E-08	3.77E-07
12	2.96E-08	5	2.99E-07	2.99E-07	2.60E-07	7.69E-08	3.37E-07
13	2.96E-08	4	2.62E-07	2.62E-07	2.27E-07	7.69E-08	3.04E-07
14	2.96E-08	2	1.12E-07	1.12E-07	9.74E-08	1.15E-07	2.13E-07
15	2.96E-08	3	1.58E-07	1.58E-07	1.37E-07	7.69E-08	2.14E-07
16	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
17	2.96E-08	0	0.00E+00	5.92E-08	5.13E-08	1.51E-07	2.02E-07
18	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
19	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
20	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
21	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
22	2.96E-08	0	0.00E+00	0.00E+00	0.00E+00	7.69E-08	7.69E-08
23	2.96E-08	1	3.74E-08	3.74E-08	3.25E-08	7.69E-08	1.09E-07
24	2.96E-08	1	7.48E-08	7.48E-08	6.49E-08	7.69E-08	1.42E-07
				g/s	g/s		

64.8	
including deliveries (2 per day, 10am, 2pm)	

Annualised Emission Rate	Annualised Emission Rate
8.20E-08	2.29E-07

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.467	1.06	1.06	0.387	0.0090	0.0099	19.73
milestone 2	240000		14578	80.467	1.06	1.06	0.387	0.0154	0.0170	33.92
milestone 3	360000		20676	80.467	1.06	1.06	0.387	0.0218	0.0241	48.11
milestone 4	480000		22723	80.467	1.06	1.06	0.387	0.0240	0.0264	52.87
milestone 5	760000		32534	80.467	1.06	1.06	0.387	0.0343	0.0379	75.70
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	39.910	0.104	0.104	0.003	0.000228	0.000252	0.50
milestone 2	240000	24	4992	39.910	0.104	0.104	0.006	0.000522	0.000575	1.15
milestone 3	360000	24	6240	39.910	0.104	0.104	0.006	0.000652	0.000719	1.44
milestone 4	480000	64	16640	39.910	0.104	0.104	0.015	0.001738	0.001916	3.83
milestone 5	760000	64	19968	39.910	0.104	0.104	0.015	0.002086	0.002300	4.60
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	0.390	0.0092	0.0101	20
						milestone 2	0.392	0.0159	0.0175	35
						milestone 3	0.392	0.0225	0.0248	50
						milestone 4	0.401	0.0257	0.0284	57
						milestone 5	0.401	0.0364	0.0402	80

0.06174	0.02646	0.036	0.009
PMBW			PMTW

PM10 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor PM_{10}

EMFAC2011 Emission Rates									*0.6214*
Region Type:	GAI								*mile to km*
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr		PM10_TW	PM10_BW	Combined
						(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0360	0.0617	0.0977

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM10 (g/hr-veh)	
2020	HHDT	D	SV	A		
						annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
			g/mile		
T7 Single	g/vkt	0.0607	0.0977	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0562	0.0904	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor PM_{10}

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed		PM10_TW	PM10_BW	PM10_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20		0.0080	0.0368	0.0448
2020	Annual	LDA	DSL	Aggregated	20		0.0080	0.0368	0.0448
Idling Calculation									
2020	Annual	LDA	GAS	Aggregated					
						(gms/mile)	gms/km		
Speed	5	miles/hr	GAS	Aggregated	Aggregated		0.0000		
	8.046	km/hr	DSL	Aggregated	Aggregated		0.0000		

		PM10	g/mile		
Gas LDA (ann)	g/vkt	0.02781	0.0448	EMFAC2011	
DSL LDA (ann)	g/vkt	0.02781	0.0448	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.02572	0.0414	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.02572	0.0414	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0257	0.0414	sum	Based on 0.38% Diesel

0.00E+00

AERMOD Model Inputs

Paved road modelled as a series of volume sources

Lemon St West Of Sonoma		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.040	g/hr	0.0185	based on annual
Emission Factor/vehicle		0.0000112	g/sec	0.0000823	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.20E-07	g/sec	1.61E-06	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	Annualised Emission Rate PM10 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.20E-07	5	2.14E-06	3.76E-06	3.26E-06	8.00E-07	4.06E-06
2	2.20E-07	6	2.86E-06	2.86E-06	2.48E-06	0.00E+00	2.48E-06
3	2.20E-07	10	4.29E-06	4.29E-06	3.72E-06	0.00E+00	3.72E-06
4	2.20E-07	11	5.00E-06	5.00E-06	4.34E-06	3.99E-07	4.74E-06
5	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	5.33E-07	5.49E-06
6	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	5.33E-07	5.49E-06
7	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	5.33E-07	5.49E-06
8	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	7.99E-07	5.76E-06
9	2.20E-07	13	5.72E-06	8.94E-06	7.76E-06	2.13E-06	9.89E-06
10	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	5.33E-07	5.49E-06
11	2.20E-07	15	6.60E-06	6.60E-06	5.72E-06	5.33E-07	6.26E-06
12	2.20E-07	13	5.72E-06	5.72E-06	4.96E-06	5.33E-07	5.49E-06
13	2.20E-07	11	5.00E-06	5.00E-06	4.34E-06	5.33E-07	4.87E-06
14	2.20E-07	5	2.14E-06	2.14E-06	1.86E-06	7.99E-07	2.66E-06
15	2.20E-07	7	3.02E-06	3.02E-06	2.62E-06	5.33E-07	3.16E-06
16	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
17	2.20E-07	0	0.00E+00	1.61E-06	1.40E-06	1.33E-06	2.73E-06
18	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
19	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
20	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
21	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
22	2.20E-07	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
23	2.20E-07	2	7.14E-07	7.14E-07	6.20E-07	5.33E-07	1.15E-06
24	2.20E-07	3	1.43E-06	1.43E-06	1.24E-06	5.33E-07	1.77E-06

166.1

including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
2.88E-06	6.16E-07	3.50E-06

PM10 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Emission factor, E	g/VKT	0.056	0.0257	Lemon
Emission factor, E (annual)	g/VKT	0.0562	0.0257	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.029	g/hr	0.0135	based on annual
Emission Factor/vehicle		0.00000819	g/sec	0.00006002	includes shift trips/day
Emissions /vehicle/AERMOD Source		3.72E-07	g/sec	2.73E-06	

Sonoma North of Lemon		0.525
Split	0.05	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	3.72E-07	0.24	1.81E-07	3.18E-07	2.75E-07	6.76E-08	3.43E-07
2	3.72E-07	0.32	2.42E-07	2.42E-07	2.10E-07	0.00E+00	2.10E-07
3	3.72E-07	0.49	3.62E-07	3.62E-07	3.14E-07	0.00E+00	3.14E-07
4	3.72E-07	0.57	4.23E-07	4.23E-07	3.67E-07	3.38E-08	4.00E-07
5	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	4.50E-08	4.64E-07
6	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	4.50E-08	4.64E-07
7	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	4.50E-08	4.64E-07
8	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	6.75E-08	4.87E-07
9	3.72E-07	0.65	4.83E-07	7.56E-07	6.56E-07	1.80E-07	8.36E-07
10	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	4.50E-08	4.64E-07

11	3.72E-07	0.75	5.58E-07	5.58E-07	4.84E-07	4.50E-08	5.29E-07
12	3.72E-07	0.65	4.83E-07	4.83E-07	4.19E-07	4.50E-08	4.64E-07
13	3.72E-07	0.57	4.23E-07	4.23E-07	3.67E-07	4.50E-08	4.12E-07
14	3.72E-07	0.24	1.81E-07	1.81E-07	1.57E-07	6.75E-08	2.25E-07
15	3.72E-07	0.34	2.56E-07	2.56E-07	2.22E-07	4.50E-08	2.67E-07
16	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
17	3.72E-07	0.00	0.00E+00	1.36E-07	1.18E-07	1.13E-07	2.31E-07
18	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
19	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
20	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
21	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
22	3.72E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
23	3.72E-07	0.08	6.04E-08	6.04E-08	5.24E-08	4.50E-08	9.74E-08
24	3.72E-07	0.16	1.21E-07	1.21E-07	1.05E-07	4.50E-08	1.50E-07
				g/sec	g/sec		
		8.3			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			2.43E-07	5.21E-08	2.95E-07

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	
Emission Factor/vehicle		0.041	g/hr	0.019	based on winter
Emission Factor/vehicle		0.0000115	g/sec	0.0000840	includes shift trips/day
Emissions /vehicle/AERMOD Source		3.70E-07	g/sec	2.71E-06	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	3.70E-07	2	1.40E-06	2.46E-06	2.13E-06	5.24E-07	2.66E-06
2	3.70E-07	3	1.87E-06	1.87E-06	1.62E-06	0.00E+00	1.62E-06
3	3.70E-07	4	2.81E-06	2.81E-06	2.44E-06	0.00E+00	2.44E-06
4	3.70E-07	4	3.28E-06	3.28E-06	2.84E-06	2.62E-07	3.10E-06
5	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	3.49E-07	3.60E-06
6	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	3.49E-07	3.60E-06
7	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	3.49E-07	3.60E-06
8	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	5.23E-07	3.77E-06
9	3.70E-07	5	3.74E-06	5.86E-06	5.08E-06	1.40E-06	6.48E-06
10	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	3.49E-07	3.60E-06
11	3.70E-07	6	4.32E-06	4.32E-06	3.75E-06	3.49E-07	4.10E-06
12	3.70E-07	5	3.74E-06	3.74E-06	3.25E-06	3.49E-07	3.60E-06
13	3.70E-07	4	3.28E-06	3.28E-06	2.84E-06	3.49E-07	3.19E-06
14	3.70E-07	2	1.40E-06	1.40E-06	1.22E-06	5.23E-07	1.74E-06
15	3.70E-07	3	1.98E-06	1.98E-06	1.72E-06	3.49E-07	2.07E-06
16	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
17	3.70E-07	0	0.00E+00	1.06E-06	9.17E-07	8.73E-07	1.79E-06
18	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
19	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
20	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
21	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
22	3.70E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
23	3.70E-07	1	4.68E-07	4.68E-07	4.06E-07	3.49E-07	7.55E-07
24	3.70E-07	1	9.36E-07	9.36E-07	8.12E-07	3.49E-07	1.16E-06
				g/hr	g/sec		
		64.8				Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)				4.03E-07	2.29E-06

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		16	m	16	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.046	g/hr	0.021	based on annual
Emission Factor/vehicle		0.00001280	g/sec	0.00009374	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.51E-07	g/sec	1.84E-06	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	2.51E-07	3	1.37E-06	2.40E-06	2.08E-06	5.10E-07	2.59E-06
2	2.51E-07	4	1.82E-06	1.82E-06	1.58E-06	0.00E+00	1.58E-06
3	2.51E-07	5	2.73E-06	2.73E-06	2.37E-06	0.00E+00	2.37E-06
4	2.51E-07	6	3.19E-06	3.19E-06	2.77E-06	2.55E-07	3.02E-06
5	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	3.40E-07	3.50E-06
6	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	3.40E-07	3.50E-06
7	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	3.40E-07	3.50E-06
8	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	5.09E-07	3.67E-06
9	2.51E-07	7	3.65E-06	5.70E-06	4.95E-06	1.36E-06	6.31E-06
10	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	3.40E-07	3.50E-06
11	2.51E-07	8	4.21E-06	4.21E-06	3.65E-06	3.40E-07	3.99E-06
12	2.51E-07	7	3.65E-06	3.65E-06	3.16E-06	3.40E-07	3.50E-06
13	2.51E-07	6	3.19E-06	3.19E-06	2.77E-06	3.40E-07	3.11E-06
14	2.51E-07	3	1.37E-06	1.37E-06	1.19E-06	5.09E-07	1.70E-06
15	2.51E-07	4	1.93E-06	1.93E-06	1.67E-06	3.40E-07	2.01E-06
16	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
17	2.51E-07	0	0.00E+00	1.03E-06	8.93E-07	8.50E-07	1.74E-06
18	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
19	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
20	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
21	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
22	2.51E-07	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
23	2.51E-07	1	4.56E-07	4.56E-07	3.95E-07	3.40E-07	7.35E-07
24	2.51E-07	2	9.11E-07	9.11E-07	7.91E-07	3.40E-07	1.13E-06
				g/hr	g/sec		
		93.0				Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)				3.93E-07	2.23E-06

Sonoma South of Magazine

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	
Emission Factor/vehicle		0.039	g/hr	0.018	based on annual
Emission Factor/vehicle		0.0000109	g/sec	0.0000798	includes shift trips/day
Emissions /vehicle/AERMOD Source		3.76E-07	g/sec	2.75E-06	

Sonoma South of Magazine				0.698
Split	0.39			km

Milestone 5

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	Annualised Emission Rate PM10 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	3.76E-07	2	1.43E-06	2.50E-06	2.17E-06	5.32E-07	2.70E-06
2	3.76E-07	3	1.90E-06	1.90E-06	1.65E-06	0.00E+00	1.65E-06
3	3.76E-07	4	2.85E-06	2.85E-06	2.47E-06	0.00E+00	2.47E-06
4	3.76E-07	4	3.33E-06	3.33E-06	2.88E-06	2.66E-07	3.15E-06
5	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	3.54E-07	3.65E-06
6	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	3.54E-07	3.65E-06
7	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	3.54E-07	3.65E-06
8	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	5.31E-07	3.83E-06
9	3.76E-07	5	3.80E-06	5.95E-06	5.16E-06	1.42E-06	6.58E-06
10	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	3.54E-07	3.65E-06
11	3.76E-07	6	4.39E-06	4.39E-06	3.81E-06	3.54E-07	4.16E-06
12	3.76E-07	5	3.80E-06	3.80E-06	3.30E-06	3.54E-07	3.65E-06
13	3.76E-07	4	3.33E-06	3.33E-06	2.88E-06	3.54E-07	3.24E-06
14	3.76E-07	2	1.43E-06	1.43E-06	1.24E-06	5.31E-07	1.77E-06
15	3.76E-07	3	2.01E-06	2.01E-06	1.74E-06	3.54E-07	2.10E-06
16	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
17	3.76E-07	0	0.00E+00	1.07E-06	9.31E-07	8.86E-07	1.82E-06
18	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
19	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
20	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
21	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
22	3.76E-07	0	0.00E+00	0.00E+00	0.00E+00	3.54E-07	3.54E-07
23	3.76E-07	1	4.75E-07	4.75E-07	4.12E-07	3.54E-07	7.66E-07
24	3.76E-07	1	9.50E-07	9.50E-07	8.24E-07	3.54E-07	1.18E-06
				g/s	g/s		

64.8	
including deliveries (2 per day, 10am, 2pm)	

Annualised Emission Rate	Annualised Emission Rate
4.10E-07	2.32E-06

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.467	4.52	4.52	1.656	0.0383	0.0423	84.53
milestone 2	240000		14578	80.467	4.52	4.52	1.656	0.0659	0.0726	145.29
milestone 3	360000		20676	80.467	4.52	4.52	1.656	0.0935	0.1030	206.06
milestone 4	480000		22723	80.467	4.52	4.52	1.656	0.1027	0.1132	226.47
milestone 5	760000		32534	80.467	4.52	4.52	1.656	0.1471	0.1621	324.25
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	39.910	1.027	1.027	0.032	0.002242	0.002471	4.94
milestone 2	240000	24	4992	39.910	1.027	1.027	0.054	0.005125	0.005649	11.30
milestone 3	360000	24	6240	39.910	1.027	1.027	0.054	0.006406	0.007061	14.12
milestone 4	480000	64	16640	39.910	1.027	1.027	0.145	0.017082	0.018830	37.66
milestone 5	760000	64	19968	39.910	1.027	1.027	0.145	0.020499	0.022596	45.19
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	1.688	0.0406	0.0447	89
						milestone 2	1.710	0.0710	0.0783	157
						milestone 3	1.710	0.0999	0.1101	220
						milestone 4	1.801	0.1198	0.1321	264
						milestone 5	1.801	0.1676	0.1847	369

PM10 Public Paved Road (Exhaust Emissions)

HHDT Emission Factor $PM_{2.5}$

EMFAC2011 Emission Rates							*0.6214*
Region Type:	GAI						*mile to km*
Region:	Solano (SV)						
Calendar Year:	2020						
Season:	Annual						
Speed:	40	miles/hr					
Vehicle Classification:	EMFAC2011 Categories					Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run	Combined
						(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.00764	0.0076

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM2.5 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.004	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0047	0.0076	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0005	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0044	0.0071	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor $PM_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2.5_RUNEX	PM2.5_TW	PM2.5_BW	PM2.5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40	0.00146				0.00146
2020	Annual	LDA	DSL	Aggregated	40	0.0107				0.01067
Idling Calculation										
2020	Annual	LDA	GAS	Aggregated		PM2.5_RUNEX				
						(gms/mile)	gms/km			
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0119	0.0074			
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269			

		PM2.5	g/mile		
Gas LDA (ann)	g/vkt	0.00091	0.00146	EMFAC2011	
DSL LDA (ann)	g/vkt	0.00663	0.01067	EMFAC2011	
Idling Gas LDA	g/vkt	0.00740	0.01191	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02692	0.04332	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00139	0.00224	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00815	0.01312	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0014	0.0023	sum	Based on 0.38% Diesel

Summary of 2020 LDA Emission Factors (g/miles) for 10 mph ,20 mph and 40 mph (aggregated MY)

	Runnig Emission Factors (g/mile)			
Pollutans	5 mph	10mph	20 mph	40 mph
NOx	0.10181	0.08806	0.06946	0.05308
ROG	0.07786	0.04950	0.02346	0.00985
CO	1.16760	1.05027	0.86529	0.62065
PM	0.01332	0.00841	0.00394	0.00163
PM10	0.01191	0.00752	0.00352	0.00146
PM2_5				
SOx	0.00883	0.00655	0.00403	0.00239
CO2	882.84970	654.83655	402.80093	238.16411
CH4	0.03138	0.01995	0.00945	0.00396
PM10 BW	0.03675	0.03675	0.03675	0.03675
PM10 TW	0.00800	0.00000	0.00000	0.00000
PM2.5 BW	0.00000	0.00000	0.00000	0.00000
PM10 TW	0.00800	0.00000	0.00000	0.00000

calendar_year	2020
season_month	Annual
vehicle_class	LDA
fuel	Gas
sub_area	Solano (SV)
process	RUNEX

Sum of emission_rate	**Column Labels**			
Row Labels	**5**	**10**	**20**	**40**
NOx	0.101812039	0.088060685	0.069463244	0.05308003
ROG	0.077859983	0.049503125	0.023455664	0.009847318
CO	1.167597529	1.050269177	0.865288583	0.620652221
PM	0.013318119	0.008411241	0.003936999	0.001629658
PM10	0.011907028	0.007520087	0.003519919	0.001457041
PM2_5	0.010948386	0.00691466	0.003236556	0.001339759
SOx	0.008831535	0.006553156	0.004034096	0.002386778
CO2	882.8497006	654.8365536	402.8009326	238.1641053
CH4	0.031381726	0.019947631	0.009447155	0.003962809

calendar_year	2020
season_month	Annual
vehicle_class	(All)
fuel	Gas
sub_area	Solano (SV)
speed_time	(blank)

Sum of emission_rate	**Column Labels**	
Row Labels	**PMBW**	**PMTW**
PM	0.0375	0.008
PM10	0.03675	0.008
PM2_5	0.01575	0.002

calendar_year	2020
season_month	Annual
vehicle_class	(All)
fuel	Gas
sub_area	Solano (SV)

Sum of emission_rate	**Column Labels**			
	STREX			
Row Labels	**5**	**10**	**20**	**40**
NOx	0.075502111	0.081335058	0.091793963	0.107883826
ROG	0.008779447	0.017117517	0.03290625	0.060934083
CO	0.117991045	0.231454874	0.448872205	0.845665554
PM	0.000245274	0.000478643	0.000928126	0.001758076
PM10	0.000219357	0.000428033	0.000829955	0.001572077
PM2_5	0.000201731	0.000393623	0.000763217	0.001445645
SOx	0.000108622	0.000124433	0.000160185	0.000248215
CO2	10.67050358	12.04885164	15.23744829	23.34224368
CH4	0.000650935	0.001269165	0.002439828	0.004517972

Fugitive Release From Process Bagfilters

Bag Filters		Process	BagFilter	Flue Diameter	Surface Area (m2)	Maximum PM10 Concentration (mg/Nm3)	Maximum PM2.5 Concentration (mg/Nm3)	Act Exit Velocity (m/s)	Norm Exit Velocity (m/s)
513-	BF1	Clinker unloading trucks line	Bag filter on top of clinker hopper	0.3	0.0707	2.5	2.25	15.7	15.7
521-	BF1	Secondary input line product	Bag filter on 521-FB1	0.3	0.0707	2.5	2.25	15.7	15.7
521-	BF2	Secondary input line product	Bag filter output 521-BE1	0.3	0.0707	2.5	2.25	15.7	15.7
Silo1	**FN1**	Finished product line to storage	Fan on bag filter top of silo 1	0.30	0.0707	2.5	2.25	11.4	9.0
Silo2	**FN2**	Finished product line to storage	Fan on bag filter top of silo 2	0.30	0.0707	2.5	2.25	2.4	1.9
Silo3	**FN3**	Finished product line to storage	Fan on bag filter top of silo 3	0.30	0.0707	2.5	2.25	2.4	1.9
Truck1	**BF1**	Trucks loading n°1	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
Truck2	**BF1**	Trucks loading n°2	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
Truck3	**BF3**	Trucks loading n°3	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
						3.1	1.26		

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 3% O2, Dry	11,784	1.04	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**30**	ppm at 3% O2	0.299	ratio
NOX Emission Level	30.0	ppm at 3% O2		

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2) (73 PPM)	56.58	2.00	3.142	381.05	1.33	1.04	11784	0.67	667	0.185	1.4698	35.28
SO2	2.78	2.00	3.142	381.05	1.33	1.04	11784	0	33	0.009	0.0721	1.73
CO	175.84	2.00	3.142	381.05	1.33	1.04	11784	2.07	2072	0.576	4.5679	109.63
PM10	**2.50**	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	**0.0082**	0.0649	1.56
PM2.5	**2.50**	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	**0.0082**	0.0649	1.56
TOC	23.03	2.00	3.142	381.05	1.33	1.04	11784	0.27	271	0.075	0.5982	14.36

Actual	(mg/Nm3)	Diameter (m)	(m2)	(K)	(m/s)	(m/s)	(m3/hr)	Rate (kg/hr)	g/hr	g/s	g/kWh
NOX (as NO2)	16.92	2.00	3.142	381.05	7.57	7.41	83821	1.42	1418	0.394	0.0760
SO2	0.83	2.00	3.142	381.05	7.57	7.41	83821	0	70	0.019	0.0020
CO	52.58	2.00	3.142	381.05	7.57	7.41	83821	4.41	4408	1.224	0.1253
PM	0.75	2.00	3.142	381.05	7.57	7.41	83821	0.06	63	0.017	0.0113
TOC	6.89	2.00	3.142	381.05	7.57	7.41	83821	0.58	577	0.160	0.0164

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	PM (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.86**				

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

PM2.5
Annual Average

Shipping (48 Movements)	Emission Rates	Units	Sources	Contributors	Permit (Fugitive Only)
Transit (greater than 3km from port)	7.16E-06	g/s/source	65	Orcem & VMT Cumulative	
Transit (within 3km of port)	3.84E-06	g/s/source	34	Orcem & VMT Cumulative	
Maneuvering	1.87E-05	g/s/source	26	Orcem & VMT Cumulative	
Hoteling (Aux Eng)	0.00359	g/s/source	2	Orcem & VMT Cumulative	
Hoteling (Boiler)	0.00144	g/s/source	2	Orcem & VMT Cumulative	
Tugs (Ship Assist)	9.88E-06	g/s/source	26	Orcem & VMT Cumulative	
Barge (No barge for Phase 1 alternative)	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Barge	0.00E+00	g/s/source	126	VMT Only	
Diesel Hoppers	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Diesel Hopper 1	2.53E-05	g/s	1	Orcem Only	
Diesel Hopper 2	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 1	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 2	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 3	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 4	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 5	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 6	2.53E-05	g/s	1	Orcem Only	
Diesel Conveyor 7	2.53E-05	g/s	1	Orcem Only	
Drop Points (Orcem Hoppers / Conveyors) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
ship upload 1	9.82E-05	g/s	1	Orcem Only	Yes
ship upload 2	9.82E-05	g/s	1	Orcem Only	Yes
mobile hopper 1	9.82E-05	g/s	1	Orcem Only	Yes
mobile hopper 2	9.82E-05	g/s	1	Orcem Only	Yes
conveyor1	1.96E-04	g/s	1	Orcem Only	Yes
intake hopper	1.96E-04	g/s	1	Orcem Only	Yes
front loading upload 1	9.82E-05	g/s	1	Orcem Only	Yes
front loading upload 2	9.82E-05	g/s	1	Orcem Only	Yes
excavator upload & drop1	1.96E-04	g/s	1	Orcem Only	Yes
excavator upload & drop2	1.96E-04	g/s	1	Orcem Only	Yes
millfeed	2.02E-04	g/s	1	Orcem Only	Yes
elevator drop	2.02E-04	g/s	1	Orcem Only	Yes
main silo	1.96E-04	g/s	1	Orcem Only	Yes
gypsum silo	5.89E-06	g/s	1	Orcem Only	Yes
main silo conveyor	1.96E-04	g/s	1	Orcem Only	Yes
gypsum silo conveyor	5.89E-06	g/s	1	Orcem Only	Yes
mill intake	2.02E-04	g/s	1	Orcem Only	Yes
conveyor drop 1	9.81E-05	g/s	1	Orcem Only	Yes
conveyor drop 2	9.81E-05	g/s	1	Orcem Only	Yes
gypsum handling (drop & upload)	1.18E-05	g/s	1	Orcem Only	Yes
Drop Points (VMT Hoppers / Conveyors) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
mobile hopper 1		g/s	1	VMT Only	?
mobile hopper 2		g/s	1	VMT Only	?
mobile hopper 3		g/s	1	VMT Only	?
mobile hopper 4		g/s	1	VMT Only	?
mobile hopper 5		g/s	1	VMT Only	?
mobile hopper 6		g/s	1	VMT Only	?
mobile hopper 7		g/s	1	VMT Only	?
FL1 Truck Drop1		g/s	1	VMT Only	?
FL1 Truck Uploading		g/s	1	VMT Only	?
FL Rail Upload		g/s	1	VMT Only	?
FL Rail Drop		g/s	1	VMT Only	?
Rail Unloading		g/s	1	VMT Only	?
Raw Material Storage Areas (Orcem) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Slag Heap South	1.18E-08	g/s/m2	1	Orcem Only	Yes
Slag Heap North	2.94E-09	g/s/m2	1	Orcem Only	Yes
Slag Heap 3 - Gypsum	2.94E-09	g/s/m2	1	Orcem Only	Yes
Conveyor Drops (Orcem) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Conveyor Drop 1	4.27E-07	g/s/m2	1	Orcem Only	Yes
Conveyor Drop 2	1.09E-06	g/s/m2	1	Orcem Only	Yes
Raw Material Storage Areas (VMT) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Stockpile Phase 1		g/s/m2	1	VMT Only	?
Excavators / Front Loaders (Orcem) Exhaust	**Emission Rates**	**Units**	**Sources**	**Contributors**	
S1 Front Loader & Excavator Combined	9.13E-06	g/s/source	28	Orcem Only	
S2 Front Loader & Excavator Combined	9.13E-06	g/s/source	28	Orcem Only	
S3 Front Loader & Excavator Combined	9.13E-06	g/s/source	28	Orcem Only	
Excavators / Front Loaders (Orcem) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
S1 Front Loader & Excavator Combined	7.50E-05	g/s/source	28	Orcem Only	No
S2 Front Loader & Excavator Combined	7.19E-05	g/s/source	28	Orcem Only	No
S3 Front Loader & Excavator Combined	1.87E-05	g/s/source	28	Orcem Only	No
Front Loaders (VMT) Exhaust	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Front Loader		g/s/source	1	VMT Only	
Front Loaders (VMT) Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Front Loader		g/s/source	1	VMT Only	No
Forklift Exhaust	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Forklift		g/s	1	VMT Only	
Forklift Fugitive	**Emission Rates**	**Units**	**Sources**	**Contributors**	
Forklift		g/s	1	VMT Only	No
Industrial Paved (Onsite Trucks) (Year 2020)	**Emission Rates**	**Units**	**Sources**	**Contributors**	
PM2.5 Onsite Paved Road (Exhaust Emissions)	4.79E-07	g/s/source	61	Orcem & VMT Cumulative	
PM2.5 Onsite Paved Road (Exhaust Emissions)	3.04E-07	g/s/source	22	Orcem Only	
PM2.5 Onsite Paved Road (Exhaust Emissions)	1.67E-07	g/s/source	19	VMT Only	
Industrial Paved (Onsite Trucks) (Year 2020)	**Emission Rates**	**Units**	**Sources**	**Contributors**	
PM2.5 Onsite Paved Road (Fugitive Emissions)		g/s/source	61	Orcem & VMT Cumulative	No
PM2.5 Onsite Paved Road (Fugitive Emissions)		g/s/source	22	Orcem Only	No
PM2.5 Onsite Paved Road (Fugitive Emissions)		g/s/source	19	VMT Only	No

Public Paved Rd (Offsite Trucks) (Exhaust)	Emission Rates	Units	Sources	Contributors	
Lemon St West Of Sonoma	9.86E-07	g/s/source	51	Orcem & VMT Cumulative	
Sonoma North of Lemon	2.91E-08	g/s/source	22	Orcem & VMT Cumulative	
Sonoma South of Lemon	2.26E-07	g/s/source	31	Orcem & VMT Cumulative	
Lemon St East Of Sonoma	6.29E-07	g/s/source	51	Orcem & VMT Cumulative	
Sonoma South of Magazine	2.29E-07	g/s/source	29	Orcem & VMT Cumulative	

Public Paved Rd (Offsite Trucks) (Fugitive)	Emission Rates	Units	Sources	Contributors	
Lemon St West Of Sonoma		g/s/source	51	Orcem & VMT Cumulative	No
Sonoma North of Lemon		g/s/source	22	Orcem & VMT Cumulative	No
Sonoma South of Lemon		g/s/source	31	Orcem & VMT Cumulative	No
Lemon St East Of Sonoma		g/s/source	51	Orcem & VMT Cumulative	No
Sonoma South of Magazine		g/s/source	29	Orcem & VMT Cumulative	No

Main Stack	Emission Rates	Units	Sources	Contributors	
Main Stack	0.00710	g/s	1	Orcem Only	

Bag Filters (Fugitive)	Emission Rates	Units	Sources	Contributors	
Silo1	1.39E-03	g/s	1	Orcem Only	Yes
Silo2	2.98E-04	g/s	1	Orcem Only	Yes
Silo3	2.98E-04	g/s	1	Orcem Only	Yes
Truck1	1.08E-03	g/s	1	Orcem Only	Yes
Truck2	1.08E-03	g/s	1	Orcem Only	Yes
Truck3	1.08E-03	g/s	1	Orcem Only	Yes

Railways (Milestone 5 & Phase 1 Alternative)	Emission Rates	Units	Sources	Contributors	
Switching (average)	2.07E-06	g/s/source	75	Orcem & VMT Cumulative	
Line Haul idling	5.64E-07	g/s/source	3	Orcem & VMT Cumulative	
Line Haul (10 kph)	8.95E-08	g/s/source	41	Orcem & VMT Cumulative	
Line Haul (15 kph)	2.98E-07	g/s/source	24	Orcem & VMT Cumulative	

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

Project PM2.5
Annual Average

Point Sources

Source	Description	Emission Rate	Units	
RAIL_ID	Rail Idling	5.64E-07	g/s	
RAILID2	Rail Idling	5.64E-07	g/s	
RAILID3	Rail Idling	5.64E-07	g/s	
SHPHTAX1	ship auxiliary engine1	3.59E-03	g/s	
SHPHBR1	Auxiliary Boiler 1	1.44E-03	g/s	
SHPHTAX2	ship auxiliary engine 2	3.59E-03	g/s	
SHPHBR2	Auxiliary Boiler 2	1.44E-03	g/s	
STACK	MAIN STACK	7.10E-03	g/s	
MOB_HOP1	mobile hopper 1	2.53E-05	g/s	
MOB_HOP2	mobile hopper 2	2.53E-05	g/s	
CONVY4	conveyor	2.53E-05	g/s	
CONVY3	Mobile Conveyor Drop	2.53E-05	g/s	
CONVY1	conveyor	2.53E-05	g/s	
CONVY6	conveyor	2.53E-05	g/s	
CONVY5	conveyor	2.53E-05	g/s	
CONVY7	conveyor	2.53E-05	g/s	
CONVY2	conveyor	2.53E-05	g/s	
SILO1	Silo1	1.39E-03	g/s	new
SILO2	Silo2	2.98E-04	g/s	new
SILO3	Silo3	2.98E-04	g/s	new
LOAD1	Truck loading1	1.08E-03	g/s	new
LOAD2	Truck loading2	1.08E-03	g/s	new
LOAD3	Truck loading3	1.08E-03	g/s	new

Area Sources

Source	Description	Emission Rate	Units	
RMSP_S	Raw material storage south	1.18E-08	g/s/m2	new
RWSP_N	Raw material storage north	2.94E-09	g/s/m2	new
RMSA_GYP	Gypsum RMSA	2.94E-09	g/s/m2	new
STOCK1	VMT Stockpile1	0.00E+00	g/s/m2	new

Line Sources

Source	Description	Emission Rate	Units	
RMSPD2	RMSP 2 Conveyor drop	1.09E-06	g/s/m2	new
RMSPD1	RMSP 1 Conveyor Drop	4.27E-07	g/s/m2	new

Volume Sources

Source	Description	Emission Rate	Units
ONFUG1	Onsite Exh	4.297E-07	g/s
ONFUG2	Onsite Exh	4.297E-07	g/s
ONFUG3	Onsite Exh	4.297E-07	g/s
ONFUG4	Onsite Exh	4.297E-07	g/s
ONFUG5	Onsite Exh	4.297E-07	g/s
ONFUG6	Onsite Exh	4.297E-07	g/s
ONFUG7	Onsite Exh	4.297E-07	g/s
ONFUG8	Onsite Exh	4.297E-07	g/s
ONFUG9	Onsite Exh	4.297E-07	g/s
ONFUG10	Onsite Exh	4.297E-07	g/s
ONFUG11	Onsite Exh	4.297E-07	g/s
ONFUG12	Onsite Exh	4.297E-07	g/s
ONFUG13	Onsite Exh	4.297E-07	g/s
ONFUG14	Onsite Exh	4.297E-07	g/s
ONFUG15	Onsite Exh	4.297E-07	g/s
ONFUG16	Onsite Exh	4.297E-07	g/s
ONFUG17	Onsite Exh	4.297E-07	g/s
ONFUG18	Onsite Exh	4.297E-07	g/s
ONFUG19	Onsite Exh	4.297E-07	g/s
ONFUG20	Onsite Exh	4.297E-07	g/s
ONFUG21	Onsite Exh	4.297E-07	g/s
ONFUG22	Onsite Exh	4.297E-07	g/s
ONFUG23	Onsite Exh	4.297E-07	g/s
ONFUG24	Onsite Exh	4.297E-07	g/s
ONFUG25	Onsite Exh	4.297E-07	g/s
ONFUG26	Onsite Exh	4.297E-07	g/s
ONFUG27	Onsite Exh	4.297E-07	g/s
ONFUG28	Onsite Exh	4.297E-07	g/s
ONFUG29	Onsite Exh	4.297E-07	g/s
ONFUG30	Onsite Exh	4.297E-07	g/s

ONFUG31	Onsite Exh	4.297E-07	g/s
ONFUG32	Onsite Exh	4.297E-07	g/s
ONFUG33	Onsite Exh	4.297E-07	g/s
ONFUG34	Onsite Exh	4.297E-07	g/s
ONFUG35	Onsite Exh	4.297E-07	g/s
ONFUG36	Onsite Exh	4.297E-07	g/s
ONFUG37	Onsite Exh	4.297E-07	g/s
ONFUG38	Onsite Exh	4.297E-07	g/s
ONFUG39	Onsite Exh	4.297E-07	g/s
ONFUG40	Onsite Exh	4.297E-07	g/s
ONFUG41	Onsite Exh	4.297E-07	g/s
ORFUG42	Orcem Only Exh	2.631E-07	g/s
ORFUG43	Orcem Only Exh	2.631E-07	g/s
ORFUG44	Orcem Only Exh	2.631E-07	g/s
ORFUG45	Orcem Only Exh	2.631E-07	g/s
ORFUG46	Orcem Only Exh	2.631E-07	g/s
ORFUG47	Orcem Only Exh	2.631E-07	g/s
ORFUG48	Orcem Only Exh	2.631E-07	g/s
ORFUG49	Orcem Only Exh	2.631E-07	g/s
ORFUG50	Orcem Only Exh	2.631E-07	g/s
ORFUG51	Orcem Only Exh	2.631E-07	g/s
ORFUG52	Orcem Only Exh	2.631E-07	g/s
ORFUG53	Orcem Only Exh	2.631E-07	g/s
ORFUG54	Orcem Only Exh	2.631E-07	g/s
ORFUG55	Orcem Only Exh	2.631E-07	g/s
ORFUG56	Orcem Only Exh	2.631E-07	g/s
ORFUG57	Orcem Only Exh	2.631E-07	g/s
ORFUG58	Orcem Only Exh	2.631E-07	g/s
ORFUG59	Orcem Only Exh	2.631E-07	g/s
ORFUG60	Orcem Only Exh	2.631E-07	g/s
ORFUG61	Orcem Only Exh	2.631E-07	g/s
ORFUG62	Orcem Only Exh	2.631E-07	g/s
ORFUG63	Orcem Only Exh	2.631E-07	g/s
ONFUG64	Onsite Exh	4.297E-07	g/s
ONFUG65	Onsite Exh	4.297E-07	g/s
ONFUG66	Onsite Exh	4.297E-07	g/s
ONFUG67	Onsite Exh	4.297E-07	g/s
ONFUG68	Onsite Exh	4.297E-07	g/s
ONFUG69	Onsite Exh	4.297E-07	g/s
ONFUG70	Onsite Exh	4.297E-07	g/s
ONFUG71	Onsite Exh	4.297E-07	g/s
ONFUG72	Onsite Exh	4.297E-07	g/s
ONFUG73	Onsite Exh	4.297E-07	g/s
ONFUG74	Onsite Exh	4.297E-07	g/s
ONFUG75	Onsite Exh	4.297E-07	g/s
ONFUG76	Onsite Exh	4.297E-07	g/s
ONFUG77	Onsite Exh	4.297E-07	g/s
ONFUG78	Onsite Exh	4.297E-07	g/s
ONFUG79	Onsite Exh	4.297E-07	g/s
ONFUG80	Onsite Exh	4.297E-07	g/s
ONFUG81	Onsite Exh	4.297E-07	g/s
ONFUG82	Onsite Exh	4.297E-07	g/s
ONFUG83	Onsite Exh	4.297E-07	g/s
LMFUG1	Lemon St Exh	9.863E-07	g/s
LMFUG2	Lemon St Exh	9.863E-07	g/s
LMFUG3	Lemon St Exh	9.863E-07	g/s
LMFUG4	Lemon St Exh	9.863E-07	g/s
LMFUG5	Lemon St Exh	9.863E-07	g/s
LMFUG6	Lemon St Exh	9.863E-07	g/s
LMFUG7	Lemon St Exh	9.863E-07	g/s
LMFUG8	Lemon St Exh	9.863E-07	g/s
LMFUG9	Lemon St Exh	9.863E-07	g/s
LMFUG10	Lemon St Exh	9.863E-07	g/s
LMFUG11	Lemon St Exh	9.863E-07	g/s
LMFUG12	Lemon St Exh	9.863E-07	g/s
LMFUG13	Lemon St Exh	9.863E-07	g/s
LMFUG14	Lemon St Exh	9.863E-07	g/s
LMFUG15	Lemon St Exh	9.863E-07	g/s
LMFUG16	Lemon St Exh	9.863E-07	g/s
LMFUG17	Lemon St Exh	9.863E-07	g/s
LMFUG18	Lemon St Exh	9.863E-07	g/s
LMFUG19	Lemon St Exh	9.863E-07	g/s
LMFUG20	Lemon St Exh	9.863E-07	g/s
LMFUG21	Lemon St Exh	9.863E-07	g/s

LMFUG22	Lemon St Exh	9.863E-07	g/s
LMFUG23	Lemon St Exh	9.863E-07	g/s
LMFUG24	Lemon St Exh	9.863E-07	g/s
LMFUG25	Lemon St Exh	9.863E-07	g/s
LMFUG26	Lemon St Exh	9.863E-07	g/s
LMFUG27	Lemon St Exh	9.863E-07	g/s
LMFUG28	Lemon St Exh	9.863E-07	g/s
LMFUG29	Lemon St Exh	9.863E-07	g/s
LMFUG30	Lemon St Exh	9.863E-07	g/s
LMFUG31	Lemon St Exh	9.863E-07	g/s
LMFUG32	Lemon St Exh	9.863E-07	g/s
LMFUG33	Lemon St Exh	9.863E-07	g/s
LMFUG34	Lemon St Exh	9.863E-07	g/s
LMFUG35	Lemon St Exh	9.863E-07	g/s
LMFUG36	Lemon St Exh	9.863E-07	g/s
LMFUG37	Lemon St Exh	9.863E-07	g/s
LMFUG38	Lemon St Exh	9.863E-07	g/s
LMFUG39	Lemon St Exh	9.863E-07	g/s
LMFUG40	Lemon St Exh	9.863E-07	g/s
LMFUG41	Lemon St Exh	9.863E-07	g/s
LMFUG42	Lemon St Exh	9.863E-07	g/s
LMFUG43	Lemon St Exh	9.863E-07	g/s
LMFUG44	Lemon St Exh	9.863E-07	g/s
LMFUG45	Lemon St Exh	9.863E-07	g/s
LMFUG46	Lemon St Exh	9.863E-07	g/s
LMFUG47	Lemon St Exh	9.863E-07	g/s
LMFUG48	Lemon St Exh	9.863E-07	g/s
LMFUG49	Lemon St Exh	9.863E-07	g/s
LMFUG50	Lemon St Exh	9.863E-07	g/s
LMFUG51	Lemon St Exh	9.863E-07	g/s
SNFUG1	Sonona Blvd North	2.913E-08	g/s
SNFUG2	Sonona Blvd North	2.913E-08	g/s
SNFUG3	Sonona Blvd North	2.913E-08	g/s
SNFUG4	Sonona Blvd North	2.913E-08	g/s
SNFUG5	Sonona Blvd North	2.913E-08	g/s
SNFUG6	Sonona Blvd North	2.913E-08	g/s
SNFUG7	Sonona Blvd North	2.913E-08	g/s
SNFUG8	Sonona Blvd North	2.913E-08	g/s
SNFUG9	Sonona Blvd North	2.913E-08	g/s
SNFUG10	Sonona Blvd North	2.913E-08	g/s
SNFUG11	Sonona Blvd North	2.913E-08	g/s
SNFUG12	Sonona Blvd North	2.913E-08	g/s
SNFUG13	Sonona Blvd North	2.913E-08	g/s
SNFUG14	Sonona Blvd North	2.913E-08	g/s
SNFUG15	Sonona Blvd North	2.913E-08	g/s
SNFUG16	Sonona Blvd North	2.913E-08	g/s
SNFUG17	Sonona Blvd North	2.913E-08	g/s
SNFUG18	Sonona Blvd North	2.913E-08	g/s
SNFUG19	Sonona Blvd North	2.913E-08	g/s
SNFUG20	Sonona Blvd North	2.913E-08	g/s
SNFUG21	Sonona Blvd North	2.913E-08	g/s
SNFUG22	Sonona Blvd North	2.913E-08	g/s
SSFUG1	Sonoma Blvd South	2.913E-08	g/s
SSFUG2	Sonoma Blvd South	2.913E-08	g/s
SSFUG3	Sonoma Blvd South	2.913E-08	g/s
SSFUG4	Sonoma Blvd South	2.913E-08	g/s
SSFUG5	Sonoma Blvd South	2.913E-08	g/s
SSFUG6	Sonoma Blvd South	2.913E-08	g/s
SSFUG7	Sonoma Blvd South	2.913E-08	g/s
SSFUG8	Sonoma Blvd South	2.913E-08	g/s
SSFUG9	Sonoma Blvd South	2.913E-08	g/s
SSFUG10	Sonoma Blvd South	2.913E-08	g/s
SSFUG11	Sonoma Blvd South	2.913E-08	g/s
SSFUG12	Sonoma Blvd South	2.913E-08	g/s
SSFUG13	Sonoma Blvd South	2.913E-08	g/s
SSFUG14	Sonoma Blvd South	2.913E-08	g/s
SSFUG15	Sonoma Blvd South	2.913E-08	g/s
SSFUG16	Sonoma Blvd South	2.913E-08	g/s
SSFUG17	Sonoma Blvd South	2.913E-08	g/s
SSFUG18	Sonoma Blvd South	2.913E-08	g/s
SSFUG19	Sonoma Blvd South	2.913E-08	g/s
SSFUG20	Sonoma Blvd South	2.913E-08	g/s
SSFUG21	Sonoma Blvd South	2.913E-08	g/s
SSFUG22	Sonoma Blvd South	2.913E-08	g/s

SSFUG23	Sonoma Blvd South	2.913E-08	g/s
SSFUG24	Sonoma Blvd South	2.913E-08	g/s
SSFUG25	Sonoma Blvd South	2.913E-08	g/s
SSFUG26	Sonoma Blvd South	2.913E-08	g/s
SSFUG27	Sonoma Blvd South	2.913E-08	g/s
SSFUG28	Sonoma Blvd South	2.913E-08	g/s
SSFUG29	Sonoma Blvd South	2.913E-08	g/s
SSFUG30	Sonoma Blvd South	2.913E-08	g/s
SSFUG31	Sonoma Blvd South	2.913E-08	g/s
SMFUG1	Sonona South Of Magazine	2.292E-07	g/s
SMFUG2	Sonona South Of Magazine	2.292E-07	g/s
SMFUG3	Sonona South Of Magazine	2.292E-07	g/s
SMFUG4	Sonona South Of Magazine	2.292E-07	g/s
SMFUG5	Sonona South Of Magazine	2.292E-07	g/s
SMFUG6	Sonona South Of Magazine	2.292E-07	g/s
SMFUG7	Sonona South Of Magazine	2.292E-07	g/s
SMFUG8	Sonona South Of Magazine	2.292E-07	g/s
SMFUG9	Sonona South Of Magazine	2.292E-07	g/s
SMFUG10	Sonona South Of Magazine	2.292E-07	g/s
SMFUG11	Sonona South Of Magazine	2.292E-07	g/s
SMFUG12	Sonona South Of Magazine	2.292E-07	g/s
SMFUG13	Sonona South Of Magazine	2.292E-07	g/s
SMFUG14	Sonona South Of Magazine	2.292E-07	g/s
SMFUG15	Sonona South Of Magazine	2.292E-07	g/s
SMFUG16	Sonona South Of Magazine	2.292E-07	g/s
SMFUG17	Sonona South Of Magazine	2.292E-07	g/s
SMFUG18	Sonona South Of Magazine	2.292E-07	g/s
SMFUG19	Sonona South Of Magazine	2.292E-07	g/s
SMFUG20	Sonona South Of Magazine	2.292E-07	g/s
SMFUG21	Sonona South Of Magazine	2.292E-07	g/s
SMFUG22	Sonona South Of Magazine	2.292E-07	g/s
SMFUG23	Sonona South Of Magazine	2.292E-07	g/s
SMFUG24	Sonona South Of Magazine	2.292E-07	g/s
SMFUG25	Sonona South Of Magazine	2.292E-07	g/s
SMFUG26	Sonona South Of Magazine	2.292E-07	g/s
SMFUG27	Sonona South Of Magazine	2.292E-07	g/s
SMFUG28	Sonona South Of Magazine	2.292E-07	g/s
SMFUG29	Sonona South Of Magazine	2.292E-07	g/s
LEFUG1	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG2	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG3	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG4	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG5	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG6	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG7	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG8	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG9	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG10	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG11	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG12	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG13	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG14	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG15	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG16	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG17	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG18	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG19	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG20	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG21	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG22	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG23	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG24	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG25	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG26	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG27	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG28	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG29	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG30	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG31	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG32	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG33	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG34	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG35	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG36	Lemon East Of Sonoma	6.291E-07	g/s

LEFUG37	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG38	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG39	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG40	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG41	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG42	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG43	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG44	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG45	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG46	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG47	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG48	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG49	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG50	Lemon East Of Sonoma	6.291E-07	g/s
LEFUG51	Lemon East Of Sonoma	6.291E-07	g/s
VMTFUG1	VMT Only Exh	1.666E-07	g/s
VMTFUG2	VMT Only Exh	1.666E-07	g/s
VMTFUG3	VMT Only Exh	1.666E-07	g/s
VMTFUG4	VMT Only Exh	1.666E-07	g/s
VMTFUG5	VMT Only Exh	1.666E-07	g/s
VMTFUG6	VMT Only Exh	1.666E-07	g/s
VMTFUG7	VMT Only Exh	1.666E-07	g/s
VMTFUG8	VMT Only Exh	1.666E-07	g/s
VMTFUG9	VMT Only Exh	1.666E-07	g/s
VMTFUG10	VMT Only Exh	1.666E-07	g/s
VMTFUG11	VMT Only Exh	1.666E-07	g/s
VMTFUG12	VMT Only Exh	1.666E-07	g/s
VMTFUG13	VMT Only Exh	1.666E-07	g/s
VMTFUG14	VMT Only Exh	1.666E-07	g/s
VMTFUG15	VMT Only Exh	1.666E-07	g/s
VMTFUG16	VMT Only Exh	1.666E-07	g/s
VMTFUG17	VMT Only Exh	1.666E-07	g/s
VMTFUG18	VMT Only Exh	1.666E-07	g/s
VMTFUG19	VMT Only Exh	1.666E-07	g/s
FLS1F1	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F2	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F3	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F4	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F5	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F6	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F7	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F8	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F9	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F10	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F11	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F12	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F13	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F14	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F15	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F16	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F17	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F18	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F19	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F20	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F21	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F22	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F23	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F24	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F25	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS1F26	RMSP1 to Mhopper Exh	9.130E-06	g/s
FLS2F1	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F2	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F3	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F4	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F5	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F6	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F7	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F8	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F9	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F10	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F11	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F12	RMSP2 to Mhopper Exh	9.130E-06	g/s
FLS2F13	RMSP2 to Mhopper Exh	9.130E-06	g/s
FORK1	Forklift Operations	0.000E+00	g/s

TUG1	Tug Emissions	9.884E-06	g/s
TUG2	Tug Emissions	9.884E-06	g/s
TUG3	Tug Emissions	9.884E-06	g/s
TUG4	Tug Emissions	9.884E-06	g/s
TUG5	Tug Emissions	9.884E-06	g/s
TUG6	Tug Emissions	9.884E-06	g/s
TUG7	Tug Emissions	9.884E-06	g/s
TUG8	Tug Emissions	9.884E-06	g/s
TUG9	Tug Emissions	9.884E-06	g/s
TUG10	Tug Emissions	9.884E-06	g/s
TUG11	Tug Emissions	9.884E-06	g/s
TUG12	Tug Emissions	9.884E-06	g/s
TUG13	Tug Emissions	9.884E-06	g/s
TUG14	Tug Emissions	9.884E-06	g/s
TUG15	Tug Emissions	9.884E-06	g/s
TUG16	Tug Emissions	9.884E-06	g/s
TUG17	Tug Emissions	9.884E-06	g/s
TUG18	Tug Emissions	9.884E-06	g/s
TUG19	Tug Emissions	9.884E-06	g/s
TUG20	Tug Emissions	9.884E-06	g/s
TUG21	Tug Emissions	9.884E-06	g/s
TUG22	Tug Emissions	9.884E-06	g/s
TUG23	Tug Emissions	9.884E-06	g/s
TUG24	Tug Emissions	9.884E-06	g/s
TUG25	Tug Emissions	9.884E-06	g/s
TUG26	Tug Emissions	9.884E-06	g/s
RAILST1	rail switching	2.074E-06	g/s
RAILST2	rail switching	2.074E-06	g/s
RAILST3	rail switching	2.074E-06	g/s
RAILST4	rail switching	2.074E-06	g/s
RAILST5	rail switching	2.074E-06	g/s
RAILST6	rail switching	2.074E-06	g/s
RAILST7	rail switching	2.074E-06	g/s
RAILST8	rail switching	2.074E-06	g/s
RAILST9	rail switching	2.074E-06	g/s
RAILST10	rail switching	2.074E-06	g/s
RAILST11	rail switching	2.074E-06	g/s
RAILST12	rail switching	2.074E-06	g/s
RAILST13	rail switching	2.074E-06	g/s
RAILST14	rail switching	2.074E-06	g/s
RAILST15	rail switching	2.074E-06	g/s
RAILST16	rail switching	2.074E-06	g/s
RAILST17	rail switching	2.074E-06	g/s
RAILST18	rail switching	2.074E-06	g/s
RAILST19	rail switching	2.074E-06	g/s
RAILST20	rail switching	2.074E-06	g/s
RAILST21	rail switching	2.074E-06	g/s
RAILST22	rail switching	2.074E-06	g/s
RAILST23	rail switching	2.074E-06	g/s
RAILST24	rail switching	2.074E-06	g/s
RAILST25	rail switching	2.074E-06	g/s
RAILST26	rail switching	2.074E-06	g/s
RAILST27	rail switching	2.074E-06	g/s
RAILST28	rail switching	2.074E-06	g/s
RAILST29	rail switching	2.074E-06	g/s
RAILST30	rail switching	2.074E-06	g/s
RAILST31	rail switching	2.074E-06	g/s
RAILST32	rail switching	2.074E-06	g/s
RAILST33	rail switching	2.074E-06	g/s
RAILST34	rail switching	2.074E-06	g/s
RAILST35	rail switching	2.074E-06	g/s
RAILST36	rail switching	2.074E-06	g/s
RAILST37	rail switching	2.074E-06	g/s
RAILST38	rail switching	2.074E-06	g/s
RAILST39	rail switching	2.074E-06	g/s
RAILST40	rail switching	2.074E-06	g/s
RAILST41	rail switching	2.074E-06	g/s
RAILST42	rail switching	2.074E-06	g/s
RAILST43	rail switching	2.074E-06	g/s
RAILST44	rail switching	2.074E-06	g/s
RAILST45	rail switching	2.074E-06	g/s
RAILST46	rail switching	2.074E-06	g/s
RAILST47	rail switching	2.074E-06	g/s
RAILST48	rail switching	2.074E-06	g/s

RAILST49	rail switching	2.074E-06	g/s
RAILST50	rail switching	2.074E-06	g/s
RAILST51	rail switching	2.074E-06	g/s
RAILST52	rail switching	2.074E-06	g/s
RAILST53	rail switching	2.074E-06	g/s
RAILST54	rail switching	2.074E-06	g/s
RAILST55	rail switching	2.074E-06	g/s
RAILST56	rail switching	2.074E-06	g/s
RAILST57	rail switching	2.074E-06	g/s
RAILST58	rail switching	2.074E-06	g/s
RAILST59	rail switching	2.074E-06	g/s
RAILST60	rail switching	2.074E-06	g/s
RAILST61	rail switching	2.074E-06	g/s
RAILST62	rail switching	2.074E-06	g/s
RAILST63	rail switching	2.074E-06	g/s
RAILST64	rail switching	2.074E-06	g/s
RAILST65	rail switching	2.074E-06	g/s
RAILST66	rail switching	2.074E-06	g/s
RAILST67	rail switching	2.074E-06	g/s
RAILST68	rail switching	2.074E-06	g/s
RAILST69	rail switching	2.074E-06	g/s
RAILST70	rail switching	2.074E-06	g/s
RAILST71	rail switching	2.074E-06	g/s
RAILST72	rail switching	2.074E-06	g/s
RAILST73	rail switching	2.074E-06	g/s
RAILST74	rail switching	2.074E-06	g/s
RAILST75	rail switching	2.074E-06	g/s
RAILLN1	rail haul	8.948E-08	g/s
RAILLN2	rail haul	8.948E-08	g/s
RAILLN3	rail haul	8.948E-08	g/s
RAILLN4	rail haul	8.948E-08	g/s
RAILLN5	rail haul	8.948E-08	g/s
RAILLN6	rail haul	8.948E-08	g/s
RAILLN7	rail haul	8.948E-08	g/s
RAILLN8	rail haul	8.948E-08	g/s
RAILLN9	rail haul	8.948E-08	g/s
RAILLN10	rail haul	8.948E-08	g/s
RAILLN11	rail haul	8.948E-08	g/s
RAILLN12	rail haul	8.948E-08	g/s
RAILLN13	rail haul	8.948E-08	g/s
RAILLN14	rail haul	8.948E-08	g/s
RAILLN15	rail haul	8.948E-08	g/s
RAILLN16	rail haul	8.948E-08	g/s
RAILLN17	rail haul	8.948E-08	g/s
RAILLN18	rail haul	8.948E-08	g/s
RAILLN19	rail haul	8.948E-08	g/s
RAILLN20	rail haul	8.948E-08	g/s
RAILLN21	rail haul	8.948E-08	g/s
RAILLN22	rail haul	8.948E-08	g/s
RAILLN23	rail haul	8.948E-08	g/s
RAILLN24	rail haul	8.948E-08	g/s
RAILLN25	rail haul	8.948E-08	g/s
RAILLN26	rail haul	8.948E-08	g/s
RAILLN27	rail haul	8.948E-08	g/s
RAILLN28	rail haul	8.948E-08	g/s
RAILLN29	rail haul	8.948E-08	g/s
RAILLN30	rail haul	8.948E-08	g/s
RAILLN31	rail haul	8.948E-08	g/s
RAILLN32	rail haul	8.948E-08	g/s
RAILLN33	rail haul	8.948E-08	g/s
RAILLN34	rail haul	8.948E-08	g/s
RAILLN35	rail haul	8.948E-08	g/s
RAILLN36	rail haul	8.948E-08	g/s
RAILLN37	rail haul	8.948E-08	g/s
RAILLN38	rail haul	8.948E-08	g/s
RAILLN39	rail haul	8.948E-08	g/s
RAILLN40	rail haul	8.948E-08	g/s
RAILLN41	rail haul	8.948E-08	g/s
RAILLN42	rail haul (15km/hr)	2.983E-07	g/s
RAILLN43	rail haul (15km/hr)	2.983E-07	g/s
RAILLN44	rail haul (15km/hr)	2.983E-07	g/s
RAILLN45	rail haul (15km/hr)	2.983E-07	g/s
RAILLN46	rail haul (15km/hr)	2.983E-07	g/s
RAILLN47	rail haul (15km/hr)	2.983E-07	g/s

RAILLN48	rail haul (15km/hr)	2.983E-07	g/s
RAILLN49	rail haul (15km/hr)	2.983E-07	g/s
RAILLN50	rail haul (15km/hr)	2.983E-07	g/s
RAILLN51	rail haul (15km/hr)	2.983E-07	g/s
RAILLN52	rail haul (15km/hr)	2.983E-07	g/s
RAILLN53	rail haul (15km/hr)	2.983E-07	g/s
RAILLN54	rail haul (15km/hr)	2.983E-07	g/s
RAILLN55	rail haul (15km/hr)	2.983E-07	g/s
RAILLN56	rail haul (15km/hr)	2.983E-07	g/s
RAILLN57	rail haul (15km/hr)	2.983E-07	g/s
RAILLN58	rail haul (15km/hr)	2.983E-07	g/s
RAILLN59	rail haul (15km/hr)	2.983E-07	g/s
RAILLN60	rail haul (15km/hr)	2.983E-07	g/s
RAILLN61	rail haul (15km/hr)	2.983E-07	g/s
RAILLN62	rail haul (15km/hr)	2.983E-07	g/s
RAILLN63	rail haul (15km/hr)	2.983E-07	g/s
RAILLN64	rail haul (15km/hr)	2.983E-07	g/s
RAILLN65	rail haul (15km/hr)	2.983E-07	g/s
TUGB2	Tug Emissions	9.884E-06	g/s
TUGB3	Tug Emissions	9.884E-06	g/s
TUGB4	Tug Emissions	9.884E-06	g/s
TUGB5	Tug Emissions	9.884E-06	g/s
TUGB6	Tug Emissions	9.884E-06	g/s
TUGB7	Tug Emissions	9.884E-06	g/s
TUGB8	Tug Emissions	9.884E-06	g/s
TUGB9	Tug Emissions	9.884E-06	g/s
TUGB10	Tug Emissions	9.884E-06	g/s
TUGB11	Tug Emissions	9.884E-06	g/s
TUGB12	Tug Emissions	9.884E-06	g/s
TUGB13	Tug Emissions	9.884E-06	g/s
TUGB14	Tug Emissions	9.884E-06	g/s
TUGB15	Tug Emissions	9.884E-06	g/s
TUGB16	Tug Emissions	9.884E-06	g/s
TUGB17	Tug Emissions	9.884E-06	g/s
TUGB18	Tug Emissions	9.884E-06	g/s
TUGB19	Tug Emissions	9.884E-06	g/s
TUGB20	Tug Emissions	9.884E-06	g/s
TUGB21	Tug Emissions	9.884E-06	g/s
TUGB22	Tug Emissions	9.884E-06	g/s
TUGB23	Tug Emissions	9.884E-06	g/s
TUGB24	Tug Emissions	9.884E-06	g/s
TUGB25	Tug Emissions	9.884E-06	g/s
TUGB26	Tug Emissions	9.884E-06	g/s
TUGB1	Tug Emissions	9.884E-06	g/s
BARGE1	Barge	0.000E+00	g/s
BARGE2	Barge	0.000E+00	g/s
BARGE3	Barge	0.000E+00	g/s
BARGE4	Barge	0.000E+00	g/s
BARGE5	Barge	0.000E+00	g/s
BARGE6	Barge	0.000E+00	g/s
BARGE7	Barge	0.000E+00	g/s
BARGE8	Barge	0.000E+00	g/s
BARGE9	Barge	0.000E+00	g/s
BARGE10	Barge	0.000E+00	g/s
BARGE11	Barge	0.000E+00	g/s
BARGE12	Barge	0.000E+00	g/s
BARGE13	Barge	0.000E+00	g/s
BARGE14	Barge	0.000E+00	g/s
BARGE15	Barge	0.000E+00	g/s
BARGE16	Barge	0.000E+00	g/s
BARGE17	Barge	0.000E+00	g/s
BARGE18	Barge	0.000E+00	g/s
BARGE19	Barge	0.000E+00	g/s
BARGE20	Barge	0.000E+00	g/s
BARGE21	Barge	0.000E+00	g/s
BARGE22	Barge	0.000E+00	g/s
BARGE23	Barge	0.000E+00	g/s
BARGE24	Barge	0.000E+00	g/s
BARGE25	Barge	0.000E+00	g/s
BARGE26	Barge	0.000E+00	g/s
BARGE27	Barge	0.000E+00	g/s
BARGE28	Barge	0.000E+00	g/s
BARGE29	Barge	0.000E+00	g/s
BARGE30	Barge	0.000E+00	g/s

BARGE31	Barge	0.000E+00	g/s
BARGE32	Barge	0.000E+00	g/s
BARGE33	Barge	0.000E+00	g/s
BARGE34	Barge	0.000E+00	g/s
BARGE35	Barge	0.000E+00	g/s
BARGE36	Barge	0.000E+00	g/s
BARGE37	Barge	0.000E+00	g/s
BARGE38	Barge	0.000E+00	g/s
BARGE39	Barge	0.000E+00	g/s
BARGE40	Barge	0.000E+00	g/s
BARGE41	Barge	0.000E+00	g/s
BARGE42	Barge	0.000E+00	g/s
BARGE43	Barge	0.000E+00	g/s
BARGE44	Barge	0.000E+00	g/s
BARGE45	Barge	0.000E+00	g/s
BARGE46	Barge	0.000E+00	g/s
BARGE47	Barge	0.000E+00	g/s
BARGE48	Barge	0.000E+00	g/s
BARGE49	Barge	0.000E+00	g/s
BARGE50	Barge	0.000E+00	g/s
BARGE51	Barge	0.000E+00	g/s
BARGE52	Barge	0.000E+00	g/s
BARGE53	Barge	0.000E+00	g/s
BARGE54	Barge	0.000E+00	g/s
BARGE55	Barge	0.000E+00	g/s
BARGE56	Barge	0.000E+00	g/s
BARGE57	Barge	0.000E+00	g/s
BARGE58	Barge	0.000E+00	g/s
BARGE59	Barge	0.000E+00	g/s
BARGE60	Barge	0.000E+00	g/s
BARGE61	Barge	0.000E+00	g/s
BARGE62	Barge	0.000E+00	g/s
BARGE63	Barge	0.000E+00	g/s
BARGE64	Barge	0.000E+00	g/s
BARGE65	Barge	0.000E+00	g/s
BARGE66	Barge	0.000E+00	g/s
BARGE67	Barge	0.000E+00	g/s
BARGE68	Barge	0.000E+00	g/s
BARGE69	Barge	0.000E+00	g/s
BARGE70	Barge	0.000E+00	g/s
BARGE71	Barge	0.000E+00	g/s
BARGE72	Barge	0.000E+00	g/s
BARGE73	Barge	0.000E+00	g/s
BARGE74	Barge	0.000E+00	g/s
BARGE75	Barge	0.000E+00	g/s
BARGE76	Barge	0.000E+00	g/s
BARGE77	Barge	0.000E+00	g/s
BARGE78	Barge	0.000E+00	g/s
BARGE79	Barge	0.000E+00	g/s
BARGE80	Barge	0.000E+00	g/s
BARGE81	Barge	0.000E+00	g/s
BARGE82	Barge	0.000E+00	g/s
BARGE83	Barge	0.000E+00	g/s
BARGE84	Barge	0.000E+00	g/s
BARGE85	Barge	0.000E+00	g/s
BARGE86	Barge	0.000E+00	g/s
BARGE87	Barge	0.000E+00	g/s
BARGE88	Barge	0.000E+00	g/s
BARGE89	Barge	0.000E+00	g/s
BARGE90	Barge	0.000E+00	g/s
BARGE91	Barge	0.000E+00	g/s
BARGE92	Barge	0.000E+00	g/s
BARGE93	Barge	0.000E+00	g/s
BARGE94	Barge	0.000E+00	g/s
BARGE95	Barge	0.000E+00	g/s
BARGE96	Barge	0.000E+00	g/s
BARGE97	Barge	0.000E+00	g/s
BARGE98	Barge	0.000E+00	g/s
BARGE99	Barge	0.000E+00	g/s
BARG100	Barge	0.000E+00	g/s
BARG101	Barge	0.000E+00	g/s
BARG102	Barge	0.000E+00	g/s
BARG103	Barge	0.000E+00	g/s
BARG104	Barge	0.000E+00	g/s

BARG105	Barge	0.000E+00	g/s
BARG106	Barge	0.000E+00	g/s
BARG107	Barge	0.000E+00	g/s
BARG108	Barge	0.000E+00	g/s
BARG109	Barge	0.000E+00	g/s
BARG110	Barge	0.000E+00	g/s
BARG111	Barge	0.000E+00	g/s
BARG112	Barge	0.000E+00	g/s
BARG113	Barge	0.000E+00	g/s
BARG114	Barge	0.000E+00	g/s
BARG115	Barge	0.000E+00	g/s
BARG116	Barge	0.000E+00	g/s
BARG117	Barge	0.000E+00	g/s
BARG118	Barge	0.000E+00	g/s
BARG119	Barge	0.000E+00	g/s
BARG120	Barge	0.000E+00	g/s
BARG121	Barge	0.000E+00	g/s
BARG122	Barge	0.000E+00	g/s
BARG123	Barge	0.000E+00	g/s
BARG124	Barge	0.000E+00	g/s
BARG125	Barge	0.000E+00	g/s
BARG126	Barge	0.000E+00	g/s
NRAILST1	rail switching night	2.074E-06	g/s
NRAILST2	rail switching night	2.074E-06	g/s
NRAILST3	rail switching night	2.074E-06	g/s
NRAILST4	rail switching night	2.074E-06	g/s
NRAILST5	rail switching night	2.074E-06	g/s
NRAILST6	rail switching night	2.074E-06	g/s
NRAILST7	rail switching night	2.074E-06	g/s
NRAILST8	rail switching night	2.074E-06	g/s
NRAILST9	rail switching night	2.074E-06	g/s
NRAILS10	rail switching night	2.074E-06	g/s
NRAILS11	rail switching night	2.074E-06	g/s
NRAILS12	rail switching night	2.074E-06	g/s
NRAILS13	rail switching night	2.074E-06	g/s
NRAILS14	rail switching night	2.074E-06	g/s
NRAILS15	rail switching night	2.074E-06	g/s
NRAILS16	rail switching night	2.074E-06	g/s
NRAILS17	rail switching night	2.074E-06	g/s
NRAILS18	rail switching night	2.074E-06	g/s
NRAILS19	rail switching night	2.074E-06	g/s
NRAILS20	rail switching night	2.074E-06	g/s
NRAILS21	rail switching night	2.074E-06	g/s
NRAILS22	rail switching night	2.074E-06	g/s
NRAILS23	rail switching night	2.074E-06	g/s
NRAILS24	rail switching night	2.074E-06	g/s
NRAILS25	rail switching night	2.074E-06	g/s
NRAILS26	rail switching night	2.074E-06	g/s
NRAILS27	rail switching night	2.074E-06	g/s
NRAILS28	rail switching night	2.074E-06	g/s
NRAILS29	rail switching night	2.074E-06	g/s
NRAILS30	rail switching night	2.074E-06	g/s
NRAILS31	rail switching night	2.074E-06	g/s
NRAILS32	rail switching night	2.074E-06	g/s
NRAILS33	rail switching night	2.074E-06	g/s
NRAILS34	rail switching night	2.074E-06	g/s
NRAILS35	rail switching night	2.074E-06	g/s
NRAILS36	rail switching night	2.074E-06	g/s
NRAILS37	rail switching night	2.074E-06	g/s
NRAILS38	rail switching night	2.074E-06	g/s
NRAILS39	rail switching night	2.074E-06	g/s
NRAILS40	rail switching night	2.074E-06	g/s
NRAILS41	rail switching night	2.074E-06	g/s
NRAILS42	rail switching night	2.074E-06	g/s
NRAILS43	rail switching night	2.074E-06	g/s
NRAILS44	rail switching night	2.074E-06	g/s
NRAILS45	rail switching night	2.074E-06	g/s
NRAILS46	rail switching night	2.074E-06	g/s
NRAILS47	rail switching night	2.074E-06	g/s
NRAILS48	rail switching night	2.074E-06	g/s
NRAILS49	rail switching night	2.074E-06	g/s
NRAILS50	rail switching night	2.074E-06	g/s
NRAILS51	rail switching night	2.074E-06	g/s
NRAILS52	rail switching night	2.074E-06	g/s

NRAILS53	rail switching night	2.074E-06	g/s
NRAILS54	rail switching night	2.074E-06	g/s
NRAILS55	rail switching night	2.074E-06	g/s
NRAILS56	rail switching night	2.074E-06	g/s
NRAILS57	rail switching night	2.074E-06	g/s
NRAILS58	rail switching night	2.074E-06	g/s
NRAILS59	rail switching night	2.074E-06	g/s
NRAILS60	rail switching night	2.074E-06	g/s
NRAILS61	rail switching night	2.074E-06	g/s
NRAILS62	rail switching night	2.074E-06	g/s
NRAILS63	rail switching night	2.074E-06	g/s
NRAILS64	rail switching night	2.074E-06	g/s
NRAILS65	rail switching night	2.074E-06	g/s
NRAILS66	rail switching night	2.074E-06	g/s
NRAILS67	rail switching night	2.074E-06	g/s
NRAILS68	rail switching night	2.074E-06	g/s
NRAILS69	rail switching night	2.074E-06	g/s
NRAILS70	rail switching night	2.074E-06	g/s
NRAILS71	rail switching night	2.074E-06	g/s
NRAILS72	rail switching night	2.074E-06	g/s
NRAILS73	rail switching night	2.074E-06	g/s
NRAILS74	rail switching night	2.074E-06	g/s
NRAILS75	rail switching night	2.074E-06	g/s
NRAILLN1	rail haul night	8.948E-08	g/s
NRAILLN2	rail haul night	8.948E-08	g/s
NRAILLN3	rail haul night	8.948E-08	g/s
NRAILLN4	rail haul night	8.948E-08	g/s
NRAILLN5	rail haul night	8.948E-08	g/s
NRAILLN6	rail haul night	8.948E-08	g/s
NRAILLN7	rail haul night	8.948E-08	g/s
NRAILLN8	rail haul night	8.948E-08	g/s
NRAILLN9	rail haul night	8.948E-08	g/s
NRAILN10	rail haul night	8.948E-08	g/s
NRAILN11	rail haul night	8.948E-08	g/s
NRAILN12	rail haul night	8.948E-08	g/s
NRAILN13	rail haul night	8.948E-08	g/s
NRAILN14	rail haul night	8.948E-08	g/s
NRAILN15	rail haul night	8.948E-08	g/s
NRAILN16	rail haul night	8.948E-08	g/s
NRAILN17	rail haul night	8.948E-08	g/s
NRAILN18	rail haul night	8.948E-08	g/s
NRAILN19	rail haul night	8.948E-08	g/s
NRAILN20	rail haul night	8.948E-08	g/s
NRAILN21	rail haul night	8.948E-08	g/s
NRAILN22	rail haul night	8.948E-08	g/s
NRAILN23	rail haul night	8.948E-08	g/s
NRAILN24	rail haul night	8.948E-08	g/s
NRAILN25	rail haul night	8.948E-08	g/s
NRAILN26	rail haul night	8.948E-08	g/s
NRAILN27	rail haul night	8.948E-08	g/s
NRAILN28	rail haul night	8.948E-08	g/s
NRAILN29	rail haul night	8.948E-08	g/s
NRAILN30	rail haul night	8.948E-08	g/s
NRAILN31	rail haul night	8.948E-08	g/s
NRAILN32	rail haul night	8.948E-08	g/s
NRAILN33	rail haul night	8.948E-08	g/s
NRAILN34	rail haul night	8.948E-08	g/s
NRAILN35	rail haul night	8.948E-08	g/s
NRAILN36	rail haul night	8.948E-08	g/s
NRAILN37	rail haul night	8.948E-08	g/s
NRAILN38	rail haul night	8.948E-08	g/s
NRAILN39	rail haul night	8.948E-08	g/s
NRAILN40	rail haul night	8.948E-08	g/s
NRAILN41	rail haul night	8.948E-08	g/s
NRAILN42	rail haul (15km/hr)	2.983E-07	g/s
NRAILN43	rail haul (15km/hr)	2.983E-07	g/s
NRAILN44	rail haul (15km/hr)	2.983E-07	g/s
NRAILN45	rail haul (15km/hr)	2.983E-07	g/s
NRAILN46	rail haul (15km/hr)	2.983E-07	g/s
NRAILN47	rail haul (15km/hr)	2.983E-07	g/s
NRAILN48	rail haul (15km/hr)	2.983E-07	g/s
NRAILN49	rail haul (15km/hr)	2.983E-07	g/s
NRAILN50	rail haul (15km/hr)	2.983E-07	g/s
NRAILN51	rail haul (15km/hr)	2.983E-07	g/s

NRAILN52	rail haul (15km/hr)	2.983E-07	g/s
NRAILN53	rail haul (15km/hr)	2.983E-07	g/s
NRAILN54	rail haul (15km/hr)	2.983E-07	g/s
NRAILN55	rail haul (15km/hr)	2.983E-07	g/s
NRAILN56	rail haul (15km/hr)	2.983E-07	g/s
NRAILN57	rail haul (15km/hr)	2.983E-07	g/s
NRAILN58	rail haul (15km/hr)	2.983E-07	g/s
NRAILN59	rail haul (15km/hr)	2.983E-07	g/s
NRAILN60	rail haul (15km/hr)	2.983E-07	g/s
NRAILN61	rail haul (15km/hr)	2.983E-07	g/s
NRAILN62	rail haul (15km/hr)	2.983E-07	g/s
NRAILN63	rail haul (15km/hr)	2.983E-07	g/s
NRAILN64	rail haul (15km/hr)	2.983E-07	g/s
NRAILN65	rail haul (15km/hr)	2.983E-07	g/s
NTUG1	Tug Emissions	9.884E-06	g/s
NTUG2	Tug Emissions	9.884E-06	g/s
NTUG3	Tug Emissions	9.884E-06	g/s
NTUG4	Tug Emissions	9.884E-06	g/s
NTUG5	Tug Emissions	9.884E-06	g/s
NTUG6	Tug Emissions	9.884E-06	g/s
NTUG7	Tug Emissions	9.884E-06	g/s
NTUG8	Tug Emissions	9.884E-06	g/s
NTUG9	Tug Emissions	9.884E-06	g/s
NTUG10	Tug Emissions	9.884E-06	g/s
NTUG11	Tug Emissions	9.884E-06	g/s
NTUG12	Tug Emissions	9.884E-06	g/s
NTUG13	Tug Emissions	9.884E-06	g/s
NTUG14	Tug Emissions	9.884E-06	g/s
NTUG15	Tug Emissions	9.884E-06	g/s
NTUG16	Tug Emissions	9.884E-06	g/s
NTUG17	Tug Emissions	9.884E-06	g/s
NTUG18	Tug Emissions	9.884E-06	g/s
NTUG19	Tug Emissions	9.884E-06	g/s
NTUG20	Tug Emissions	9.884E-06	g/s
NTUG21	Tug Emissions	9.884E-06	g/s
NTUG22	Tug Emissions	9.884E-06	g/s
NTUG23	Tug Emissions	9.884E-06	g/s
NTUG24	Tug Emissions	9.884E-06	g/s
NTUG25	Tug Emissions	9.884E-06	g/s
NTUG26	Tug Emissions	9.884E-06	g/s
NTUGB2	Tug Emissions	9.884E-06	g/s
NTUGB3	Tug Emissions	9.884E-06	g/s
NTUGB4	Tug Emissions	9.884E-06	g/s
NTUGB5	Tug Emissions	9.884E-06	g/s
NTUGB6	Tug Emissions	9.884E-06	g/s
NTUGB7	Tug Emissions	9.884E-06	g/s
NTUGB8	Tug Emissions	9.884E-06	g/s
NTUGB9	Tug Emissions	9.884E-06	g/s
NTUGB10	Tug Emissions	9.884E-06	g/s
NTUGB11	Tug Emissions	9.884E-06	g/s
NTUGB12	Tug Emissions	9.884E-06	g/s
NTUGB13	Tug Emissions	9.884E-06	g/s
NTUGB14	Tug Emissions	9.884E-06	g/s
NTUGB15	Tug Emissions	9.884E-06	g/s
NTUGB16	Tug Emissions	9.884E-06	g/s
NTUGB17	Tug Emissions	9.884E-06	g/s
NTUGB18	Tug Emissions	9.884E-06	g/s
NTUGB19	Tug Emissions	9.884E-06	g/s
NTUGB20	Tug Emissions	9.884E-06	g/s
NTUGB21	Tug Emissions	9.884E-06	g/s
NTUGB22	Tug Emissions	9.884E-06	g/s
NTUGB23	Tug Emissions	9.884E-06	g/s
NTUGB24	Tug Emissions	9.884E-06	g/s
NTUGB25	Tug Emissions	9.884E-06	g/s
NTUGB26	Tug Emissions	9.884E-06	g/s
NTUGB1	Tug Emissions	9.884E-06	g/s
TRANS33	transit33	3.844E-06	g/s
TRANS32	transit32	3.844E-06	g/s
TRANS31	transit31	3.844E-06	g/s
TRANS30	transit30	3.844E-06	g/s
TRANS29	transit29	3.844E-06	g/s
TRANS28	transit28	3.844E-06	g/s
TRANS27	transit27	3.844E-06	g/s
TRANS26	transit26	3.844E-06	g/s

TRANS25	transit25	3.844E-06	g/s
TRANS24	transit24	3.844E-06	g/s
TRANS23	transit23	3.844E-06	g/s
TRANS22	transit22	3.844E-06	g/s
TRANS21	transit21	3.844E-06	g/s
TRANS20	transit20	3.844E-06	g/s
TRANS19	transit19	3.844E-06	g/s
TRANS18	transit18	3.844E-06	g/s
TRANS17	transit17	3.844E-06	g/s
TRANS16	transit16	3.844E-06	g/s
TRANS15	transit15	3.844E-06	g/s
TRANS14	transit14	3.844E-06	g/s
TRANS13	transit13	3.844E-06	g/s
TRANS12	transit12	3.844E-06	g/s
TRANS11	transit11	3.844E-06	g/s
TRANS10	transit10	3.844E-06	g/s
TRANS9	transit9	3.844E-06	g/s
TRANS8	transit8	3.844E-06	g/s
TRANS7	transit7	3.844E-06	g/s
TRANS6	transit6	3.844E-06	g/s
TRANS5	transit5	3.844E-06	g/s
TRANS4	transit4	3.844E-06	g/s
TRANS3	transit3	3.844E-06	g/s
TRANS2	transit2	3.844E-06	g/s
TRANS1	transit1	3.844E-06	g/s
TRANS34	transit34	3.844E-06	g/s
TRANS35	transit35	7.160E-06	g/s
TRANS36	transit36	7.160E-06	g/s
TRANS37	transit37	7.160E-06	g/s
TRANS38	transit38	7.160E-06	g/s
TRANS39	transit39	7.160E-06	g/s
TRANS40	transit40	7.160E-06	g/s
TRANS41	transit41	7.160E-06	g/s
TRANS42	transit42	7.160E-06	g/s
TRANS43	transit43	7.160E-06	g/s
TRANS44	transit44	7.160E-06	g/s
TRANS45	transit45	7.160E-06	g/s
TRANS46	transit46	7.160E-06	g/s
TRANS47	transit47	7.160E-06	g/s
TRANS48	transit48	7.160E-06	g/s
TRANS49	transit49	7.160E-06	g/s
TRANS50	transit50	7.160E-06	g/s
TRANS51	transit51	7.160E-06	g/s
TRANS52	transit52	7.160E-06	g/s
TRANS53	transit53	7.160E-06	g/s
TRANS54	transit54	7.160E-06	g/s
TRANS55	transit55	7.160E-06	g/s
TRANS56	transit56	7.160E-06	g/s
TRANS57	transit57	7.160E-06	g/s
TRANS58	transit58	7.160E-06	g/s
TRANS59	transit59	7.160E-06	g/s
TRANS60	transit60	7.160E-06	g/s
TRANS61	transit61	7.160E-06	g/s
TRANS62	transit62	7.160E-06	g/s
TRANS63	transit63	7.160E-06	g/s
TRANS64	transit64	7.160E-06	g/s
TRANS65	transit65	7.160E-06	g/s
TRANS66	transit66	7.160E-06	g/s
TRANS67	transit67	7.160E-06	g/s
TRANS68	transit68	7.160E-06	g/s
TRANS69	transit69	7.160E-06	g/s
TRANS70	transit70	7.160E-06	g/s
TRANS71	transit71	7.160E-06	g/s
TRANS72	transit72	7.160E-06	g/s
TRANS73	transit73	7.160E-06	g/s
TRANS74	transit74	7.160E-06	g/s
TRANS75	transit75	7.160E-06	g/s
TRANS76	transit76	7.160E-06	g/s
TRANS77	transit77	7.160E-06	g/s
TRANS78	transit78	7.160E-06	g/s
TRANS79	transit79	7.160E-06	g/s
TRANS80	transit80	7.160E-06	g/s
TRANS81	transit81	7.160E-06	g/s
TRANS82	transit82	7.160E-06	g/s

TRANS83	transit83	7.160E-06	g/s	
TRANS84	transit84	7.160E-06	g/s	
TRANS85	transit85	7.160E-06	g/s	
TRANS86	transit86	7.160E-06	g/s	
TRANS87	transit87	7.160E-06	g/s	
TRANS88	transit88	7.160E-06	g/s	
TRANS89	transit89	7.160E-06	g/s	
TRANS90	transit90	7.160E-06	g/s	
TRANS91	transit91	7.160E-06	g/s	
TRANS92	transit92	7.160E-06	g/s	
TRANS93	transit93	7.160E-06	g/s	
TRANS94	transit94	7.160E-06	g/s	
TRANS95	transit95	7.160E-06	g/s	
TRANS96	transit96	7.160E-06	g/s	
TRANS97	transit97	7.160E-06	g/s	
TRANS98	transit98	7.160E-06	g/s	
TRANS99	transit99	7.160E-06	g/s	
MANV1	maneuv1	1.870E-05	g/s	
MANV2	maneuv2	1.870E-05	g/s	
MANV3	maneuv3	1.870E-05	g/s	
MANV4	maneuv4	1.870E-05	g/s	
MANV5	maneuv5	1.870E-05	g/s	
MANV6	maneuv6	1.870E-05	g/s	
MANV7	maneuv7	1.870E-05	g/s	
MANV8	maneuv8	1.870E-05	g/s	
MANV9	maneuv9	1.870E-05	g/s	
MANV10	maneuv10	1.870E-05	g/s	
MANV11	maneuv11	1.870E-05	g/s	
MANV12	maneuv12	1.870E-05	g/s	
MANV13	maneuv13	1.870E-05	g/s	
MANV14	maneuv14	1.870E-05	g/s	
MANV15	maneuv15	1.870E-05	g/s	
MANV16	MANV16	1.870E-05	g/s	
MANV17	MANV17	1.870E-05	g/s	
MANV18	MANV18	1.870E-05	g/s	
MANV19	MANV19	1.870E-05	g/s	
MANV20	MANV20	1.870E-05	g/s	
MANV21	MANV21	1.870E-05	g/s	
MANV22	MANV22	1.870E-05	g/s	
MANV23	MANV23	1.870E-05	g/s	
MANV24	MANV24	1.870E-05	g/s	
MANV25	MANV25	1.870E-05	g/s	
MANV26	MANV26	1.870E-05	g/s	
FL_PH1	Front Loader Phase1	0.000E+00	g/s	
GYPSFUG1	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG2	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG3	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG4	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG5	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG6	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG7	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG8	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPSFUG9	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPFUG10	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPFUG11	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
GYPFUG12	Gypsum to MHopper Fug & Exh	1.87E-05	g/s	
SHP_UPLD	ship upload 1	9.82E-05	g/s	new
SHPUPLD2	ship upload 2	9.82E-05	g/s	new
INTAKEH	intake hopper	1.96E-04	g/s	new
MILLFEED	mill feed hopper	2.02E-04	g/s	new
MAINSILO	mill silo	1.96E-04	g/s	new
MILLIN	mill intake	2.02E-04	g/s	new
FL_S1	Front Loader S1 Material Handing	9.82E-05	g/s	new
FL_S2	Front Loader S2 Material Handing	9.82E-05	g/s	new
EC_HAND1	excavator material loading & unloadir	1.96E-04	g/s	new
EC_HAND2	excavator material loading & unloadir	1.96E-04	g/s	new
GYP_MH	gypsum material handling	1.18E-05	g/s	new
HOPPER	mobile hopper 1	0.00E+00	g/s	new
HOPPER2	mobile hopper 2	0.00E+00	g/s	new
HOPPER3	mobile hopper 3	0.00E+00	g/s	new
HOPPER4	mobile hopper 4	0.00E+00	g/s	new
HOPPER5	mobile hopper 5	0.00E+00	g/s	new
HOPPER6	mobile hopper 6	0.00E+00	g/s	new
HOPPER7	mobile hopper 7	0.00E+00	g/s	new

FL_TRDP	FL1 Truck Drop1	0.00E+00	g/s	new
FL_TRU1	FL1 Truck Uploading	0.00E+00	g/s	new
FL_RL_U	FL Rail Upload	0.00E+00	g/s	new
FL_RL_D	FL Rail Drop	0.00E+00	g/s	new
RAIL_DP	Rail Unloading	0.00E+00	g/s	new
GYPSILO	gypsum silo	5.89E-06	g/s	new
ELEVAT	elevator drop	2.02E-04	g/s	new
GYPCONV	gypsum to conveyor	5.89E-06	g/s	new
MAINCON	main silo to conveyor	1.96E-04	g/s	new

VMT, Phase 1 (Alternative) - Based On Year 2020

Phase 1	1,350,000	metric tonnes per year of sand / aggregate imported
Hours Of Operation	5760	
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,0000 metric tonnes	
Ship Unloading Capacity	303	tonnes per hour averaged over 3 days
Duration of ship unloading	132	hrs (5.5 days)

Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Phase 1 Alternative	**Shipping (based on 29 trips only rather than 34)**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132 hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs
	Barge (no barge in this scenario)	0	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs

VMT, Phase 1 (Alternative) - Based On Year 2020

Phase 2	1,350,000	metric tonnes per year of sand / aggregate imported	
Hours Of Operation	5760	hrs	
Operational Details	24 days per month, 2 10-hour shift		
Shipment Load	40,0000 metric tonnes		
Ship Unloading Capacity	303	tonnes per hour averaged over 3 days	
Duration of ship unloading	132	hrs (5.5 days)	

Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
PM_{10} / $PM_{2.5}$ **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132 hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs
	Barge	1	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs
	Material Handling	Ongoing	303 tons per hrs using grab crane via two mobile hoppers. 7 Onsite Hoppers for 5760 hour per year. Includes ship uploading, conveyor drops, upload & drop and front loader upload and drop.
	Raw Material Storage Piles	Variable (depending on year)	All Year Stockpiling Assumed At All RMSPs

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions	**YEAR 2020**
Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**VMT, Phase 2 (Alternative) - Based On Year 2016**		
Visits Per Year	**29**	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	**59103.9**	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.0	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46	3.70%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36	10.20%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	

Auxilliary Engine		
Hoteling	0.06	POLA (2012)
Maneuvering	0.275	POLA (2012)
Transit	0.104	POLA (2012)

Source: (CARB (2011) Appendix D)

Main Engine		
Transit		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR
Maneuvering		
Engine Speed	**Fuel**	
		PM10
Slow	Marine Distillate (0.1% S)	**0.25005**
Medium	Marine Distillate (0.1% S)	**0.25005**
		g/kW-HR

Auxiliary Engine		
Engine Speed	**Fuel**	
		PM10
Medium	Marine Distillate (0.1% S)	**0.25001**
		g/kW-HR

Boiler	
	PM10
Marine Distillate (0.1% S)	**0.13336**
	g/kW-HR

Tug	
	PM10
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

No Barge For Phase 1 Alternative

Barge Emission Factor YEAR 2020

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	PM10		Time (hrs)	inward	outward	Barge Emission Rate
Main	235	g/hr	0.540	2.57	3.60	0.070
				m/s	m/s	
Auxiliary	16.8	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine(s).

PM10		tonnage / shipment
Drop points	ship upload 1	20000
	ship upload 2	20000
Phase 2 - Ship unloading (assumes all unloading in Phase 1)	mobile hopper 1	40000
	mobile hopper 2	40000
	mobile hopper 3	20000
	mobile hopper 4	13333
	mobile hopper 5	13333
	mobile hopper 6	13333
	mobile hopper 7	13333
Phase 2 - Transloading from Phase 1 to 2 to facilitate barge loading (assumed 7500 tonnes per shipment over 2 days)	mobile hopper 8	7500
	mobile hopper 9	7500
	mobile hopper 10	7500
	mobile hopper 11	7500
	mobile hopper 12	7500
	mobile hopper 13	7500

Annual Mean

Annual Total	39287.3	g	Average / event	37984.7	g

Mass Emission			Mass Emission		
PM10	1.96E-03	Tonnes	PM10	1.90E-03	Tonnes
PM2.5	2.95E-04	Tonnes	PM2.5	2.85E-04	Tonnes

Annualised Emission Rate

Mass Emission			Mass Emission		
PM10	6.23E-05	g/s	PM10	6.02E-05	g/s
PM2.5	9.34E-06	g/s	PM2.5	9.03E-06	g/s

Mass Emission			Mass Emission		
Phase 1			Phase 2		
PM10	1.18E-08	g/s*m2	PM10	1.18E-08	g/s*m2
PM2.5	1.77E-09	g/s*m2	PM2.5	1.77E-09	g/s*m2

PM10	tonnage	hours of operation	PM10 lbs/day	PM10 MTPA	PM10 tpa

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	PM10	
Forklift	0.20	100	0.010	diesel
		hp	g/(hp-hr)	
Deterioration Rate	4.55E-07	g/(hr-hr^2)		
Age	5	years	(2015 Model)	
Activity	1800	hours/year		
	(capped at 12,000 hrs)			
Fuel Correction Factor	0.852			
Emission Rate	0.197	g/hr		

Activity Factor	0.5	Fractional usage per hour

Emission Rate / fork lift PM10	0.000027	g/s
PM2.5/PM10 Ratio	0.92	
Emission Rate / fork lift PM2.5	0.000025	g/s

tonnes to ton	*1.1023*
ton to tonnes	*0.9072*

Unpaved Road - Industrial (Forklift)

Maximum 24-Hour Scenario

Project: Orcem, Vallejo

Unpaved Roads (Chapter 13.2.2 AP42 Dated 11/2006)

$$E = [281.9 * k * (s/12)^a (W/3)^b \text{ g/veh km}$$

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	10	10	Assumption for forklift
Wet Days Per Year	Days	0	0	24-Maximum Scenario
Constant, k	lb/VMT	1.5	0.15	AP42 Table 13.2.2-2
Constant, a		0.9	0.9	AP42 Table 13.2.2-2
Constant, b		0.45	0.45	AP42 Table 13.2.2-2
Silt content, s	%	4.8	4.8	AP42 Table 13.2.2-1
Uncontrolled Emission factor, E	lb/VMT	1.13	0.11	Calculation
Uncontrolled Emission factor, E	g/VKT	318.67	31.87	Calculation
Control Efficiency for Watering	Factor	0.968	0.968	Cumlative efficiency based on dust suppression using MgCl2, frequent watering & 15 mph speed limit
Controlled Emission factor, E	g/VKT	**10.20**	**1.02**	Calculation

AERMOD Model Inputs

Unpaved road modelled as a series of adjacent volume sources

Fork Lift Area			
Distance Travelled Per Hour	1.0	km	**each forklift**
PM10 Emission Rate	10.20	g/hr	
PM2.5 Emission Rate	1.02	g/hr	

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

OFFROAD2011	Load Factor	HP	PM10 (Diesel)
Front Loader	0.3618	369	0.010
			g/(hp-hr)
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	3 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	0.85		
Emission Rate	1.10	g/hr	

Activity Factor	90%	Fractional usage per hour
PM2.5/PM10 Ratio	0.92	
PM10 Emission Rate / Front Loader	0.000275	g/s
PM2.5 Emission Rate / Front Loader	0.000253	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

PM10 (Diesel)	Maximum Day		Hours Of Operation	Tonnage/annum
Emission Rate / Front Loader / Truck Loading	0.0000550	g/s	5760	0.00570
Emission Rate / Front Loader / TransLoading	0.0000688	g/s	1392	0.00138
Emission Rate / Front Loader / Rail Loading	0.0000550	g/s	2038	0.00202
Emission Rate / Front Loader / Barge Loading	0.0000550	g/s	288	0.00029
			Sum	0.0094

Volume of front loader	12.2	m3
Density of Sand / Aggregate	1.50	tonnes/m3
Tonnage / front loader	**18.3**	tonnes
Tons / front loader	20.17	tons

Modelling Day 2	**Dedicated to barge loading**	
Maximum Required	6600.0	tonnes/day
Hours To Complete Loading	24.0	hours
Trips per day	360.7	trips
Maximum Distance Per Cycle	40.0	m (one-way)
Trips per hour	**15.0**	**based on 24-hr day**

Modelling Day 4	**Dedicated to rail loading**	
Capacity	9072.0	tonnes/day
Hours To Complete Loading	24.0	hours
Trips per day	495.7	trips
Maximum Distance Per Cycle	40.0	m (one-way)
Trips per hour	**20.7**	**based on 24-hr day**

Modelling Day 3	**Truck Loading & Transloading**	
Capacity	1077.8	tonnes/day
Truck Loading Per Day	1077.8	tonnes/day
Hours To Complete Loading	24.0	hours
Tonnes / hour	44.9	tonnes/hour
Maximum Distance Per Cycle	50.0	m (one-way)
Trips / hour	**2.5**	**based on 24-hr day**

Trans-Loading Per Day	3750.0	tonnes/day
Hours To Complete Loading	24.0	hours
Tonnes / hour	156.3	tonnes/hour
Maximum Distance Per Cycle	50.0	m (one-way)
Trips / hour	**8.5**	**based on 24-hr day**

PM10 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

Year 2020

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC 2007 Categories					Annual		0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0297		0.0297

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season		PM10 (g/hr-veh)
2020	HHDT	D	SV	A		
					annual	0.004
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.0184	0.0297	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0005	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0171	0.0275	Sum	Assumption - Based On Idling for 7.5% of time

0.00E+00

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM10_STREX	PM10_Combined
					miles/hr	(gms/mile)		(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.0075		#REF!	0.0075
2020	Annual	LDA	DSL	Aggregated	10	0.0320		0.00000	0.0320
LDA Idling Calculation									
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX			
						(gms/mile)	gms/km		
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0119	0.0074		
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269		

		PM10_run	g/mile		
Gas LDA (ann)	g/vkt	#REF!	#REF!	EMFAC2011	start emissions - 10mins
DSL LDA (ann)	g/vkt	0.0199	0.0320	EMFAC2011	
Idling Gas LDA	g/vkt	0.0074	0.0119	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0269	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	#REF!	#REF!	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.0204	0.0328	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	#REF!	#REF!	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.012	g/hr	#REF!	based on annual
Emission Factor/vehicle	3.44E-06	g/sec	#REF!	includes all trips/day
Emissions /vehicle/AERMOD Source	4.30E-08	g/sec	#REF!	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	2 shifts	80
Phase 2	20	2 shifts	80
Phase 2 Alternative	20	2 shifts	80

Diurnal Emission Factors Based On Truck Movement Breakdown

phase 2 alternative

Weekday Hours	PM10 Emissions (g/s)	phase 2 alternative Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	Annualised Emission Rate PM10 Including LDA
1	4.30E-08	0	0.00E+00	#REF!	0	0.00E+00	#REF!
2	4.30E-08	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
3	4.30E-08	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
4	4.30E-08	3	1.29E-07	1.291E-07	2	1.07E-07	1.07E-07
5	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
6	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
7	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
8	4.30E-08	6	2.58E-07	2.581E-07	5	2.15E-07	2.15E-07
9	4.30E-08	4	1.72E-07	#REF!	3	1.43E-07	#REF!
10	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
11	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
12	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
13	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
14	4.30E-08	6	2.58E-07	2.581E-07	5	2.15E-07	2.15E-07
15	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
16	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
17	4.30E-08	4	1.72E-07	#REF!	3	1.43E-07	#REF!
18	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
19	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
20	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
21	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
22	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
23	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07
24	4.30E-08	4	1.72E-07	1.721E-07	3	1.43E-07	1.43E-07

Total HHDT/Day	87.0		72.5	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)				#REF!
Annual HHDT Based Or	31755			
Actual HHDT Based On	26445	**Phase 1 Alternative**		
Ratio	0.8328			

Annual HGV Traffic	tonnage	truck tonnage	Based on 21 US ton trucks trucks per year	distance travelled (km)	PM10 g/trip	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.725	0.0124	0.002	0.0003	0.0004	0.72
Phase 1 Trucks & Rail	720000	240000	13846	0.725	0.0124	0.002	0.0002	0.0002	0.38
Phase 1 Alternative	1350000	480000	26445	0.725	0.0124	0.002	0.0003	0.0004	0.72
Phase 2	1,160,000	214,400	12503	0.725	0.0124	0.002	0.0002	0.0002	0.34
Phase 2 Alternative	1,160,000	310,400	17542	0.725	0.0124	0.002	0.0002	0.0002	0.48

LDA Traffic	tonnage	movements/day	movement per year	distance travelled (miles)	PM10 g/trip	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	#REF!	#REF!	#REF!	#REF!	#REF!
Phase 1 Trucks & Rail	720000	24	4992	0.725	#REF!	#REF!	#REF!	#REF!	#REF!
Phase 1 Alternative	1350000	40	10400	0.725	#REF!	#REF!	#REF!	#REF!	#REF!
Phase 2	1,160,000	80	20800	0.725	#REF!	#REF!	#REF!	#REF!	#REF!
Phase 2 Alternative	1,160,000	80	20800	0.725	#REF!	#REF!	#REF!	#REF!	#REF!
								tpa	

		PM10 lbs/day	MTPA	tpa	lbs/year
Combined	Phase 1 Trucks Only	#REF!	#REF!	#REF!	#REF!
	Phase 1 Trucks & Rail	#REF!	#REF!	#REF!	#REF!
	Phase 1 Alternative	#REF!	#REF!	#REF!	#REF!
	Phase 2	#REF!	#REF!	#REF!	#REF!
	Phase 2 Alternative	#REF!	#REF!	#REF!	#REF!

PM2.5 Onsite Paved Road (TW & BW Emissions) - Assumed 10 miles/hr

Year 2020

HHDT Emission Factor

EMFAC2011 Emission Rates									*0.6214*
Region Type:	GAI								*mile to km*
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr		PM10_TW	PM10_BW	Combined
							(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0360	0.0617	0.0977

HHDT Idling Emission Factors					
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	
2020	HHDT	D	SV	A	
					annual
	Speed	5	miles/hr		
		8.046	km/hr		

HHDT Emission Factor					
		0.0000	g/mile		
T7 Single	g/vkt	0.0607	0.0977	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0562	0.0904	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2_5_RUNEX	PM2_5_PMTW	PM2_5_PMBW	PM10_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10		0.00800	0.03675	0.0448
2020	Annual	LDA	DSL	Aggregated	10		0.00800	0.03675	0.0448

LDA Idling Calculation					
2020	Annual	LDA	GAS	Aggregated	
Speed	5	miles/hr	GAS	Aggregated	Aggregated
	8.046	km/hr	DSL	Aggregated	Aggregated

			g/mile		
Gas LDA (ann)	g/vkt	0.0278	0.0448	EMFAC2011	start emissions - 10mins
DSL LDA (ann)	g/vkt	0.0278	0.0448	EMFAC2011	
Idling Gas LDA	g/vkt	0.0000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.0257	0.0414	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.0257	0.0414	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0257	0.0414	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM10		PM10	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.041	g/hr	0.019	based on annual
Emission Factor/vehicle	1.13E-05	g/sec	1.04E-04	includes all trips/day
Emissions /vehicle/AERMOD Source	1.41E-07	g/sec	1.30E-06	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	2 shifts	80
Phase 2	20	2 shifts	80
Phase 2 Alternative	20	2 shifts	80

Diurnal Emission Factors Based On Truck Movement Breakdown

phase 1 alternative

Weekday Hours	PM10 Emissions (g/s)	phase 1 alternative Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	Vehicles Per Hour	PM10 Including LDA	Annualised Emission Rate PM10 Including LDA
1	1.41E-07	0	0.00E+00	1.295E-06	0	0.00E+00	1.30E-06
2	1.41E-07	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
3	1.41E-07	0	0.00E+00	0.000E+00	0	0.00E+00	0.00E+00
4	1.41E-07	3	4.24E-07	4.243E-07	2	3.53E-07	3.53E-07
5	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
6	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
7	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
8	1.41E-07	6	8.49E-07	8.486E-07	5	7.07E-07	7.07E-07
9	1.41E-07	4	5.66E-07	3.156E-06	3	4.71E-07	3.06E-06
10	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
11	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
12	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
13	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
14	1.41E-07	6	8.49E-07	8.486E-07	5	7.07E-07	7.07E-07
15	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
16	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
17	1.41E-07	4	5.66E-07	1.861E-06	3	4.71E-07	1.77E-06
18	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
19	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
20	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
21	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
22	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
23	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07
24	1.41E-07	4	5.66E-07	5.657E-07	3	4.71E-07	4.71E-07

Total HHDT/Day	87.0		72.5	Annualised Emission Rate
	including deliveries (2 per day, 10am, 2pm)			6.43E-07
Annual HHDT Based Or	31755			
Actual HHDT Based On	26445	**Phase 1 Alternative**		
Ratio	0.8328			

Annual HGV Traffic	tonnage	truck tonnage	Based on 21 US ton trucks trucks per year	distance travelled (km)	PM10 g/trip	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.725	0.0407	0.008	0.0011	0.0012	2.37
Phase 1 Trucks & Rail	720000	240000	13846	0.725	0.0407	0.008	0.0006	0.0006	1.24
Phase 1 Alternative	1350000	480000	26445	0.725	0.0407	0.008	0.0011	0.0012	2.37
Phase 2	1,160,000	214,400	12503	0.725	0.0407	0.008	0.0005	0.0006	1.12
Phase 2 Alternative	1,160,000	310,400	17542	0.725	0.0407	0.008	0.0007	0.0008	1.58

LDA Traffic	tonnage	movements/day	movement per year	distance travelled (miles)	PM10 g/trip	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.0186	0.001	0.000070	0.000077	0.15
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.0186	0.001	0.000093	0.000103	0.21
Phase 1 Alternative	1350000	40	10400	0.725	0.0186	0.002	0.000194	0.000214	0.43
Phase 2	1,160,000	80	20800	0.725	0.0186	0.003	0.000388	0.000428	0.86
Phase 2 Alternative	1,160,000	80	20800	0.725	0.0186	0.003	0.000388	0.000428	0.86
								tpa	

		PM10 lbs/day	MTPA	tpa	lbs/year
Combined	Phase 1 Trucks Only	0.009	0.0011	0.0013	2.53
	Phase 1 Trucks & Rail	0.009	0.0007	0.0007	1.45

Phase 1 Alternative	0.009	0.0013	0.0014	2.80
Phase 2	0.011	0.0009	0.0010	1.98
Phase 2 Alternative	0.0111	0.0011	0.0012	2.43

PM10 Public Paved Road (Exhaust Emissions)

Year 2020

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor — PM_{10}

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC 2007 Categories					Annual		Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM10_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0228		0.023

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM10 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.004	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM10_run	g/mile		
T7 Single	g/vkt	0.014	0.023	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.000	0.001	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0131	0.0211	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor $PM_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM10_RUNEX		PM10_Combined
					miles/hr	(gms/mile)		(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.0035		0.0035
2020	Annual	LDA	DSL	Aggregated	20	0.0191		0.0191
Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		PM10_RUNEX		
						(gms/mile)	gms/km	
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0119	0.0074	
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0433	0.0269	

		PM10	g/mile		
Gas LDA (ann)	g/vkt	0.0022	0.0035	EMFAC2011	
DSL LDA (ann)	g/vkt	0.0119	0.0191	EMFAC2011	
Idling Gas LDA	g/vkt	0.0074	0.0119	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0269	0.0433	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.0026	0.0041	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.0130	0.0209	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0026	0.0042	sum	Based on 0.38% Diesel

Note: Emission Factor Includes tire & brake wear

AERMOD Model Inputs
Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.009	g/hr	0.0019	based on annual
Emission Factor/vehicle		0.0000026	g/sec	0.0000105	includes shift trips/day
Emissions /vehicle/AERMOD Source		5.14E-08	g/sec	2.05E-07	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/s)	Phase 2 Alternative Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	5.14E-08	0	0.00E+00	2.05E-07	0	0.00E+00	2.05E-07
2	5.14E-08	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	5.14E-08	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	5.14E-08	3	3.09E-07	3.09E-07	2	2.57E-07	2.57E-07
5	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
6	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
7	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
8	5.14E-08	6	6.17E-07	6.17E-07	5	5.14E-07	5.14E-07
9	5.14E-08	4	4.12E-07	8.22E-07	3	3.43E-07	7.53E-07
10	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
11	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
12	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
13	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
14	5.14E-08	6	6.17E-07	6.17E-07	5	5.14E-07	5.14E-07
15	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
16	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
17	5.14E-08	4	4.12E-07	6.17E-07	3	3.43E-07	5.48E-07
18	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
19	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
20	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
21	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
22	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
23	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07
24	5.14E-08	4	4.12E-07	4.12E-07	3	3.43E-07	3.43E-07

	Maximum Day	Annual Mean	Annualised Emission Rate
	87.0	72.5	3.45E-07
	including deliveries (2 per day, 10am, 2pm)	including deliveries (2 per day, 10am, 2pm)	

PM10 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	0.013	0.0026	Lemon
Controlled Emission factor, E (annual)	g/VKT	0.0044	0.0014	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon
Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.002	g/hr	0.0007	based on annual
Emission Factor/vehicle		6.45E-07	g/sec	4.14E-06	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.93E-08	g/sec	1.88E-07	

Sonoma North of Lemon			0.525
Split	0.05		km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	2.93E-08	0.00	0.00E+00	9.40E-09	0	0.00E+00	9.40E-09
2	2.93E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	2.93E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	2.93E-08	0.15	8.80E-09	8.80E-09	0	7.33E-09	7.33E-09
5	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
6	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
7	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
8	2.93E-08	0.30	1.76E-08	1.76E-08	0	1.47E-08	1.47E-08
9	2.93E-08	0.20	1.17E-08	3.05E-08	0	9.77E-09	2.86E-08
10	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
11	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
12	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
13	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
14	2.93E-08	0.30	1.76E-08	1.76E-08	0	1.47E-08	1.47E-08
15	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
16	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
17	2.93E-08	0.20	1.17E-08	2.11E-08	0	9.77E-09	1.92E-08
18	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
19	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09

20	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
21	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
22	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
23	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09
24	2.93E-08	0.20	1.17E-08	1.17E-08	0	9.77E-09	9.77E-09

g/sec

4.4	3.6	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)	including deliveries (2 per day, 10am, 2pm)	1.04E-08

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	31		31	
Distance Travelled (Lemon Street)	0.735	km	0.735	
Emission Factor/vehicle	0.003	g/hr	0.001	based on annual
Emission Factor/vehicle	0.0000009	g/sec	0.0000058	includes shift trips/day
Emissions /vehicle/AERMOD Source	2.91E-08	g/sec	1.87E-07	

Sonoma South of Lemon		0.735
Split	0.39	km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	2.91E-08	0	0.00E+00	7.28E-08	0.00	0.00E+00	7.28E-08
2	2.91E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	2.91E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	2.91E-08	1	6.82E-08	6.82E-08	0.97	5.68E-08	5.68E-08
5	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
6	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
7	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
8	2.91E-08	2	1.36E-07	1.36E-07	1.95	1.14E-07	1.14E-07
9	2.91E-08	2	9.09E-08	2.37E-07	1.30	7.57E-08	2.21E-07
10	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
11	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
12	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
13	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
14	2.91E-08	2	1.36E-07	1.36E-07	1.95	1.14E-07	1.14E-07
15	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
16	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
17	2.91E-08	2	9.09E-08	1.64E-07	1.30	7.57E-08	1.49E-07
18	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
19	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
20	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
21	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
22	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
23	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08
24	2.91E-08	2	9.09E-08	9.09E-08	1.30	7.57E-08	7.57E-08

g/hr

33.9	28.3	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)	including deliveries (2 per day, 10am, 2pm)	8.08E-08

Distance

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle	0.011	g/hr	0.002	based on annual
Emission Factor/vehicle	0.00000299	g/sec	0.00001193	includes shift trips/day
Emissions /vehicle/AERMOD Source	5.86E-08	g/sec	2.34E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	5.86E-08	0	0.00E+00	1.31E-07	0.00	0.00E+00	1.31E-07
2	5.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	5.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	5.86E-08	2	1.97E-07	1.97E-07	1.40	1.64E-07	1.64E-07
5	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
6	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
7	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
8	5.86E-08	3	3.94E-07	3.94E-07	2.80	3.28E-07	3.28E-07
9	5.86E-08	2	2.62E-07	5.24E-07	1.87	2.19E-07	4.80E-07
10	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
11	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
12	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
13	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
14	5.86E-08	3	3.94E-07	3.94E-07	2.80	3.28E-07	3.28E-07
15	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
16	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
17	5.86E-08	2	2.62E-07	3.93E-07	1.87	2.19E-07	3.50E-07
18	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
19	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
20	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
21	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
22	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
23	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07
24	5.86E-08	2	2.62E-07	2.62E-07	1.87	2.19E-07	2.19E-07

g/hr

48.7	40.6	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)	including deliveries (2 per day, 10am, 2pm)	2.20E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	
Emission Factor/vehicle	0.003	g/hr	0.001	based on annual
Emission Factor/vehicle	0.0000009	g/sec	0.0000055	includes shift trips/day
Emissions /vehicle/AERMOD Source	2.96E-08	g/sec	1.90E-07	

Sonoma South of Magazine		0.698
Split	0.39	km

Phase 2 Alternative

	PM10	PM10	PM10	PM10	PM10	PM10	PM10

Weekday Hours	Emissions (g/sec)	Vehicles Per Hour	Emissions (g/sec)	Including LDA	Vehicles Per Hour	Including LDA	Including LDA
1	2.96E-08	0	0.00E+00	7.40E-08	0.00	0.00E+00	7.40E-08
2	2.96E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	2.96E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	2.96E-08	1	6.92E-08	6.92E-08	0.97	5.77E-08	5.77E-08
5	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
6	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
7	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
8	2.96E-08	2	1.38E-07	1.38E-07	1.95	1.15E-07	1.15E-07
9	2.96E-08	2	9.23E-08	2.40E-07	1.30	7.69E-08	2.25E-07
10	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
11	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
12	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
13	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
14	2.96E-08	2	1.38E-07	1.38E-07	1.95	1.15E-07	1.15E-07
15	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
16	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
17	2.96E-08	2	9.23E-08	1.66E-07	1.30	7.69E-08	1.51E-07
18	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
19	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
20	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
21	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
22	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
23	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
24	2.96E-08	2	9.23E-08	9.23E-08	1.30	7.69E-08	7.69E-08
				g/s			
		33.9			28.3		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		8.20E-08
	check	87.0			72.5		

		Deliveries	Staff
Distance Travelled		80.47	39.91
Units		km	km
Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	trucks per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.467	1.06	1.06	0.202	0.0279	0.0308	61.53
Phase 1 Trucks & Rail	720000	240000	13846	80.467	1.06	1.06	0.202	0.0146	0.0161	32.22
Phase 1 Alternative	1350000	480000	26445	80.467	1.06	1.06	0.202	0.0279	0.0308	61.53
Phase 2	1,160,000	214,400	12503	80.467	1.06	1.06	0.202	0.0132	0.0145	29.09
Phase 2 Alternative	1,160,000	310,400	17542	80.467	1.06	1.06	0.202	0.0185	0.0204	40.82

LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	0.10	0.10	0.006	0.0004	0.0004	0.86
Phase 1 Trucks & Rail	720000	24	4992	39.910	0.10	0.10	0.006	0.0005	0.0006	1.15
Phase 1 Alternative	1350000	40	10400	39.910	0.10	0.10	0.009	0.0011	0.0012	2.40
Phase 2	1,160,000	80	20800	39.910	0.10	0.10	0.018	0.0022	0.0024	4.79
Phase 2 Alternative	1,160,000	80	20800	39.910	0.10	0.10	0.018	0.0022	0.0024	4.79
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.208	0.0283	0.0312	62.4
						Phase 1 Trucks & Rail	0.208	0.0151	0.0167	33.4
						Phase 1 Alternative	0.212	0.0290	0.0320	63.9
						Phase 2	0.221	0.0154	0.0169	33.9
						Phase 2 Alternative	0.221	0.0207	0.0228	45.6

PM10 Public Paved Road (Exhaust Emissions)

Year 2020

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor PM$_{10}$

EMFAC2011 Emission Rates									0.6214
Region Type:	GAI								mile to km
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr		PM10_TW	PM10_BW	Combined
							(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0360	0.0617	0.098

HHDT Idling Emission Factors				
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season
2020	HHDT	D	SV	A
	Speed	5	miles/hr	
		8.046	km/hr	

HHDT Emission Factor					
		0.0000	g/mile		
T7 Single	g/vkt	0.061	0.098	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.000	0.000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0562	0.0904	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor PM$_{10}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed		PM10_TW	PM10_BW	PM10_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20		0.0020	0.0157	0.018
2020	Annual	LDA	DSL	Aggregated	20		0.0020	0.0157	0.018
Idling Calculation									
2020	Annual	LDA	GAS	Aggregated		0			
						(gms/mile)	gms/km		
Speed	5	miles/hr	GAS	Aggregated	Aggregated		0.0000		
	8.046	km/hr	DSL	Aggregated	Aggregated		0.0000		

		PM10	g/mile		
Gas LDA (ann)	g/vkt	0.0110	0.0177	EMFAC2011	
DSL LDA (ann)	g/vkt	0.0110	0.0177	EMFAC2011	
Idling Gas LDA	g/vkt	0.0000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.0102	0.0164	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.0102	0.0164	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0102	0.0164	sum	Based on 0.38% Diesel

Note: Emission Factor Includes tire & brake wear

AERMOD Model Inputs
Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.040	g/hr	0.0073	based on annual
Emission Factor/vehicle		0.0000112	g/sec	0.0000408	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.20E-07	g/sec	8.00E-07	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/s)	Phase 2 Alternative Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	2.20E-07	0	0.00E+00	8.00E-07	0	0.00E+00	8.00E-07
2	2.20E-07	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	2.20E-07	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	2.20E-07	3	1.32E-06	1.32E-06	2	1.10E-06	1.10E-06
5	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
6	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
7	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
8	2.20E-07	6	2.64E-06	2.64E-06	5	2.20E-06	2.20E-06
9	2.20E-07	4	1.76E-06	3.36E-06	3	1.47E-06	3.07E-06
10	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
11	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
12	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
13	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
14	2.20E-07	6	2.64E-06	2.64E-06	5	2.20E-06	2.20E-06
15	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
16	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
17	2.20E-07	4	1.76E-06	2.56E-06	3	1.47E-06	2.27E-06
18	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
19	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
20	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
21	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
22	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
23	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
24	2.20E-07	4	1.76E-06	1.76E-06	3	1.47E-06	1.47E-06
		Maximum Day			Annual Mean		Annualised Emission Rate
		87.0			72.5		1.46E-06
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		

PM10 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	0.056	0.0102	Lemon
Controlled Emission factor, E (annual)	g/VKT	0.0562	0.0102	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon
Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.029	g/hr	0.0054	based on annual
Emission Factor/vehicle		8.19E-06	g/sec	2.98E-05	includes shift trips/day
Emissions /vehicle/AERMOD Source		3.72E-07	g/sec	1.35E-06	

Sonoma North of Lemon		0.525
Split	0.05	km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	3.72E-07	0.00	0.00E+00	6.76E-08	0	0.00E+00	6.76E-08
2	3.72E-07	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	3.72E-07	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	3.72E-07	0.15	1.12E-07	1.12E-07	0	9.30E-08	9.30E-08
5	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
6	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
7	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
8	3.72E-07	0.30	2.23E-07	2.23E-07	0	1.86E-07	1.86E-07
9	3.72E-07	0.20	1.49E-07	2.84E-07	0	1.24E-07	2.59E-07
10	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
11	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
12	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
13	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
14	3.72E-07	0.30	2.23E-07	2.23E-07	0	1.86E-07	1.86E-07
15	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
16	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07

17	3.72E-07	0.20	1.49E-07	2.17E-07	0	1.24E-07	1.92E-07
18	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
19	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
20	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
21	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
22	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
23	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
24	3.72E-07	0.20	1.49E-07	1.49E-07	0	1.24E-07	1.24E-07
				g/sec			
		4.4			3.6		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		1.24E-07

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	
Emission Factor/vehicle		0.041	g/hr	0.007	based on annual
Emission Factor/vehicle		0.0000115	g/sec	0.0000417	includes shift trips/day
Emissions /vehicle/AERMOD Source		3.70E-07	g/sec	1.34E-06	

Sonoma South of Lemon		0.735
Split	0.39	km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	3.70E-07	0	0.00E+00	5.24E-07	0.00	0.00E+00	5.24E-07
2	3.70E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	3.70E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	3.70E-07	1	8.66E-07	8.66E-07	0.97	7.21E-07	7.21E-07
5	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
6	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
7	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
8	3.70E-07	2	1.73E-06	1.73E-06	1.95	1.44E-06	1.44E-06
9	3.70E-07	2	1.15E-06	2.20E-06	1.30	9.61E-07	2.01E-06
10	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
11	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
12	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
13	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
14	3.70E-07	2	1.73E-06	1.73E-06	1.95	1.44E-06	1.44E-06
15	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
16	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
17	3.70E-07	2	1.15E-06	1.68E-06	1.30	9.61E-07	1.49E-06
18	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
19	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
20	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
21	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
22	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
23	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
24	3.70E-07	2	1.15E-06	1.15E-06	1.30	9.61E-07	9.61E-07
				g/hr			
		33.9			28.3		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		9.59E-07
				Distance			

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		16	m	16	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.046	g/hr	0.008	based on annual
Emission Factor/vehicle		0.00001280	g/sec	0.00004648	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.51E-07	g/sec	9.11E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	2.51E-07	0	0.00E+00	5.10E-07	0.00	0.00E+00	5.10E-07
2	2.51E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	2.51E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	2.51E-07	2	8.43E-07	8.43E-07	1.40	7.02E-07	7.02E-07
5	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
6	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
7	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
8	2.51E-07	3	1.69E-06	1.69E-06	2.80	1.40E-06	1.40E-06
9	2.51E-07	2	1.12E-06	2.14E-06	1.87	9.36E-07	1.96E-06
10	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
11	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
12	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
13	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
14	2.51E-07	3	1.69E-06	1.69E-06	2.80	1.40E-06	1.40E-06
15	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
16	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
17	2.51E-07	2	1.12E-06	1.63E-06	1.87	9.36E-07	1.45E-06
18	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
19	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
20	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
21	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
22	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
23	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
24	2.51E-07	2	1.12E-06	1.12E-06	1.87	9.36E-07	9.36E-07
				g/hr			
		48.7			40.6		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		9.33E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM10		PM10	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	
Emission Factor/vehicle		0.039	g/hr	0.007	based on annual

Emission Factor/vehicle		0.0000109	g/sec	0.0000396	includes shift trips/day
0		3.76E-07	g/sec	1.36E-06	

Sonoma South of Magazine			0.698
Split	0.39		km

Phase 2 Alternative

Weekday Hours	PM10 Emissions (g/sec)	PM10 Vehicles Per Hour	PM10 Emissions (g/sec)	PM10 Including LDA	PM10 Vehicles Per Hour	PM10 Including LDA	PM10 Including LDA
1	3.76E-07	0	0.00E+00	5.32E-07	0.00	0.00E+00	5.32E-07
2	3.76E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	3.76E-07	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	3.76E-07	1	8.79E-07	8.79E-07	0.97	7.32E-07	7.32E-07
5	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
6	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
7	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
8	3.76E-07	2	1.76E-06	1.76E-06	1.95	1.46E-06	1.46E-06
9	3.76E-07	2	1.17E-06	2.24E-06	1.30	9.76E-07	2.04E-06
10	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
11	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
12	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
13	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
14	3.76E-07	2	1.76E-06	1.76E-06	1.95	1.46E-06	1.46E-06
15	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
16	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
17	3.76E-07	2	1.17E-06	1.70E-06	1.30	9.76E-07	1.51E-06
18	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
19	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
20	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
21	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
22	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
23	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
24	3.76E-07	2	1.17E-06	1.17E-06	1.30	9.76E-07	9.76E-07
				g/s			
		33.9			28.3		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		9.73E-07
	check	87.0			72.5		

		Deliveries	Staff
Distance Travelled		80.47	39.91
Units		km	km
Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	trucks per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.467	4.52	4.52	0.867	0.1195	0.1318	263.56
Phase 1 Trucks & Rail	720000	240000	13846	80.467	4.52	4.52	0.867	0.0626	0.0690	138.00
Phase 1 Alternative	1350000	480000	26445	80.467	4.52	4.52	0.867	0.1195	0.1318	263.56
Phase 2	1,160,000	214,400	12503	80.467	4.52	4.52	0.867	0.0565	0.0623	124.60
Phase 2 Alternative	1,160,000	310,400	17542	80.467	4.52	4.52	0.867	0.0793	0.0874	174.83
LDA Traffic					PM10	PM10	PM10	PM10	PM10	PM10
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	0.41	0.41	0.022	0.0015	0.0017	3.36
Phase 1 Trucks & Rail	720000	24	4992	39.910	0.41	0.41	0.022	0.0020	0.0022	4.48
Phase 1 Alternative	1350000	40	10400	39.910	0.41	0.41	0.036	0.0042	0.0047	9.34
Phase 2	1,160,000	80	20800	39.910	0.41	0.41	0.072	0.0085	0.0093	18.67
Phase 2 Alternative	1,160,000	80	20800	39.910	0.41	0.41	0.072	0.0085	0.0093	18.67
									tpa	
							PM10			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.889	0.1211	0.1335	266.9
						Phase 1 Trucks & Rail	0.889	0.0646	0.0712	142.5
						Phase 1 Alternative	0.903	0.1238	0.1364	272.9
						Phase 2	0.939	0.0650	0.0716	143.3
						Phase 2 Alternative	0.939	0.0878	0.0967	193.5

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	PM (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.86**				

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported		
Production Capacity	100 tons per hour		
Hours Of Operation	7600	per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)		
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)		
Ship Unloading Capacity	**303**		
Duration of ship unloading	**132**	**hrs**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508hrs, manuverving & transit = 2hrs x 19 = 38hrs
	Material Handling	Ongoing	303 tons per hrs using grab crane via two mobile hoppers. 3 Onsite Hoppers based on 100 tons per hour for 7600 hour per year. Includes ship uploading, conveyor drops, excavator upload & drop and front loader upload and drop.
	Raw Material Storage Piles	Variable (depending on year)	All Year Stockpiling Assumed At Both RMSPs

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported		
Production Capacity	100 tons per hour		
Hours Of Operation	7600	per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)		
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)		
Ship Unloading Capacity	**303**		
Duration of ship unloading	**132**	**hrs**	

Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508hrs, manuverving & transit = 2hrs x 19 = 38hrs
	Material Handling	Ongoing	303 tons per hrs using grab crane via two mobile hoppers. 3 Onsite Hoppers based on 100 tons per hour for 7600 hour per year. Includes ship uploading, conveyor drops, excavator upload & drop and front loader upload and drop.
	Raw Material Storage Piles	Variable (depending on year)	All Year Stockpiling Assumed At Both RMSPs

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 59103.9m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Orcem California Inc., Mode 1 (Milestone 5)**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	**59103.9**	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	3.46	3.70%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.36	10.20%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	

Auxilliary Engine	
Hoteling	0.06
Maneuvering	0.275
Transit	0.104

Source: (CARB (2011) Appendix D)

Main Engine		
Transit		
Engine Speed	**Fuel**	
		PM25
Slow	Marine Distillate (0.1% S)	**0.24405**
Medium	Marine Distillate (0.1% S)	**0.24405**
		g/kW-HR
Maneuvering		
Engine Speed	**Fuel**	
		PM25
Slow	Marine Distillate (0.1% S)	**0.24405**
Medium	Marine Distillate (0.1% S)	**0.24405**
		g/kW-HR

Auxiliary Engine		
Engine Speed	**Fuel**	
		PM25
Medium	Marine Distillate (0.1% S)	**0.23001**
		g/kW-HR

Boiler	
	PM25
Marine Distillate (0.1% S)	**0.130**
	g/kW-HR

Tug	
	PM25
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

	PM2.5 Emissions (g/yr)	Milestone 5 Emissions/Sec
ship upload 1	468.7	1.49E-05
ship upload 2	468.7	1.49E-05
mobile hopper 1	468.7	1.49E-05
mobile hopper 2	468.7	1.49E-05
conveyor1	937.5	2.97E-05
intake hopper	937.5	2.97E-05
front loading upload 1	468.7	1.49E-05
front loading upload 2	468.7	1.49E-05
excavator upload & drop1	937.5	2.97E-05
excavator upload & drop2	937.5	2.97E-05
millfeed	965.6	3.06E-05
elevator drop	965.6	3.06E-05
main silo	937.5	2.97E-05
gypsum silo	28.1	8.92E-07
main silo conveyor	937.5	2.97E-05
gypsum silo conveyor	28.1	8.92E-07
mill intake	965.6	3.06E-05
conveyor drop 1	468.7	1.49E-05
conveyor drop 2	468.7	1.49E-05
gypsum handling (drop & upload)	28.1	8.92E-07

Annual Average

Slag Heap South			Slag Heap North			Slag Heap 3 - Gypsum		
Count	39	hr	**Count**	39	hr	**Count**	39	hr
Total	10699.0	g	**Average / event**	28784.1	g	**Average / event**	8462.6	g

Mass Emission			**Mass Emission**			**Mass Emission**		
PM10	5.35E-04	**Tonnes**	**PM10**	3.60E-04	**Tonnes**	**PM10**	1.06E-04	**Tonnes**
PM2.5	8.02E-05	**Tonnes**	**PM2.5**	5.40E-05	**Tonnes**	**PM2.5**	1.59E-05	**Tonnes**

Annualised Emission Rate

Mass Emission			**Mass Emission**			**Mass Emission**		
PM10	**1.70E-05**	**g/s**	**PM10**	**1.14E-05**	**g/s**	**PM10**	**3.35E-06**	**g/s**
PM2.5	**2.54E-06**	**g/s**	**PM2.5**	**1.71E-06**	**g/s**	**PM2.5**	**5.03E-07**	**g/s**

Mass Emission			**Mass Emission**			**Mass Emission**		
PM10	**1.18E-08**	**g/s*m2**	**PM10**	**2.94E-09**	**g/s*m2**	**PM10**	**2.94E-09**	**g/s*m2**
PM2.5	**1.77E-09**	**g/s*m2**	**PM2.5**	**4.41E-10**	**g/s*m2**	**PM2.5**	**4.42E-10**	**g/s*m2**

PM10			PM10	PM10	PM10	PM10
	tonnage	hours of operation	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	1200	0.0191	0.00016	0.00017	0.348
milestone 2	240000	2400	0.0191	0.00016	0.00017	0.348
milestone 3	360000	3600	0.0191	0.00032	0.00035	0.697
milestone 4	480000	4800	0.0191	0.00047	0.00052	1.045
milestone 5	760000	7600	0.0191	0.00063	0.0007	1.393

PM2.5			PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	hours of operation	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	1200	0.00287	0.00002	0.00002	0.047
milestone 2	240000	2400	0.00287	0.00004	0.00005	0.093
milestone 3	360000	3600	0.00287	0.00006	0.00007	0.140
milestone 4	480000	4800	0.00287	0.00008	0.00009	0.187
milestone 5	760000	7600	0.00287	0.00013	0.0001	0.296

Mobile Hoppers / Conveyors

	Load Factor	kw	PM10
Hopper / Conveyor	0.40	201	0.0100
			g/(hp-hr)
Deterioration Rate	3.70E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.852		
Emission Rate	0.699	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate /Hopper / Conveyor PM10	0.000194	g/s	
PM2.5/PM10 Ratio	0.92		
Emission Rate / Hopper / Conveyor PM2.5	0.000179	g/s	
			Milestone 5

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)

OFFROAD2011	Load Factor	HP	PM10
Excavator	0.3819	175	0.010
			g/(hp-hr)
Deterioration Rate	5.00E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 5 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	0.630	g/hr	

Activity Factor	0.25	Fractional usage per hour

Emission Rate / Excavator PM10	0.000044	g/s
PM2.5/PM10 Ratio	0.92	
Emission Rate / Excavator PM2.5	0.000040	g/s

tonnes to ton	*1.1023*
ton to tonnes	*0.9072*

Unpaved Road - Industrial (Excavator - 1 in operation for Milestone 5)

Maximum 24-Hour Scenario

Project: Orcem, Vallejo

Unpaved Roads (Chapter 13.2.2 AP42 Dated 11/2006)

$$E = [281.9 * k * (s/12)^a (W/3)^b \text{ g/veh km}$$

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	20	20	Assumption for excavator
Wet Days Per Year	Days	0	0	24-Maximum Scenario
Constant, k	lb/VMT	1.5	0.15	AP42 Table 13.2.2-2
Constant, a		0.9	0.9	AP42 Table 13.2.2-2
Constant, b		0.45	0.45	AP42 Table 13.2.2-2
Silt content, s	%	4.8	4.8	AP42 Table 13.2.2-1
Uncontrolled Emission factor, E	lb/VMT	1.54	0.15	Calculation
Uncontrolled Emission factor, E	g/VKT	435.31	43.53	Calculation
Control Efficiency for Watering	Factor	0.968	0.968	Cumulative efficiency based on dust suppression using MgCl2, frequent watering & 15 mph speed limit
Controlled Emission factor, E	g/VKT	**13.93**	**1.39**	Calculation

AERMOD Model Inputs

PM10			
Speed	**16**	**km/hr**	**(10 miles/hr)**
	Maximum 24-Hr		
Slag Heap North Sources	**12**		
Slag Heap South Sources	**5**		
Spacing Slag Heap North	**0.010**		
Spacing Slag Heap South	**0.009**		
Distance Travelled Slag Heap N	**0.120**		
Distance Travelled Slag Heap S	**0.045**		
Trips / hour	**7.4**	**split 50:50 S1 & S2**	

Front Loader Trips		
Volume of front loader		**12.2**
Density of GGBS		**1.20**
Tonnage / front loader		**14.64**
Tons / front loader		**16.14**
Tonnage	**Hours of operation**	**Trips/annum**
120000	**1105.263158**	**8197**
240000	**2210.526316**	**16393**
360000	**3315.789474**	**24590**
480000	**4421.052632**	**32787**
760000	**7000**	**51913**

Slag Heap North	**Maximum 24-Hr**		
Distance	**0.120**	**km**	
			Trips per hour
Tonnage	**380,000**	**milestone 5**	**1.0**
			Traverses the slag heap once per hour
PM10 Emission Rate	**0.000464**	**g/sec**	

Unpaved Road - Industrial (Front Loader (2 CNG / LPG / Propane in operation for Milestone 5))

OFFROAD	Load Factor	HP	PM10 (Diesel)
Front Loader	0.3618	369	0.010
			g/(hp-hr)
Deterioration Rate	3.75E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	0.852		
Emission Rate	1.10	g/hr	

Activity Factor	0.75	Fractional usage per hour		
Front Loader Hours Of Operation	7000.0	hrs (milestone 5)	Combined	
Emission Rate / Front Loader PM10	0.000229	g/s	0.000273	including excavator exhaust emissions
PM2.5/PM10 Ratio	0.92		0.92	
Emission Rate / Front Loader PM2.5	0.000211	g/s	0.000251	including excavator exhaust emissions

	Maximum 24-hrs	Annual Mean
Sources (Slag Heap N)	12	28
Sources (Slag Heap S)	5	28

Maximum 24-Hours	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	2.27E-05	g/s	2.09E-05	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	5.46E-05	g/s	5.02E-05	including excavator exhaust emissions

Annual Mean	PM10		PM2.5	
Emission Rate / Front Loader / Source (SHN)	9.75E-06	g/s	8.97E-06	including excavator exhaust emissions
Emission Rate / Front Loader / Source (SHS)	9.75E-06	g/s	8.97E-06	including excavator exhaust emissions

PM10	Front Loader - Gypsum Loading			
Emission Rate	1.10	g/hr		
	0.00031	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	0.069	g/km		Tonnage / front loader
Gypsum Storage Sources	28			Tons / front loader
Time per trip	0.035	hrs		
Spacing storage	0.010	km		Tonnage
				3,522
Distance Travelled S3	0.560	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.24	14,088
				22,306
Emissions per hour S3	0.0385	g/hr	0.00914	
Emissions per sec S3	0.0000107	g/sec	0.00000254	
	PM10 Maximum Day		PM10 Annual Mean	PM2.5 Maximum Day
Emissions per sec S3/source	3.82E-07	g/sec	9.07E-08	3.51E-07

tonnes to ton	*1.1023*
ton to tonnes	*0.9072*

Unpaved Road - Industrial (Front Loader stockpile to hopper)

Maximum 24-Hour Scenario				
Project: Orcem, Vallejo				
Unpaved Roads (Chapter 13.2.2 AP42 Dated 11/2006)				
E =[281.9*k*(s/12)^a(W/3)^b g/veh km				
Parameter	**Units**	**PM10**	**PM2.5**	**Reference**
Mean Vehicle Weight	**tons**	**42.5**	**42.5**	**CAT980 (34.43 empty, 16.14 tons load)**
Wet Days Per Year	**Days**	**0**	**0**	**24-Maximum**
Constant, k	**lb/VMT**	**1.5**	**0.15**	**AP42 Table 13.2.2-2**
Constant, a		**0.9**	**0.9**	**AP42 Table 13.2.2-2**
Constant, b		**0.45**	**0.45**	**AP42 Table 13.2.2-2**
Silt content, s	**%**	**4.8**	**4.8**	**AP42 Table 13.2.2-1**
Uncontrolled Emission factor, E	**lb/VMT**	**2.17**	**0.22**	**Calculation**
Uncontrolled Emission factor, E	**g/VKT**	**611.10**	**61.11**	**Calculation**
Control Efficiency for Watering	**Factor**	**0.968**	**0.968**	**Cumulative efficiency based on dust suppression using MgCl2, frequent watering & 15 mph speed limit**
Controlled Emission factor, E	**g/VKT**	**19.56**	**1.96**	**Calculation**

AERMOD Model Inputs

Unpaved road modelled as a series of adjacent volume sources

Front loader will take material from each raw material storage pile and load the hopper during normal operating hours.

Slag Heap North	**Maximum 24-hr**				
Average Distance Per Trip	**0.120**	**km**	(one-way)		
Volume of front loader	**12.20**	**m3**			
Density of GGBS	**1.20**				
Tonnage / front loader	**14.64**	**tonnes**			
Tons / front loader	**16.14**	**tons**	**Trips/annum**	**Hours Of operation**	**Trips per hour**
Tonnage Deposited In SHN	**380,000**	**milestone 5**	25956	7000.0	3.7
PM10 Emission Rate	**0.00483**	**g/sec**			(one-way)

PM2.5 Onsite Paved Road (Exhaust Emissions)

HHDT Emission Factor

EMFAC2011 Emission Rates									*0.6214*
Region Type:	GAI								*mile to km*
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM25_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0284			0.0284

HHDT Idling Emission Factors							
CY	EMFAC2007 Vehicle C:	Fuel_Type	air_basin	season			PM2.5 (g/hr-veh)
2020	HHDT	D	SV	A			
						annual	0.003
	Speed	5	miles/hr				
		8.046	km/hr				

HHDT Emission Factor					
		PM25_run	g/mile		
T7 Single	g/vkt	0.0176	0.0284	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0163	0.0263	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2_5_RUNEX	PM2_5_PMTW	PM2_5_PMBW	PM2_5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.0069			0.00039	0.00691
2020	Annual	LDA	DSL	Aggregated	10	0.0306			0.00000	0.03060
LDA Idling Calculation										
2020	Annual	LDA	GAS	Aggregated		PM2_5_RUNEX				
						(gms/mile)	gms/km			
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0109	0.0068			
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0414	0.0258			

		PM25_run	g/mile		
Gas LDA (ann)	g/vkt	0.00482	0.0078	EMFAC2011	start emissions - one start per day averaged over onsite trip distance (0.755km)
DSL LDA (ann)	g/vkt	0.01902	0.0306	EMFAC2011	
Idling Gas LDA	g/vkt	0.00680	0.0109	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02575	0.0414	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00497	0.0080	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01952	0.0314	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0050	0.0081	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.012	g/hr	0.004	based on annual
Emission Factor/vehicle	3.43E-06	g/sec	1.69E-05	includes all trips/day
Emissions /vehicle/AERMOD Source	4.13E-08	g/sec	2.03E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM2.5 Emissions (g/s)	Milestone 5 Vehicles Per Hour	PM2.5 Emissions (g/s)	PM2.5 Including LDA
1	4.13E-08	5	2.01E-07	4.040E-07
2	4.13E-08	6	2.68E-07	2.679E-07
3	4.13E-08	10	4.02E-07	4.019E-07
4	4.13E-08	11	4.69E-07	4.689E-07
5	4.13E-08	13	5.36E-07	5.358E-07
6	4.13E-08	13	5.36E-07	5.358E-07
7	4.13E-08	13	5.36E-07	5.358E-07
8	4.13E-08	13	5.36E-07	5.358E-07
9	4.13E-08	13	5.36E-07	9.419E-07
10	4.13E-08	13	5.36E-07	5.358E-07
11	4.13E-08	15	6.18E-07	6.185E-07
12	4.13E-08	13	5.36E-07	5.358E-07
13	4.13E-08	11	4.69E-07	4.689E-07
14	4.13E-08	5	2.01E-07	2.009E-07
15	4.13E-08	7	2.84E-07	2.836E-07
16	4.13E-08	0	0.00E+00	0.000E+00
17	4.13E-08	0	0.00E+00	2.030E-07
18	4.13E-08	0	0.00E+00	0.000E+00
19	4.13E-08	0	0.00E+00	0.000E+00
20	4.13E-08	0	0.00E+00	0.000E+00
21	4.13E-08	0	0.00E+00	0.000E+00
22	4.13E-08	0	0.00E+00	0.000E+00
23	4.13E-08	2	6.70E-08	6.698E-08
24	4.13E-08	3	1.34E-07	1.340E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	Maximum 24-Hour PM2.5 Including LDA
1	4.13E-08	5	2.01E-07	4.04E-07
2	4.13E-08	6	2.68E-07	2.68E-07
3	4.13E-08	10	4.02E-07	4.02E-07
4	4.13E-08	11	4.69E-07	4.69E-07
5	4.13E-08	13	5.36E-07	5.36E-07
6	4.13E-08	13	5.36E-07	5.36E-07
7	4.13E-08	13	5.36E-07	5.36E-07
8	4.13E-08	19	7.84E-07	7.84E-07
9	4.13E-08	19	7.84E-07	1.19E-06
10	4.13E-08	19	7.84E-07	7.84E-07
11	4.13E-08	21	8.66E-07	8.66E-07
12	4.13E-08	19	7.84E-07	7.84E-07
13	4.13E-08	17	7.17E-07	7.17E-07
14	4.13E-08	11	4.49E-07	4.49E-07
15	4.13E-08	13	5.31E-07	5.31E-07
16	4.13E-08	6	2.48E-07	2.48E-07
17	4.13E-08	6	2.48E-07	4.51E-07
18	4.13E-08	0	0.00E+00	0.00E+00
19	4.13E-08	0	0.00E+00	0.00E+00
20	4.13E-08	0	0.00E+00	0.00E+00
21	4.13E-08	0	0.00E+00	0.00E+00
22	4.13E-08	0	0.00E+00	0.00E+00
23	4.13E-08	2	6.70E-08	6.70E-08
24	4.13E-08	3	1.34E-07	1.34E-07

226.1

including deliveries (2 per day, 10am, 2pm)

Annual Average Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	Emissions (g/s) Including LDA	Annualised Emission Rate Emissions (g/s) Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	4.13E-08	5	2.01E-07	4.04E-07	3.50E-07	2.54E-07	6.04E-07
2	4.13E-08	6	2.68E-07	2.68E-07	2.32E-07	0.00E+00	2.32E-07
3	4.13E-08	10	4.02E-07	4.02E-07	3.49E-07	0.00E+00	3.49E-07
4	4.13E-08	11	4.69E-07	4.69E-07	4.07E-07	1.03E-07	5.10E-07
5	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07	1.37E-07	6.02E-07
6	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07	1.37E-07	6.02E-07
7	4.13E-08	13	5.36E-07	5.36E-07	4.65E-07	1.37E-07	6.02E-07
8	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07	2.06E-07	6.99E-07
9	4.13E-08	14	5.68E-07	9.75E-07	8.45E-07	6.45E-07	1.49E-06
10	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07	1.37E-07	6.30E-07
11	4.13E-08	16	6.51E-07	6.51E-07	5.65E-07	1.37E-07	7.02E-07
12	4.13E-08	14	5.68E-07	5.68E-07	4.93E-07	1.37E-07	6.30E-07
13	4.13E-08	12	5.01E-07	5.01E-07	4.35E-07	1.37E-07	5.72E-07
14	4.13E-08	6	2.34E-07	2.34E-07	2.03E-07	2.06E-07	4.08E-07
15	4.13E-08	8	3.16E-07	3.16E-07	2.74E-07	1.37E-07	4.11E-07
16	4.13E-08	1	3.26E-08	3.26E-08	2.83E-08	1.37E-07	1.65E-07
17	4.13E-08	1	3.26E-08	2.36E-07	2.04E-07	3.91E-07	5.95E-07
18	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07
19	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07
20	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07
21	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07
22	4.13E-08	0	0.00E+00	0.00E+00	0.00E+00	1.37E-07	1.37E-07
23	4.13E-08	2	6.70E-08	6.70E-08	5.81E-08	1.37E-07	1.95E-07
24	4.13E-08	3	1.34E-07	1.34E-07	1.16E-07	1.37E-07	2.53E-07

174.0

including deliveries (2 per day, 10am, 2pm)

Annualised	Annualised Emission Rate	Annualised Emission Rate
2.89E-07	1.67E-07	4.56E-07

Annual									
HGV Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage		trucks per year	distance travelled (km)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	0.0123	0.005	0.0001	0.0001	0.23
milestone 2	240000		14578	0.755	0.0123	0.005	0.0002	0.0002	0.40
milestone 3	360000		20676	0.755	0.0123	0.005	0.0003	0.0003	0.56
milestone 4	480000		22723	0.755	0.0123	0.005	0.0003	0.0003	0.62
milestone 5	760000		32534	0.755	0.0123	0.005	0.0004	0.0004	0.89
LDA Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	0.755	0.0038	0.000	0.000008	0.000009	0.02
milestone 2	240000	24	4992	0.755	0.0038	0.000	0.000019	0.000021	0.04
milestone 3	360000	24	6240	0.755	0.0038	0.000	0.000024	0.000026	0.05
milestone 4	480000	64	16640	0.755	0.0038	0.001	0.000063	0.000070	0.14
milestone 5	760000	64	19968	0.755	0.0038	0.001	0.000076	0.000083	0.17
								tpa	
						PM2.5			
						lbs/day	MTPA	tpa	lbs/year
				Combined	milestone 1	0.005	0.0001	0.0001	0.25
					milestone 2	0.005	0.0002	0.0002	0.44
					milestone 3	0.005	0.0003	0.0003	0.61
					milestone 4	0.005	0.0003	0.0004	0.76
					milestone 5	0.005	0.0005	0.0005	1.05

PM2.5 Onsite Paved Road (TW & BW Emissions)

HHDT Emission Factor

EMFAC2011 Emission Rates									*0.6214*
Region Type:	GAI								*mile to km*
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM25_run	PM25_TW	PM25_BW	Combined
						(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0090	0.0265	0.0355

HHDT Idling Emission Factors							
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season			PM2.5 (g/hr-veh)
2020	HHDT	D	SV	A			
						annual	
	Speed	5	miles/hr				
		8.046	km/hr				

HHDT Emission Factor					
		PM25_run	g/mile		
T7 Single	g/vkt	0.0220	0.0355	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0204	0.0328	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2_5_RUNEX	PM2_5_PMTW	PM2_5_PMBW	PM2_5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10		0.00200	0.01575		0.01775
2020	Annual	LDA	DSL	Aggregated	10		0.00200	0.01575		0.01775

LDA Idling Calculation							
2020	Annual	LDA	GAS	Aggregated		PM2_5_RUNEX	
						(gms/mile)	gms/km
Speed	5	miles/hr	GAS	Aggregated	Aggregated		0.0000
	8.046	km/hr	DSL	Aggregated	Aggregated		0.0000

		PM25_run	g/mile		
Gas LDA (ann)	g/vkt	0.01103	0.0177	EMFAC2011	start emissions - one start per day averaged over onsite trip distance (0.755km)
DSL LDA (ann)	g/vkt	0.01103	0.0177	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.01020	0.0164	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01020	0.0164	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.0102	0.0164	sum	Based on 0.38% Diesel

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
	0.469	mile	0.469	
Emission Factor/vehicle	0.015	g/hr	0.008	based on annual
Emission Factor/vehicle	4.27E-06	g/sec	3.42E-05	includes all trips/day
Emissions /vehicle/AERMOD Source	5.15E-08	g/sec	4.12E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM2.5 Emissions (g/s)	Milestone 5 Vehicles Per Hour	PM2.5 Emissions (g/s)	PM2.5 Including LDA
1	5.15E-08	5	2.50E-07	6.630E-07
2	5.15E-08	6	3.34E-07	3.340E-07
3	5.15E-08	10	5.01E-07	5.010E-07
4	5.15E-08	11	5.84E-07	5.845E-07
5	5.15E-08	13	6.68E-07	6.680E-07
6	5.15E-08	13	6.68E-07	6.680E-07
7	5.15E-08	13	6.68E-07	6.680E-07
8	5.15E-08	13	6.68E-07	6.680E-07
9	5.15E-08	13	6.68E-07	1.493E-06
10	5.15E-08	13	6.68E-07	6.680E-07
11	5.15E-08	15	7.71E-07	7.710E-07
12	5.15E-08	13	6.68E-07	6.680E-07
13	5.15E-08	11	5.84E-07	5.845E-07
14	5.15E-08	5	2.50E-07	2.505E-07
15	5.15E-08	7	3.53E-07	3.535E-07
16	5.15E-08	0	0.00E+00	0.000E+00
17	5.15E-08	0	0.00E+00	4.125E-07
18	5.15E-08	0	0.00E+00	0.000E+00
19	5.15E-08	0	0.00E+00	0.000E+00
20	5.15E-08	0	0.00E+00	0.000E+00
21	5.15E-08	0	0.00E+00	0.000E+00
22	5.15E-08	0	0.00E+00	0.000E+00
23	5.15E-08	2	8.35E-08	8.350E-08
24	5.15E-08	3	1.67E-07	1.670E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	Maximum 24-Hour PM2.5 Including LDA
1	5.15E-08	5	2.50E-07	6.63E-07
2	5.15E-08	6	3.34E-07	3.34E-07
3	5.15E-08	10	5.01E-07	5.01E-07
4	5.15E-08	11	5.84E-07	5.84E-07
5	5.15E-08	13	6.68E-07	6.68E-07
6	5.15E-08	13	6.68E-07	6.68E-07
7	5.15E-08	13	6.68E-07	6.68E-07
8	5.15E-08	19	9.77E-07	9.77E-07
9	5.15E-08	19	9.77E-07	1.80E-06
10	5.15E-08	19	9.77E-07	9.77E-07
11	5.15E-08	21	1.08E-06	1.08E-06
12	5.15E-08	19	9.77E-07	9.77E-07
13	5.15E-08	17	8.93E-07	8.93E-07
14	5.15E-08	11	5.60E-07	5.60E-07
15	5.15E-08	13	6.63E-07	6.63E-07
16	5.15E-08	6	3.09E-07	3.09E-07
17	5.15E-08	6	3.09E-07	7.21E-07
18	5.15E-08	0	0.00E+00	0.00E+00
19	5.15E-08	0	0.00E+00	0.00E+00
20	5.15E-08	0	0.00E+00	0.00E+00
21	5.15E-08	0	0.00E+00	0.00E+00
22	5.15E-08	0	0.00E+00	0.00E+00
23	5.15E-08	2	8.35E-08	8.35E-08
24	5.15E-08	3	1.67E-07	1.67E-07

226.1

including deliveries (2 per day, 10am, 2pm)

Annual Average Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	Emissions (g/s) Including LDA	Annualised Emission Rate Emissions (g/s) Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	5.15E-08	5	2.50E-07	6.63E-07	5.75E-07	5.14E-07	1.09E-06
2	5.15E-08	6	3.34E-07	3.34E-07	2.90E-07	0.00E+00	2.90E-07
3	5.15E-08	10	5.01E-07	5.01E-07	4.35E-07	0.00E+00	4.35E-07
4	5.15E-08	11	5.84E-07	5.84E-07	5.07E-07	1.28E-07	6.35E-07
5	5.15E-08	13	6.68E-07	6.68E-07	5.80E-07	1.71E-07	7.50E-07
6	5.15E-08	13	6.68E-07	6.68E-07	5.80E-07	1.71E-07	7.50E-07
7	5.15E-08	13	6.68E-07	6.68E-07	5.80E-07	1.71E-07	7.50E-07
8	5.15E-08	14	7.09E-07	7.09E-07	6.15E-07	2.56E-07	8.71E-07
9	5.15E-08	14	7.09E-07	1.53E-06	1.33E-06	1.20E-06	2.53E-06
10	5.15E-08	14	7.09E-07	7.09E-07	6.15E-07	1.71E-07	7.86E-07
11	5.15E-08	16	8.12E-07	8.12E-07	7.04E-07	1.71E-07	8.75E-07
12	5.15E-08	14	7.09E-07	7.09E-07	6.15E-07	1.71E-07	7.86E-07
13	5.15E-08	12	6.25E-07	6.25E-07	5.42E-07	1.71E-07	7.13E-07
14	5.15E-08	6	2.91E-07	2.91E-07	2.53E-07	2.56E-07	5.09E-07
15	5.15E-08	8	3.94E-07	3.94E-07	3.42E-07	1.71E-07	5.13E-07
16	5.15E-08	1	4.07E-08	4.07E-08	3.53E-08	1.71E-07	2.06E-07
17	5.15E-08	1	4.07E-08	4.53E-07	3.93E-07	6.85E-07	1.08E-06
18	5.15E-08	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
19	5.15E-08	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
20	5.15E-08	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
21	5.15E-08	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
22	5.15E-08	0	0.00E+00	0.00E+00	0.00E+00	1.71E-07	1.71E-07
23	5.15E-08	2	8.35E-08	8.35E-08	7.24E-08	1.71E-07	2.43E-07
24	5.15E-08	3	1.67E-07	1.67E-07	1.45E-07	1.71E-07	3.16E-07

174.0

including deliveries (2 per day, 10am, 2pm)

Annualised	Annualised Emission Rate	Annualised Emission Rate
3.84E-07	2.41E-07	6.24E-07

Annual HGV Traffic	tonnage		trucks per year	distance travelled (km)	PM2.5 g/trip	PM2.5 lbs/day	PM2.5 MTPA	PM2.5 tpa	PM2.5 lbs/year	
milestone 1	120000		8481	0.755	0.0154	0.006	0.0001	0.0001	0.29	
milestone 2	240000		14578	0.755	0.0154	0.006	0.0002	0.0002	0.49	
milestone 3	360000		20676	0.755	0.0154	0.006	0.0003	0.0004	0.70	
milestone 4	480000		22723	0.755	0.0154	0.006	0.0003	0.0004	0.77	
milestone 5	760000		32534	0.755	0.0154	0.006	0.0005	0.0006	1.10	

LDA Traffic	tonnage	movements/day	movement per year	distance travelled (miles)	PM2.5 g/trip	PM2.5 lbs/day	PM2.5 MTPA	PM2.5 tpa	PM2.5 lbs/year	
milestone 1	120000	14	2184	0.755	0.0077	0.000	0.000017	0.000019	0.04	
milestone 2	240000	24	4992	0.755	0.0077	0.000	0.000038	0.000042	0.08	
milestone 3	360000	24	6240	0.755	0.0077	0.000	0.000048	0.000053	0.11	
milestone 4	480000	64	16640	0.755	0.0077	0.001	0.000128	0.000141	0.28	
milestone 5	760000	64	19968	0.755	0.0077	0.001	0.000154	0.000170	0.34	
								tpa		
						PM2.5 lbs/day	MTPA	tpa	lbs/year	
				Combined	milestone 1	0.006	0.0001	0.0002	0.32	
					milestone 2	0.006	0.0003	0.0003	0.58	
					milestone 3	0.006	0.0004	0.0004	0.81	
					milestone 4	0.007	0.0005	0.0005	1.05	
					milestone 5	0.007	0.0007	0.0007	1.44	

Paved Road - Industrial (Finished Product & Roadway Raw Materials)
HHDT

Project: Orcem, Vallejo

Paved Roads (Chapter 13.2.1 AP42 Dated 01/2011)

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	25	25	Assumption
Wet Days Per Year	Days	0	0	24-Hr Maximum Scenario
Constant, k	g/VKT	0.62	0.15	AP42 Table 13.2.1-1
Constant, a		0.91	0.91	AP42 Equation 13.2.1-1
Constant, b		1.02	1.02	AP42 Equation 13.2.1-2
Silt Loading, Sl	g/m2	0.32	0.32	CARB
Uncontrolled Emission factor, E	g/VKT	5.86	1.42	Calculation
Control Efficiency for Watering	Factor	0.80	0.80	SCAQMD (2007)
Controlled Emission factor, E	g/VKT	1.17	0.28	Calculation

Paved Roads (Chapter 13.2.1 AP42 Date
LDA

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter
Mean Vehicle Weight
Wet Days Per Year
Constant, k
Constant, a
Constant, b
Silt Loading, Sl
Uncontrolled Emission factor, E
Control Efficiency for Watering
Controlled Emission factor, E

AERMOD Model Inputs
Paved road modelled as a series of 9m spaced volume sources

	HHDT PM10		LDA PM10	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
Emission Factor/vehicle	0.885	g/hr	0.067	
Emission Factor/vehicle	0.00024584	g/sec	0.000299	includes all trips/day
Emission Factor/vehicle/Source	2.96E-06	g/sec	3.60E-06	

AERMOD Model Inputs
Paved road modelled as a series of 9m spaced volume sources

	HHDT PM2.5		LDA PM2.5	
Spacing of volume sources	9	m	9	
AERMOD Volume Sources	83		83	
Distance Travelled Onsite	0.755	km	0.755	
Emission Factor/vehicle	0.214	g/hr	0.016	
Emission Factor/vehicle	0.00005948	g/sec	0.00007238	includes all trips/day
Emissions /vehicle/AERMOD Source	7.17E-07	g/sec	8.72E-07	

Diurnal Emission Factors Based On Truck Movement Breakdown

No Rail Loading

Hour Of Day	PM10 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM10 Emissions (g/s)	PM10 Including LDA
1	2.96E-06	5	1.44E-05	1.80E-05
2	2.96E-06	6	1.92E-05	1.92E-05
3	2.96E-06	10	2.88E-05	2.88E-05
4	2.96E-06	11	3.36E-05	3.36E-05
5	2.96E-06	13	3.84E-05	3.84E-05
6	2.96E-06	13	3.84E-05	3.84E-05
7	2.96E-06	13	3.84E-05	3.84E-05
8	2.96E-06	13	3.84E-05	3.84E-05
9	2.96E-06	13	3.84E-05	4.56E-05
10	2.96E-06	13	3.84E-05	3.84E-05
11	2.96E-06	15	4.43E-05	4.43E-05
12	2.96E-06	13	3.84E-05	3.84E-05
13	2.96E-06	11	3.36E-05	3.36E-05
14	2.96E-06	5	1.44E-05	1.44E-05

PM2.5 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor $PM_{2.5}$

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC 2007 Categories					Annual		Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM2.5_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.0218		0.0218

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM2.5 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.003	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor

		PM2.5_run	g/mile		
T7 Single	g/vkt	0.0135	0.0218	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0125	0.0202	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor $PM_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2.5_RUNEX	PM2.5_TW	PM2.5_BW	PM2.5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.0032				0.0032
2020	Annual	LDA	DSL	Aggregated	20	0.0183				0.0183
Idling Calculation										
2020	Annual	LDA	GAS	Aggregated		PM2.5_RUNEX				
						(gms/mile)	gms/km			
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0109	0.0068			
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0414	0.0258			

		PM2.5	g/mile		
Gas LDA (ann)	g/vkt	0.00201	0.0032	EMFAC2011	
DSL LDA (ann)	g/vkt	0.01135	0.0183	EMFAC2011	
Idling Gas LDA	g/vkt	0.00680	0.0109	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02575	0.0414	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00237	0.0038	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01243	0.0200	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0024	0.0039	sum	Based on 0.38% Diesel

0.00E+00

AERMOD Model Inputs

Paved road modelled as a series of volume sources

Lemon St West Of Sonoma	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	14	m	14	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle	0.009	g/hr	0.0017	based on annual
Emission Factor/vehicle	0.0000025	g/sec	0.0000077	includes shift trips/day
Emissions /vehicle/AERMOD Source	4.92E-08	g/sec	1.51E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	4.92E-08	5	4.79E-07	6.30E-07	5.46E-07	1.89E-07	7.35E-07
2	4.92E-08	6	6.38E-07	6.38E-07	5.54E-07	0.00E+00	5.54E-07
3	4.92E-08	10	9.57E-07	9.57E-07	8.31E-07	0.00E+00	8.31E-07
4	4.92E-08	11	1.12E-06	1.12E-06	9.69E-07	2.46E-07	1.22E-06
5	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	3.28E-07	1.44E-06
6	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	3.28E-07	1.44E-06
7	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	3.28E-07	1.44E-06
8	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	4.92E-07	1.60E-06
9	4.92E-08	13	1.28E-06	1.58E-06	1.37E-06	7.06E-07	2.08E-06
10	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	3.28E-07	1.44E-06
11	4.92E-08	15	1.47E-06	1.47E-06	1.28E-06	3.28E-07	1.61E-06
12	4.92E-08	13	1.28E-06	1.28E-06	1.11E-06	3.28E-07	1.44E-06
13	4.92E-08	11	1.12E-06	1.12E-06	9.69E-07	3.28E-07	1.30E-06
14	4.92E-08	5	4.79E-07	4.79E-07	4.15E-07	4.92E-07	9.07E-07
15	4.92E-08	7	6.76E-07	6.76E-07	5.86E-07	3.28E-07	9.14E-07
16	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
17	4.92E-08	0	0.00E+00	1.51E-07	1.31E-07	5.17E-07	6.48E-07
18	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
19	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
20	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
21	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
22	4.92E-08	0	0.00E+00	0.00E+00	0.00E+00	3.28E-07	3.28E-07
23	4.92E-08	2	1.60E-07	1.60E-07	1.38E-07	3.28E-07	4.66E-07
24	4.92E-08	3	3.19E-07	3.19E-07	2.77E-07	3.28E-07	6.05E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
6.1294E-07	3.29E-07	9.42E-07

PM2.5 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Emission factor, E	g/VKT	0.013	0.0024	Lemon
Emission factor, E (annual)	g/VKT	0.0092	0.0013	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	22		22	
Distance Travelled (Lemon Street)	0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle	0.005	g/hr	0.0007	based on annual
Emission Factor/vehicle	0.00000133	g/sec	0.00000305	includes shift trips/day
Emissions /vehicle/AERMOD Source	6.07E-08	g/sec	1.38E-07	

Sonoma North of Lemon		0.525
Split	0.05	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	6.07E-08	0.24	2.95E-08	3.64E-08	3.16E-08	8.65E-09	4.03E-08
2	6.07E-08	0.32	3.93E-08	3.93E-08	3.41E-08	0.00E+00	3.41E-08
3	6.07E-08	0.49	5.90E-08	5.90E-08	5.12E-08	0.00E+00	5.12E-08
4	6.07E-08	0.57	6.89E-08	6.89E-08	5.97E-08	1.52E-08	7.49E-08
5	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	2.02E-08	8.85E-08
6	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	2.02E-08	8.85E-08
7	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	2.02E-08	8.85E-08
8	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	3.03E-08	9.86E-08
9	6.07E-08	0.65	7.87E-08	9.25E-08	8.03E-08	3.75E-08	1.18E-07
10	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	2.02E-08	8.85E-08

11	6.07E-08	0.75	9.08E-08	9.08E-08	7.88E-08	2.02E-08	9.90E-08
12	6.07E-08	0.65	7.87E-08	7.87E-08	6.83E-08	2.02E-08	8.85E-08
13	6.07E-08	0.57	6.89E-08	6.89E-08	5.97E-08	2.02E-08	7.99E-08
14	6.07E-08	0.24	2.95E-08	2.95E-08	2.56E-08	3.03E-08	5.59E-08
15	6.07E-08	0.34	4.16E-08	4.16E-08	3.61E-08	2.02E-08	5.63E-08
16	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
17	6.07E-08	0.00	0.00E+00	6.92E-09	6.00E-09	2.89E-08	3.49E-08
18	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
19	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
20	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
21	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
22	6.07E-08	0.00	0.00E+00	0.00E+00	0.00E+00	2.02E-08	2.02E-08
23	6.07E-08	0.08	9.84E-09	9.84E-09	8.53E-09	2.02E-08	2.87E-08
24	6.07E-08	0.16	1.97E-08	1.97E-08	1.71E-08	2.02E-08	3.73E-08
				g/sec	g/sec		

8.3	
including deliveries (2 per day, 10am, 2pm)	

Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
3.74E-08	1.98E-08	5.72E-08

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	31		31	
Distance Travelled (Lemon Street)	0.735	km	0.735	
Emission Factor/vehicle	0.007	g/hr	0.001	based on winter
Emission Factor/vehicle	0.0000019	g/sec	0.0000043	includes shift trips/day
Emissions /vehicle/AERMOD Source	6.03E-08	g/sec	1.38E-07	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	6.03E-08	2	2.29E-07	2.82E-07	2.45E-07	6.70E-08	3.12E-07
2	6.03E-08	3	3.05E-07	3.05E-07	2.65E-07	0.00E+00	2.65E-07
3	6.03E-08	4	4.57E-07	4.57E-07	3.97E-07	0.00E+00	3.97E-07
4	6.03E-08	4	5.34E-07	5.34E-07	4.63E-07	1.17E-07	5.80E-07
5	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	1.57E-07	6.86E-07
6	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	1.57E-07	6.86E-07
7	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	1.57E-07	6.86E-07
8	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	2.35E-07	7.64E-07
9	6.03E-08	5	6.10E-07	7.17E-07	6.22E-07	2.91E-07	9.13E-07
10	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	1.57E-07	6.86E-07
11	6.03E-08	6	7.04E-07	7.04E-07	6.11E-07	1.57E-07	7.67E-07
12	6.03E-08	5	6.10E-07	6.10E-07	5.29E-07	1.57E-07	6.86E-07
13	6.03E-08	4	5.34E-07	5.34E-07	4.63E-07	1.57E-07	6.20E-07
14	6.03E-08	2	2.29E-07	2.29E-07	1.98E-07	2.35E-07	4.33E-07
15	6.03E-08	3	3.23E-07	3.23E-07	2.80E-07	1.57E-07	4.37E-07
16	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
17	6.03E-08	0	0.00E+00	5.36E-08	4.65E-08	2.24E-07	2.70E-07
18	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
19	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
20	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
21	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
22	6.03E-08	0	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07
23	6.03E-08	1	7.62E-08	7.62E-08	6.61E-08	1.57E-07	2.23E-07
24	6.03E-08	1	1.52E-07	1.52E-07	1.32E-07	1.57E-07	2.89E-07
				g/hr	g/sec		

64.8	
including deliveries (2 per day, 10am, 2pm)	

Annualised Emission Rate	Annualised Emission Rate
1.53E-07	4.43E-07

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle	0.010	g/hr	0.002	based on annual
Emission Factor/vehicle	0.00000286	g/sec	0.00000878	includes shift trips/day
Emissions /vehicle/AERMOD Source	5.60E-08	g/sec	1.72E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	5.60E-08	3	3.05E-07	4.02E-07	3.49E-07	1.20E-07	4.69E-07
2	5.60E-08	4	4.07E-07	4.07E-07	3.53E-07	0.00E+00	3.53E-07
3	5.60E-08	5	6.11E-07	6.11E-07	5.30E-07	0.00E+00	5.30E-07
4	5.60E-08	6	7.12E-07	7.12E-07	6.18E-07	1.57E-07	7.75E-07
5	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	2.09E-07	9.15E-07
6	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	2.09E-07	9.15E-07
7	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	2.09E-07	9.15E-07
8	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	3.14E-07	1.02E-06
9	5.60E-08	7	8.14E-07	1.01E-06	8.74E-07	4.50E-07	1.32E-06
10	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	2.09E-07	9.15E-07
11	5.60E-08	8	9.40E-07	9.40E-07	8.15E-07	2.09E-07	1.02E-06
12	5.60E-08	7	8.14E-07	8.14E-07	7.06E-07	2.09E-07	9.15E-07
13	5.60E-08	6	7.12E-07	7.12E-07	6.18E-07	2.09E-07	8.27E-07
14	5.60E-08	3	3.05E-07	3.05E-07	2.65E-07	3.14E-07	5.79E-07
15	5.60E-08	4	4.31E-07	4.31E-07	3.74E-07	2.09E-07	5.83E-07
16	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
17	5.60E-08	0	0.00E+00	9.64E-08	8.36E-08	3.30E-07	4.13E-07
18	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
19	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
20	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
21	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
22	5.60E-08	0	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07
23	5.60E-08	1	1.02E-07	1.02E-07	8.83E-08	2.09E-07	2.97E-07
24	5.60E-08	2	2.04E-07	2.04E-07	1.77E-07	2.09E-07	3.86E-07
				g/hr	g/sec		

93.0	
including deliveries (2 per day, 10am, 2pm)	

Annualised Emission Rate	Annualised Emission Rate
2.10E-07	6.01E-07

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	
Emission Factor/vehicle	0.006	g/hr	0.001	based on annual
Emission Factor/vehicle	0.0000018	g/sec	0.0000040	includes shift trips/day
Emissions /vehicle/AERMOD Source	6.12E-08	g/sec	1.40E-07	

Sonoma South of Magazine	0.698
Split 0.39	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	6.12E-08	2	2.32E-07	2.87E-07	2.49E-07	6.81E-08	3.17E-07
2	6.12E-08	3	3.10E-07	3.10E-07	2.69E-07	0.00E+00	2.69E-07
3	6.12E-08	4	4.64E-07	4.64E-07	4.03E-07	0.00E+00	4.03E-07
4	6.12E-08	4	5.42E-07	5.42E-07	4.70E-07	1.19E-07	5.89E-07
5	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	1.59E-07	6.96E-07
6	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	1.59E-07	6.96E-07
7	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	1.59E-07	6.96E-07
8	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	2.38E-07	7.76E-07
9	6.12E-08	5	6.19E-07	7.28E-07	6.32E-07	2.95E-07	9.27E-07
10	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	1.59E-07	6.96E-07
11	6.12E-08	6	7.15E-07	7.15E-07	6.20E-07	1.59E-07	7.79E-07
12	6.12E-08	5	6.19E-07	6.19E-07	5.37E-07	1.59E-07	6.96E-07
13	6.12E-08	4	5.42E-07	5.42E-07	4.70E-07	1.59E-07	6.29E-07
14	6.12E-08	2	2.32E-07	2.32E-07	2.01E-07	2.38E-07	4.40E-07
15	6.12E-08	3	3.28E-07	3.28E-07	2.84E-07	1.59E-07	4.43E-07
16	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
17	6.12E-08	0	0.00E+00	5.44E-08	4.72E-08	2.27E-07	2.74E-07
18	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
19	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
20	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
21	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
22	6.12E-08	0	0.00E+00	0.00E+00	0.00E+00	1.59E-07	1.59E-07
23	6.12E-08	1	7.74E-08	7.74E-08	6.71E-08	1.59E-07	2.26E-07
24	6.12E-08	1	1.55E-07	1.55E-07	1.34E-07	1.59E-07	2.93E-07
		64.8		g/s	g/s	Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)				1.55E-07	4.50E-07

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.467	1.01	1.01	0.370	0.0086	0.0094	18.88
milestone 2	240000		14578	80.467	1.01	1.01	0.370	0.0147	0.0162	32.45
milestone 3	360000		20676	80.467	1.01	1.01	0.370	0.0209	0.0230	46.03
milestone 4	480000		22723	80.467	1.01	1.01	0.370	0.0229	0.0253	50.59
milestone 5	760000		32534	80.467	1.01	1.01	0.370	0.0329	0.0362	72.43
LDA Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	39.910	0.096	0.096	0.003	0.000210	0.000231	0.46
milestone 2	240000	24	4992	39.910	0.096	0.096	0.005	0.000480	0.000529	1.06
milestone 3	360000	24	6240	39.910	0.096	0.096	0.005	0.000600	0.000661	1.32
milestone 4	480000	64	16640	39.910	0.096	0.096	0.014	0.001600	0.001763	3.53
milestone 5	760000	64	19968	39.910	0.096	0.096	0.014	0.001920	0.002116	4.23
									tpa	
							PM2.5			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	0.373	0.0088	0.0097	19
						milestone 2	0.375	0.0152	0.0168	34
						milestone 3	0.375	0.0215	0.0237	47
						milestone 4	0.383	0.0245	0.0271	54
						milestone 5	0.383	0.0348	0.0383	77

EMFAC2011 Emission Rates									*0.6214*
Region Type:	GAI								*mile to km*
Region:	Solano (SV)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC 2007 Categories					Annual	Annual	Annual	Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM2.5_run	PM2.5_TW	PM2.5_BW	Combined
						(gms/mile)	(gms/mile)	(gms/mile)	(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated		0.0090	0.0265	0.0355

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM2.5 (g/hr-veh)	
2020	HHDT	D	SV	A		
						annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM2.5_run	g/mile		
T7 Single	g/vkt	0.0220	0.0355	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0000	0.0000	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0204	0.0328	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor $PM_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2.5_RUNEX	PM2.5_TW	PM2.5_BW	PM2.5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20		0.0020	0.0157		0.0177
2020	Annual	LDA	DSL	Aggregated	20		0.0020	0.0157		0.0177
Idling Calculation										
2020	Annual	LDA	GAS	Aggregated		PM2.5_RUNEX				
						(gms/mile)	gms/km			
Speed	5	miles/hr	GAS	Aggregated	Aggregated		0.0000			
	8.046	km/hr	DSL	Aggregated	Aggregated		0.0000			

		PM2.5	g/mile		
Gas LDA (ann)	g/vkt	0.01103	0.0177	EMFAC2011	
DSL LDA (ann)	g/vkt	0.01103	0.0177	EMFAC2011	
Idling Gas LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Idling Diesel LDA	g/vkt	0.00000	0.0000	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.01020	0.0164	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.01020	0.0164	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.0102	0.0164	sum	Based on 0.38% Diesel

0.00E+00

AERMOD Model Inputs
Paved road modelled as a series of volume sources

Lemon St West Of Sonoma		HHDT		LDA	
		PM2.5		PM2.5	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.015	g/hr	0.0073	based on annual
Emission Factor/vehicle		0.0000041	g/sec	0.0000326	includes shift trips/day
Emissions /vehicle/AERMOD Source		7.99E-08	g/sec	6.40E-07	

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown
2 shift changes assumed for milestone 5

Milestone 5

Weekday Hours	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	7.99E-08	5	7.78E-07	1.42E-06	1.23E-06	8.00E-07	2.03E-06
2	7.99E-08	6	1.04E-06	1.04E-06	8.99E-07	0.00E+00	8.99E-07
3	7.99E-08	10	1.56E-06	1.56E-06	1.35E-06	0.00E+00	1.35E-06
4	7.99E-08	11	1.81E-06	1.81E-06	1.57E-06	3.99E-07	1.97E-06
5	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	5.33E-07	2.33E-06
6	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	5.33E-07	2.33E-06
7	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	5.33E-07	2.33E-06
8	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	7.99E-07	2.60E-06
9	7.99E-08	13	2.07E-06	3.35E-06	2.91E-06	2.13E-06	5.04E-06
10	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	5.33E-07	2.33E-06
11	7.99E-08	15	2.39E-06	2.39E-06	2.08E-06	5.33E-07	2.61E-06
12	7.99E-08	13	2.07E-06	2.07E-06	1.80E-06	5.33E-07	2.33E-06
13	7.99E-08	11	1.81E-06	1.81E-06	1.57E-06	5.33E-07	2.11E-06
14	7.99E-08	5	7.78E-07	7.78E-07	6.75E-07	7.99E-07	1.47E-06
15	7.99E-08	7	1.10E-06	1.10E-06	9.52E-07	5.33E-07	1.48E-06
16	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
17	7.99E-08	0	0.00E+00	6.40E-07	5.55E-07	1.33E-06	1.89E-06
18	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
19	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
20	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
21	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
22	7.99E-08	0	0.00E+00	0.00E+00	0.00E+00	5.33E-07	5.33E-07
23	7.99E-08	2	2.59E-07	2.59E-07	2.25E-07	5.33E-07	7.57E-07
24	7.99E-08	3	5.18E-07	5.18E-07	4.50E-07	5.33E-07	9.82E-07

166.1

including deliveries (2 per day, 10am, 2pm)

Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
1.05E-06	6.16E-07	1.67E-06

PM10 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Emission factor, E	g/VKT	0.020	0.0102	Lemon
Emission factor, E (annual)	g/VKT	0.0204	0.0102	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon
Paved road modelled as a series of volume sources

		HHDT		LDA	
		PM2.5		PM2.5	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.011	g/hr	0.0054	based on annual
Emission Factor/vehicle		0.00000297	g/sec	0.00002381	includes shift trips/day
Emissions /vehicle/AERMOD Source		1.35E-07	g/sec	1.08E-06	

Sonoma North of Lemon		0.525
Split	0.05	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	1.35E-07	0.24	6.57E-08	1.20E-07	1.04E-07	6.76E-08	1.72E-07
2	1.35E-07	0.32	8.76E-08	8.76E-08	7.60E-08	0.00E+00	7.60E-08
3	1.35E-07	0.49	1.31E-07	1.31E-07	1.14E-07	0.00E+00	1.14E-07
4	1.35E-07	0.57	1.53E-07	1.53E-07	1.33E-07	3.38E-08	1.67E-07
5	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	4.50E-08	1.97E-07
6	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	4.50E-08	1.97E-07
7	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	4.50E-08	1.97E-07
8	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	6.75E-08	2.20E-07
9	1.35E-07	0.65	1.75E-07	2.83E-07	2.46E-07	1.80E-07	4.26E-07
10	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	4.50E-08	1.97E-07
11	1.35E-07	0.75	2.02E-07	2.02E-07	1.75E-07	4.50E-08	2.20E-07
12	1.35E-07	0.65	1.75E-07	1.75E-07	1.52E-07	4.50E-08	1.97E-07
13	1.35E-07	0.57	1.53E-07	1.53E-07	1.33E-07	4.50E-08	1.78E-07
14	1.35E-07	0.24	6.57E-08	6.57E-08	5.70E-08	6.75E-08	1.25E-07
15	1.35E-07	0.34	9.27E-08	9.27E-08	8.05E-08	4.50E-08	1.25E-07
16	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
17	1.35E-07	0.00	0.00E+00	5.41E-08	4.69E-08	1.13E-07	1.60E-07
18	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
19	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
20	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
21	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
22	1.35E-07	0.00	0.00E+00	0.00E+00	0.00E+00	4.50E-08	4.50E-08
23	1.35E-07	0.08	2.19E-08	2.19E-08	1.90E-08	4.50E-08	6.40E-08
24	1.35E-07	0.16	4.38E-08	4.38E-08	3.80E-08	4.50E-08	8.30E-08

	g/sec		g/sec		
8.3			Annualised Emission Rate	Annualised Emission Rate	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)			8.90E-08	5.21E-08	1.41E-07

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	31		31	
Distance Travelled (Lemon Street)	0.735	km	0.735	
Emission Factor/vehicle	0.015	g/hr	0.007	based on winter
Emission Factor/vehicle	0.0000042	g/sec	0.0000333	includes shift trips/day
Emissions /vehicle/AERMOD Source	1.34E-07	g/sec	1.08E-06	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	1.34E-07	2	5.09E-07	9.29E-07	8.06E-07	5.24E-07	1.33E-06
2	1.34E-07	3	6.79E-07	6.79E-07	5.89E-07	0.00E+00	5.89E-07
3	1.34E-07	4	1.02E-06	1.02E-06	8.84E-07	0.00E+00	8.84E-07
4	1.34E-07	4	1.19E-06	1.19E-06	1.03E-06	2.62E-07	1.29E-06
5	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	3.49E-07	1.53E-06
6	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	3.49E-07	1.53E-06
7	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	3.49E-07	1.53E-06
8	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	5.23E-07	1.70E-06
9	1.34E-07	5	1.36E-06	2.20E-06	1.91E-06	1.40E-06	3.30E-06
10	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	3.49E-07	1.53E-06
11	1.34E-07	6	1.57E-06	1.57E-06	1.36E-06	3.49E-07	1.71E-06
12	1.34E-07	5	1.36E-06	1.36E-06	1.18E-06	3.49E-07	1.53E-06
13	1.34E-07	4	1.19E-06	1.19E-06	1.03E-06	3.49E-07	1.38E-06
14	1.34E-07	2	5.09E-07	5.09E-07	4.42E-07	5.23E-07	9.65E-07
15	1.34E-07	3	7.19E-07	7.19E-07	6.24E-07	3.49E-07	9.72E-07
16	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
17	1.34E-07	0	0.00E+00	4.19E-07	3.64E-07	8.73E-07	1.24E-06
18	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
19	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
20	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
21	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
22	1.34E-07	0	0.00E+00	0.00E+00	0.00E+00	3.49E-07	3.49E-07
23	1.34E-07	1	1.70E-07	1.70E-07	1.47E-07	3.49E-07	4.96E-07
24	1.34E-07	1	3.40E-07	3.40E-07	2.95E-07	3.49E-07	6.43E-07

	g/hr	g/sec		
64.8			Annualised Emission Rate	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)			4.03E-07	1.09E-06

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle	0.017	g/hr	0.008	based on annual
Emission Factor/vehicle	0.00000464	g/sec	0.00003718	includes shift trips/day
Emissions /vehicle/AERMOD Source	9.10E-08	g/sec	7.29E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	9.10E-08	3	4.96E-07	9.04E-07	7.84E-07	5.10E-07	1.29E-06
2	9.10E-08	4	6.61E-07	6.61E-07	5.74E-07	0.00E+00	5.74E-07
3	9.10E-08	5	9.92E-07	9.92E-07	8.60E-07	0.00E+00	8.60E-07
4	9.10E-08	6	1.16E-06	1.16E-06	1.00E-06	2.55E-07	1.26E-06
5	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	3.40E-07	1.49E-06
6	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	3.40E-07	1.49E-06
7	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	3.40E-07	1.49E-06
8	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	5.09E-07	1.66E-06
9	9.10E-08	7	1.32E-06	2.14E-06	1.86E-06	1.36E-06	3.22E-06
10	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	3.40E-07	1.49E-06
11	9.10E-08	8	1.53E-06	1.53E-06	1.32E-06	3.40E-07	1.66E-06
12	9.10E-08	7	1.32E-06	1.32E-06	1.15E-06	3.40E-07	1.49E-06
13	9.10E-08	6	1.16E-06	1.16E-06	1.00E-06	3.40E-07	1.34E-06
14	9.10E-08	3	4.96E-07	4.96E-07	4.30E-07	5.09E-07	9.40E-07
15	9.10E-08	4	7.00E-07	7.00E-07	6.07E-07	3.40E-07	9.47E-07
16	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
17	9.10E-08	0	0.00E+00	4.08E-07	3.54E-07	8.50E-07	1.20E-06
18	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
19	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
20	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
21	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
22	9.10E-08	0	0.00E+00	0.00E+00	0.00E+00	3.40E-07	3.40E-07
23	9.10E-08	1	1.65E-07	1.65E-07	1.43E-07	3.40E-07	4.83E-07
24	9.10E-08	2	3.31E-07	3.31E-07	2.87E-07	3.40E-07	6.26E-07

	g/hr	g/sec		
93.0			Annualised Emission Rate	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)			3.93E-07	1.06E-06

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT		LDA	
	PM2.5		PM2.5	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	
Emission Factor/vehicle	0.014	g/hr	0.007	based on annual
Emission Factor/vehicle	0.0000040	g/sec	0.0000317	includes shift trips/day
Emissions /vehicle/AERMOD Source	1.36E-07	g/sec	1.09E-06	

Sonoma South of Magazine		0.698
Split	0.39	km

Milestone 5

Weekday Hours	PM2.5 Emissions (g/sec)	PM2.5 Vehicles Per Hour	PM2.5 Emissions (g/sec)	PM2.5 Including LDA	Annualised Emission Rate PM2.5 Emissions (g/sec)	Annualised Emission Rate PM2.5 Including LDA	Cumulative PM2.5 Including LDA
1	1.36E-07	2	5.17E-07	9.43E-07	8.18E-07	5.32E-07	1.35E-06
2	1.36E-07	3	6.89E-07	6.89E-07	5.98E-07	0.00E+00	5.98E-07
3	1.36E-07	4	1.03E-06	1.03E-06	8.97E-07	0.00E+00	8.97E-07
4	1.36E-07	4	1.21E-06	1.21E-06	1.05E-06	2.66E-07	1.31E-06

5	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	3.54E-07	1.55E-06
6	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	3.54E-07	1.55E-06
7	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	3.54E-07	1.55E-06
8	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	5.31E-07	1.73E-06
9	1.36E-07	5	1.38E-06	2.23E-06		1.93E-06	1.42E-06	3.35E-06
10	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	3.54E-07	1.55E-06
11	1.36E-07	6	1.59E-06	1.59E-06		1.38E-06	3.54E-07	1.73E-06
12	1.36E-07	5	1.38E-06	1.38E-06		1.20E-06	3.54E-07	1.55E-06
13	1.36E-07	4	1.21E-06	1.21E-06		1.05E-06	3.54E-07	1.40E-06
14	1.36E-07	2	5.17E-07	5.17E-07		4.49E-07	5.31E-07	9.80E-07
15	1.36E-07	3	7.30E-07	7.30E-07		6.33E-07	3.54E-07	9.87E-07
16	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
17	1.36E-07	0	0.00E+00	4.26E-07		3.69E-07	8.86E-07	1.26E-06
18	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
19	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
20	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
21	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
22	1.36E-07	0	0.00E+00	0.00E+00		0.00E+00	3.54E-07	3.54E-07
23	1.36E-07	1	1.72E-07	1.72E-07		1.50E-07	3.54E-07	5.04E-07
24	1.36E-07	1	3.45E-07	3.45E-07		2.99E-07	3.54E-07	6.53E-07
				g/s		g/s		
		64.8					Annualised Emission Rate	Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)					4.10E-07	1.11E-06

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	80.467	1.64	1.64	0.601	0.0139	0.0153	30.67
milestone 2	240000		14578	80.467	1.64	1.64	0.601	0.0239	0.0264	52.71
milestone 3	360000		20676	80.467	1.64	1.64	0.601	0.0339	0.0374	74.76
milestone 4	480000		22723	80.467	1.64	1.64	0.601	0.0373	0.0411	82.16
milestone 5	760000		32534	80.467	1.64	1.64	0.601	0.0534	0.0588	117.64
LDA Traffic					PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000	14	2184	39.910	0.407	0.407	0.013	0.000889	0.000980	1.96
milestone 2	240000	24	4992	39.910	0.407	0.407	0.022	0.002033	0.002241	4.48
milestone 3	360000	24	6240	39.910	0.407	0.407	0.022	0.002541	0.002801	5.60
milestone 4	480000	64	16640	39.910	0.407	0.407	0.057	0.006776	0.007469	14.94
milestone 5	760000	64	19968	39.910	0.407	0.407	0.057	0.008131	0.008962	17.92
									tpa	
							PM2.5			
							lbs/day	MTPA	tpa	lbs/year
				Combined		milestone 1	0.613	0.0148	0.0163	33
						milestone 2	0.622	0.0259	0.0286	57
						milestone 3	0.622	0.0365	0.0402	80
						milestone 4	0.658	0.0440	0.0485	97
						milestone 5	0.658	0.0615	0.0678	136

PM10 Public Paved Road (Exhaust Emissions)

HHDT Emission Factor PM$_{2.5}$

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	40	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		Annual
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	PM2.5_run		Combined
						(gms/mile)		(gms/mile)
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.01587		0.0159

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Ca	Fuel_Type	air_basin	season	PM2.5 (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.003	annual
	Speed	5	miles/hr			
		8.046	km/hr			

HHDT Emission Factor					
		PM2.5_run	g/mile		
T7 Single	g/vkt	0.0099	0.0159	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0004	0.0007	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0092	0.0147	Sum	Assumption - Based On Idling for 7.5% of time

LDA Emission Factor PM$_{2.5}$

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	PM2.5_RUNEX	PM2.5_TW	PM2.5_BW	PM2.5_STREX	PM2.5_Combined
					miles/hr	(gms/mile)	(gms/mile)	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	40	0.00134				0.00134
2020	Annual	LDA	DSL	Aggregated	40	0.0102				0.01021

Idling Calculation							
2020	Annual	LDA	GAS	Aggregated		PM2.5_RUNEX	
						(gms/mile)	gms/km
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0109	0.0068
	8.046	km/hr	DSL	Aggregated	Aggregated	0.0414	0.0258

		PM2.5	g/mile		
Gas LDA (ann)	g/vkt	0.00083	0.00134	EMFAC2011	
DSL LDA (ann)	g/vkt	0.00634	0.01021	EMFAC2011	
Idling Gas LDA	g/vkt	0.00680	0.01095	EMFAC2011	
Idling Diesel LDA	g/vkt	0.02575	0.04144	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00128	0.00206	sum	Assumption - Based On Idling for 7.5% of time

Composite Emission Factor DSL (ann)	g/vkt	0.00780	**0.01255**	sum	**Assumption - Based On idling for 7.5% of time**
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**0.0013**	**0.0021**	sum	**Based on 0.38% Diesel**

Paved Road - Public Road
HHDT

Project: Orcem, Vallejo

Paved Roads (Chapter 13.2.1 AP42 Dated 01/2011)

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter	Units	PM10	PM2.5	Reference
Mean Vehicle Weight	tons	25	25	Assumption
Wet Days Per Year	Days	0	0	24-Hr Maximum Scenario
Constant, k	g/VKT	0.62	0.15	AP42 Table 13.2.1-1
Constant, a		0.91	0.91	AP42 Equation 13.2.1-1
Constant, b		1.02	1.02	AP42 Equation 13.2.1-2
Silt Loading, Sl	g/m2	0.10	0.10	Lemon St - CalEEMod Default
Silt Loading, Sl	g/m2	0.10	0.10	CARB Sonoma Blvd
Emission factor, E	g/VKT	2.03	0.49	Calculation Lemon St
Emission factor, E	g/VKT	2.03	0.49	Calculation Sonoma Blvd
Emission factor, E	g/VKT		0.49	Calculation Lemon St
Emission factor, E	g/VKT		0.49	Calculation Sonoma Blvd

Paved Roads (Chapter 13.2.1 A
LDA

$E = [k*(sL)^a(W)^b$ g/veh km

Parameter
Mean Vehicle Weight
Wet Days Per Year
Constant, k
Constant, a
Constant, b
Silt Loading, Sl
Silt Loading, Sl
Emission factor, E
Emission factor, E
Emission factor, E
Emission factor, E

AERMOD Model Inputs
Paved road modelled as a series of 9m spaced volume sources

	HHDT PM2.5		LDA PM2.5	
Spacing of volume sources	14	m	14	
AERMOD Volume Sources	51		51	
Distance Travelled Onsite	0.720	km	0.720	
Emission Factor/vehicle	0.354	g/hr	0.027	
Emission Factor/vehicle	0.000098	g/sec	0.000120	includes shift trips/day
Emission Factor/vehicle/Source	1.93E-06	g/sec	2.35E-06	

Diurnal Emission Factors Based On Truck Movement Breakdown
Milestone 5

			Times 2 to account for round trip		Maximum 24-Hour
Hour Of Day	PM2.5 Emissions (g/s)	Milestone5 Vehicles Per Hour	PM2.5 Emissions (g/s)	PM2.5 Including LDA	PM2.5 Exhaust & Fugitive
1	1.93E-06	5	1.88E-05	2.11E-05	2.17E-05
2	1.93E-06	6	2.50E-05	2.50E-05	2.57E-05
3	1.93E-06	10	3.75E-05	3.75E-05	3.85E-05
4	1.93E-06	11	4.38E-05	4.38E-05	4.49E-05
5	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
6	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
7	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
8	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
9	1.93E-06	13	5.01E-05	5.47E-05	5.63E-05
10	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
11	1.93E-06	15	5.78E-05	5.78E-05	5.92E-05
12	1.93E-06	13	5.01E-05	5.01E-05	5.13E-05
13	1.93E-06	11	4.38E-05	4.38E-05	4.49E-05
14	1.93E-06	5	1.88E-05	1.88E-05	1.92E-05

Fugitive Release From Process Bagfilters

Bag Filters		Process	BagFilter	Flue Diameter	Surface Area (m2)	Maximum PM10 Concentration (mg/Nm3)	Maximum PM2.5 Concentration (mg/Nm3)	Act Exit Velocity (m/s)	Norm Exit Velocity (m/s)
513-	BF1	Clinker unloading trucks line	Bag filter on top of clinker hoppe	0.3	0.0707	2.5	2.25	15.7	15.7
521-	BF1	Secondary input line product	Bag filter on 521-FB1	0.3	0.0707	2.5	2.25	15.7	15.7
521-	BF2	Secondary input line product	Bag filter output 521-BE1	0.3	0.0707	2.5	2.25	15.7	15.7
Silo1	**FN1**	Finished product line to storage	Fan on bag filter top of silo 1	0.30	0.0707	2.5	2.25	11.4	9.0
Silo2	**FN2**	Finished product line to storage	Fan on bag filter top of silo 2	0.30	0.0707	2.5	2.25	2.4	1.9
Silo3	**FN3**	Finished product line to storage	Fan on bag filter top of silo 3	0.30	0.0707	2.5	2.25	2.4	1.9
Truck1	**BF1**	Trucks loading n°1	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
Truck2	**BF1**	Trucks loading n°2	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
Truck3	**BF3**	Trucks loading n°3	Bag filter on top of hopper	0.30	0.0707	2.5	2.25	8.6	7.0
						3.1	1.26		

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 3% O2, Dry	11,784	1.04	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**30**	ppm at 3% O2	0.299	ratio
NOX Emission Level	30.0	ppm at 3% O2		

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2) (73 PPM)	56.58	2.00	3.142	381.05	1.33	1.04	11784	0.67	667	0.185	1.4698	35.28
SO2	2.78	2.00	3.142	381.05	1.33	1.04	11784	0	33	0.009	0.0721	1.73
CO	175.84	2.00	3.142	381.05	1.33	1.04	11784	2.07	2072	0.576	4.5679	109.63
PM10	**2.50**	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	**0.0082**	0.0649	1.56
PM2.5	**2.50**	2.00	3.142	381.05	1.33	1.04	11784	0.03	29	**0.0082**	0.0649	1.56
TOC	23.03	2.00	3.142	381.05	1.33	1.04	11784	0.27	271	0.075	0.5982	14.36

Actual	(mg/Nm3)	Diameter (m)	(m2)	(K)	(m/s)	(m/s)	(m3/hr)	Rate (kg/hr)	g/hr	g/s	g/kWh
NOX (as NO2)	16.92	2.00	3.142	381.05	7.57	7.41	83821	1.42	1418	0.394	0.0760
SO2	0.83	2.00	3.142	381.05	7.57	7.41	83821	0	70	0.019	0.0020
CO	52.58	2.00	3.142	381.05	7.57	7.41	83821	4.41	4408	1.224	0.1253
PM	0.75	2.00	3.142	381.05	7.57	7.41	83821	0.06	63	0.017	0.0113
TOC	6.89	2.00	3.142	381.05	7.57	7.41	83821	0.58	577	0.160	0.0164

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	PM (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.86**				

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

PM2.5
Annual Average

Shipping (48 Movements)	Emission Rates	Units	Sources	Contributors	Permit (Fugitive Only)
Transit (greater than 3km from port)	7.08E-06	g/s/source	65	Orcem & VMT Cumulative	
Transit (within 3km of port)	3.79E-06	g/s/source	34	Orcem & VMT Cumulative	
Maneuvering	1.84E-05	g/s/source	26	Orcem & VMT Cumulative	
Hoteling (Aux Eng)	0.00347	g/s/source	2	Orcem & VMT Cumulative	
Hoteling (Boiler)	0.00142	g/s/source	2	Orcem & VMT Cumulative	
Tugs (Ship Assist)	9.56E-06	g/s/source	26	Orcem & VMT Cumulative	

Barge (No barge for Phase 1 alternative)	Emission Rates	Units	Sources	Contributors	
Barge	0.00E+00	g/s/source	126	VMT Only	

Diesel Hoppers	Emission Rates	Units	Sources	Contributors	
Diesel Hopper 1	2.32E-05	g/s	1	Orcem Only	
Diesel Hopper 2	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 1	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 2	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 3	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 4	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 5	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 6	2.32E-05	g/s	1	Orcem Only	
Diesel Conveyor 7	2.32E-05	g/s	1	Orcem Only	

Drop Points (Orcem Hoppers / Conveyors) Fugitive	Emission Rates	Units	Sources	Contributors	
ship upload 1	1.49E-05	g/s	1	Orcem Only	Yes
ship upload 2	1.49E-05	g/s	1	Orcem Only	Yes
mobile hopper 1	1.49E-05	g/s	1	Orcem Only	Yes
mobile hopper 2	1.49E-05	g/s	1	Orcem Only	Yes
conveyor1	2.97E-05	g/s	1	Orcem Only	Yes
intake hopper	2.97E-05	g/s	1	Orcem Only	Yes
front loading upload 1	1.49E-05	g/s	1	Orcem Only	Yes
front loading upload 2	1.49E-05	g/s	1	Orcem Only	Yes
excavator upload & drop1	2.97E-05	g/s	1	Orcem Only	Yes
excavator upload & drop2	2.97E-05	g/s	1	Orcem Only	Yes
millfeed	3.06E-05	g/s	1	Orcem Only	Yes
elevator drop	3.06E-05	g/s	1	Orcem Only	Yes
main silo	2.97E-05	g/s	1	Orcem Only	Yes
gypsum silo	8.92E-07	g/s	1	Orcem Only	Yes
main silo conveyor	2.97E-05	g/s	1	Orcem Only	Yes
gypsum silo conveyor	8.92E-07	g/s	1	Orcem Only	Yes
mill intake	3.06E-05	g/s	1	Orcem Only	Yes
conveyor drop 1	1.49E-05	g/s	1	Orcem Only	Yes
conveyor drop 2	1.49E-05	g/s	1	Orcem Only	Yes
gypsum handling (drop & upload)	8.92E-07	g/s	1	Orcem Only	Yes

Drop Points (VMT Hoppers / Conveyors) Fugitive	Emission Rates	Units	Sources	Contributors	
mobile hopper 1	7.27E-05	g/s	1	VMT Only	?
mobile hopper 2	7.27E-05	g/s	1	VMT Only	?
mobile hopper 3	3.63E-05	g/s	1	VMT Only	?
mobile hopper 4	2.42E-05	g/s	1	VMT Only	?
mobile hopper 5	2.42E-05	g/s	1	VMT Only	?
mobile hopper 6	2.42E-05	g/s	1	VMT Only	?
mobile hopper 7	2.42E-05	g/s	1	VMT Only	?
FL1 Truck Drop1	1.94E-05	g/s	1	VMT Only	?
FL1 Truck Uploading	1.94E-05	g/s	1	VMT Only	?
FL Rail Upload	5.45E-05	g/s	1	VMT Only	?
FL Rail Drop	5.45E-05	g/s	1	VMT Only	?
Rail Unloading	5.45E-05	g/s	1	VMT Only	?

Raw Material Storage Areas (Orcem) Fugitive	Emission Rates	Units	Sources	Contributors	
Slag Heap South	1.77E-09	g/s/m2	1	Orcem Only	Yes
Slag Heap North	4.41E-10	g/s/m2	1	Orcem Only	Yes
Slag Heap 3 - Gypsum	4.42E-10	g/s/m2	1	Orcem Only	Yes

Conveyor Drops (Orcem) Fugitive	Emission Rates	Units	Sources	Contributors	
Conveyor Drop 1	6.46E-08	g/s/m2	1	Orcem Only	Yes
Conveyor Drop 2	1.65E-07	g/s/m2	1	Orcem Only	Yes

Raw Material Storage Areas (VMT) Fugitive	Emission Rates	Units	Sources	Contributors	
Stockpile Phase 1	1.77E-09	g/s/m2	1	VMT Only	?

Excavators / Front Loaders (Orcem) Exhaust	Emission Rates	Units	Sources	Contributors	
S1 Front Loader & Excavator Combined	8.40E-06	g/s/source	28	Orcem Only	
S2 Front Loader & Excavator Combined	8.40E-06	g/s/source	28	Orcem Only	
S3 Front Loader & Excavator Combined	8.40E-06	g/s/source	28	Orcem Only	

Excavators / Front Loaders (Orcem) Fugitive	Emission Rates	Units	Sources	Contributors	
S1 Front Loader & Excavator Combined	7.50E-06	g/s/source	28	Orcem Only	No
S2 Front Loader & Excavator Combined	7.19E-06	g/s/source	28	Orcem Only	No
S3 Front Loader & Excavator Combined	1.87E-06	g/s/source	28	Orcem Only	No

Front Loaders (VMT) Exhaust	Emission Rates	Units	Sources	Contributors	
Front Loader	4.06E-04	g/s/source	1	VMT Only	

Front Loaders (VMT) Fugitive	Emission Rates	Units	Sources	Contributors	
Front Loader	1.40E-04	g/s/source	1	VMT Only	No

Forklift Exhaust	Emission Rates	Units	Sources	Contributors	
Forklift	2.52E-05	g/s	1	VMT Only	

Forklift Fugitive	Emission Rates	Units	Sources	Contributors	
Forklift	9.85E-05	g/s	1	VMT Only	No

Industrial Paved (Onsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors	
PM2.5 Onsite Paved Road (Exhaust Emissions)	4.56E-07	g/s/source	61	Orcem & VMT Cumulative	
PM2.5 Onsite Paved Road (Exhaust Emissions)	2.89E-07	g/s/source	22	Orcem Only	
PM2.5 Onsite Paved Road (Exhaust Emissions)	1.67E-07	g/s/source	19	VMT Only	

Industrial Paved (Onsite Trucks) (Year 2020)	Emission Rates	Units	Sources	Contributors	
PM2.5 Onsite Paved Road (Fugitive Emissions)	7.33E-06	g/s/source	61	Orcem & VMT Cumulative	No
PM2.5 Onsite Paved Road (Fugitive Emissions)	4.84E-06	g/s/source	22	Orcem Only	No
PM2.5 Onsite Paved Road (Fugitive Emissions)	2.49E-06	g/s/source	19	VMT Only	No

Public Paved Rd (Offsite Trucks) (Exhaust)	Emission Rates	Units	Sources	Contributors	
Lemon St West Of Sonoma	9.42E-07	g/s/source	51	Orcem & VMT Cumulative	
Sonoma North of Lemon	5.72E-08	g/s/source	22	Orcem & VMT Cumulative	
Sonoma South of Lemon	4.43E-07	g/s/source	31	Orcem & VMT Cumulative	
Lemon St East Of Sonoma	6.01E-07	g/s/source	51	Orcem & VMT Cumulative	
Sonoma South of Magazine	4.50E-07	g/s/source	29	Orcem & VMT Cumulative	

Public Paved Rd (Offsite Trucks) (Fugitive)	4.83998E-06	Units	Sources	Contributors	
Lemon St West Of Sonoma	3.60E-05	g/s/source	51	Orcem & VMT Cumulative	No
Sonoma North of Lemon	2.95E-06	g/s/source	22	Orcem & VMT Cumulative	No
Sonoma South of Lemon	2.29E-05	g/s/source	31	Orcem & VMT Cumulative	No
Lemon St East Of Sonoma	2.23E-05	g/s/source	51	Orcem & VMT Cumulative	No
Sonoma South of Magazine	4.50E-07	g/s/source	29	Orcem & VMT Cumulative	No

Main Stack	Emission Rates	Units	Sources	Contributors	
Main Stack	0.00710	g/s	1	Orcem Only	

Bag Filters (Fugitive)	Emission Rates	Units	Sources	Contributors	
Silo1	1.39E-03	g/s	1	Orcem Only	Yes
Silo2	2.98E-04	g/s	1	Orcem Only	Yes
Silo3	2.98E-04	g/s	1	Orcem Only	Yes
Truck1	1.08E-03	g/s	1	Orcem Only	Yes
Truck2	1.08E-03	g/s	1	Orcem Only	Yes
Truck3	1.08E-03	g/s	1	Orcem Only	Yes

Railways (Milestone 5 & Phase 1 Alternative)	Emission Rates	Units	Sources	Contributors	
Switching (average)	2.01E-06	g/s/source	75	Orcem & VMT Cumulative	
Line Haul idling	5.47E-07	g/s/source	3	Orcem & VMT Cumulative	
Line Haul (10 kph)	8.68E-08	g/s/source	41	Orcem & VMT Cumulative	
Line Haul (15 kph)	2.89E-07	g/s/source	24	Orcem & VMT Cumulative	

Scenario	Milestone 5	Phase 1 Alternative
Year	2020	2020

Project PM2.5
Annual Average

Point Sources

Source	Description	Emission Rate	Units	
RAIL_ID	Rail Idling	5.47E-07	g/s	
RAILID2	Rail Idling	5.47E-07	g/s	
RAILID3	Rail Idling	5.47E-07	g/s	
SHPHTAX1	ship auxiliary engine1	3.47E-03	g/s	
SHPHBR1	Auxiliary Boiler 1	1.42E-03	g/s	
SHPHTAX2	ship auxiliary engine 2	3.47E-03	g/s	
SHPHBR2	Auxiliary Boiler 2	1.42E-03	g/s	
STACK	MAIN STACK	7.10E-03	g/s	
MOB_HOP1	mobile hopper 1	2.32E-05	g/s	
MOB_HOP2	mobile hopper 2	2.32E-05	g/s	
CONVY4	conveyor	2.32E-05	g/s	
CONVY3	Mobile Conveyor Drop	2.32E-05	g/s	
CONVY1	conveyor	2.32E-05	g/s	
CONVY6	conveyor	2.32E-05	g/s	
CONVY5	conveyor	2.32E-05	g/s	
CONVY7	conveyor	2.32E-05	g/s	
CONVY2	conveyor	2.32E-05	g/s	
SILO1	Silo1	1.39E-03	g/s	new
SILO2	Silo2	2.98E-04	g/s	new
SILO3	Silo3	2.98E-04	g/s	new
LOAD1	Truck loading1	1.08E-03	g/s	new
LOAD2	Truck loading2	1.08E-03	g/s	new
LOAD3	Truck loading3	1.08E-03	g/s	new

Area Sources

Source	Description	Emission Rate	Units	
RMSP_S	Raw material storage south	1.77E-09	g/s/m2	new
RWSP_N	Raw material storage north	4.41E-10	g/s/m2	new
RMSA_GYP	Gypsum RMSA	4.42E-10	g/s/m2	new
STOCK1	VMT Stockpile1	1.77E-09	g/s/m2	new

Line Sources

Source	Description	Emission Rate	Units	
RMSPD2	RMSP 2 Conveyor drop	1.65E-07	g/s/m2	new
RMSPD1	RMSP 1 Conveyor Drop	6.46E-08	g/s/m2	new

Volume Sources

Source	Description	Emission Rate	Units
ONFUG1	Onsite Exh	4.558E-07	g/s
ONFUG2	Onsite Exh	4.558E-07	g/s
ONFUG3	Onsite Exh	4.558E-07	g/s
ONFUG4	Onsite Exh	4.558E-07	g/s
ONFUG5	Onsite Exh	4.558E-07	g/s
ONFUG6	Onsite Exh	4.558E-07	g/s
ONFUG7	Onsite Exh	4.558E-07	g/s
ONFUG8	Onsite Exh	4.558E-07	g/s
ONFUG9	Onsite Exh	4.558E-07	g/s
ONFUG10	Onsite Exh	4.558E-07	g/s
ONFUG11	Onsite Exh	4.558E-07	g/s
ONFUG12	Onsite Exh	4.558E-07	g/s
ONFUG13	Onsite Exh	4.558E-07	g/s
ONFUG14	Onsite Exh	4.558E-07	g/s
ONFUG15	Onsite Exh	4.558E-07	g/s
ONFUG16	Onsite Exh	4.558E-07	g/s
ONFUG17	Onsite Exh	4.558E-07	g/s
ONFUG18	Onsite Exh	4.558E-07	g/s
ONFUG19	Onsite Exh	4.558E-07	g/s
ONFUG20	Onsite Exh	4.558E-07	g/s
ONFUG21	Onsite Exh	4.558E-07	g/s
ONFUG22	Onsite Exh	4.558E-07	g/s
ONFUG23	Onsite Exh	4.558E-07	g/s
ONFUG24	Onsite Exh	4.558E-07	g/s
ONFUG25	Onsite Exh	4.558E-07	g/s
ONFUG26	Onsite Exh	4.558E-07	g/s
ONFUG27	Onsite Exh	4.558E-07	g/s
ONFUG28	Onsite Exh	4.558E-07	g/s
ONFUG29	Onsite Exh	4.558E-07	g/s
ONFUG30	Onsite Exh	4.558E-07	g/s
ONFUG31	Onsite Exh	4.558E-07	g/s
ONFUG32	Onsite Exh	4.558E-07	g/s
ONFUG33	Onsite Exh	4.558E-07	g/s

ONFUG34	Onsite Exh	4.558E-07	g/s
ONFUG35	Onsite Exh	4.558E-07	g/s
ONFUG36	Onsite Exh	4.558E-07	g/s
ONFUG37	Onsite Exh	4.558E-07	g/s
ONFUG38	Onsite Exh	4.558E-07	g/s
ONFUG39	Onsite Exh	4.558E-07	g/s
ONFUG40	Onsite Exh	4.558E-07	g/s
ONFUG41	Onsite Exh	4.558E-07	g/s
ORFUG42	Orcem Only Exh	2.893E-07	g/s
ORFUG43	Orcem Only Exh	2.893E-07	g/s
ORFUG44	Orcem Only Exh	2.893E-07	g/s
ORFUG45	Orcem Only Exh	2.893E-07	g/s
ORFUG46	Orcem Only Exh	2.893E-07	g/s
ORFUG47	Orcem Only Exh	2.893E-07	g/s
ORFUG48	Orcem Only Exh	2.893E-07	g/s
ORFUG49	Orcem Only Exh	2.893E-07	g/s
ORFUG50	Orcem Only Exh	2.893E-07	g/s
ORFUG51	Orcem Only Exh	2.893E-07	g/s
ORFUG52	Orcem Only Exh	2.893E-07	g/s
ORFUG53	Orcem Only Exh	2.893E-07	g/s
ORFUG54	Orcem Only Exh	2.893E-07	g/s
ORFUG55	Orcem Only Exh	2.893E-07	g/s
ORFUG56	Orcem Only Exh	2.893E-07	g/s
ORFUG57	Orcem Only Exh	2.893E-07	g/s
ORFUG58	Orcem Only Exh	2.893E-07	g/s
ORFUG59	Orcem Only Exh	2.893E-07	g/s
ORFUG60	Orcem Only Exh	2.893E-07	g/s
ORFUG61	Orcem Only Exh	2.893E-07	g/s
ORFUG62	Orcem Only Exh	2.893E-07	g/s
ORFUG63	Orcem Only Exh	2.893E-07	g/s
ONFUG64	Onsite Exh	4.558E-07	g/s
ONFUG65	Onsite Exh	4.558E-07	g/s
ONFUG66	Onsite Exh	4.558E-07	g/s
ONFUG67	Onsite Exh	4.558E-07	g/s
ONFUG68	Onsite Exh	4.558E-07	g/s
ONFUG69	Onsite Exh	4.558E-07	g/s
ONFUG70	Onsite Exh	4.558E-07	g/s
ONFUG71	Onsite Exh	4.558E-07	g/s
ONFUG72	Onsite Exh	4.558E-07	g/s
ONFUG73	Onsite Exh	4.558E-07	g/s
ONFUG74	Onsite Exh	4.558E-07	g/s
ONFUG75	Onsite Exh	4.558E-07	g/s
ONFUG76	Onsite Exh	4.558E-07	g/s
ONFUG77	Onsite Exh	4.558E-07	g/s
ONFUG78	Onsite Exh	4.558E-07	g/s
ONFUG79	Onsite Exh	4.558E-07	g/s
ONFUG80	Onsite Exh	4.558E-07	g/s
ONFUG81	Onsite Exh	4.558E-07	g/s
ONFUG82	Onsite Exh	4.558E-07	g/s
ONFUG83	Onsite Exh	4.558E-07	g/s
LMFUG1	Lemon St Exh	9.416E-07	g/s
LMFUG2	Lemon St Exh	9.416E-07	g/s
LMFUG3	Lemon St Exh	9.416E-07	g/s
LMFUG4	Lemon St Exh	9.416E-07	g/s
LMFUG5	Lemon St Exh	9.416E-07	g/s
LMFUG6	Lemon St Exh	9.416E-07	g/s
LMFUG7	Lemon St Exh	9.416E-07	g/s
LMFUG8	Lemon St Exh	9.416E-07	g/s
LMFUG9	Lemon St Exh	9.416E-07	g/s
LMFUG10	Lemon St Exh	9.416E-07	g/s
LMFUG11	Lemon St Exh	9.416E-07	g/s
LMFUG12	Lemon St Exh	9.416E-07	g/s
LMFUG13	Lemon St Exh	9.416E-07	g/s
LMFUG14	Lemon St Exh	9.416E-07	g/s
LMFUG15	Lemon St Exh	9.416E-07	g/s
LMFUG16	Lemon St Exh	9.416E-07	g/s
LMFUG17	Lemon St Exh	9.416E-07	g/s
LMFUG18	Lemon St Exh	9.416E-07	g/s
LMFUG19	Lemon St Exh	9.416E-07	g/s
LMFUG20	Lemon St Exh	9.416E-07	g/s
LMFUG21	Lemon St Exh	9.416E-07	g/s
LMFUG22	Lemon St Exh	9.416E-07	g/s
LMFUG23	Lemon St Exh	9.416E-07	g/s
LMFUG24	Lemon St Exh	9.416E-07	g/s
LMFUG25	Lemon St Exh	9.416E-07	g/s
LMFUG26	Lemon St Exh	9.416E-07	g/s

LMFUG27	Lemon St Exh	9.416E-07	g/s
LMFUG28	Lemon St Exh	9.416E-07	g/s
LMFUG29	Lemon St Exh	9.416E-07	g/s
LMFUG30	Lemon St Exh	9.416E-07	g/s
LMFUG31	Lemon St Exh	9.416E-07	g/s
LMFUG32	Lemon St Exh	9.416E-07	g/s
LMFUG33	Lemon St Exh	9.416E-07	g/s
LMFUG34	Lemon St Exh	9.416E-07	g/s
LMFUG35	Lemon St Exh	9.416E-07	g/s
LMFUG36	Lemon St Exh	9.416E-07	g/s
LMFUG37	Lemon St Exh	9.416E-07	g/s
LMFUG38	Lemon St Exh	9.416E-07	g/s
LMFUG39	Lemon St Exh	9.416E-07	g/s
LMFUG40	Lemon St Exh	9.416E-07	g/s
LMFUG41	Lemon St Exh	9.416E-07	g/s
LMFUG42	Lemon St Exh	9.416E-07	g/s
LMFUG43	Lemon St Exh	9.416E-07	g/s
LMFUG44	Lemon St Exh	9.416E-07	g/s
LMFUG45	Lemon St Exh	9.416E-07	g/s
LMFUG46	Lemon St Exh	9.416E-07	g/s
LMFUG47	Lemon St Exh	9.416E-07	g/s
LMFUG48	Lemon St Exh	9.416E-07	g/s
LMFUG49	Lemon St Exh	9.416E-07	g/s
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LMFUG51	Lemon St Exh	9.416E-07	g/s
SNFUG1	Sonona Blvd North	5.719E-08	g/s
SNFUG2	Sonona Blvd North	5.719E-08	g/s
SNFUG3	Sonona Blvd North	5.719E-08	g/s
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SNFUG21	Sonona Blvd North	5.719E-08	g/s
SNFUG22	Sonona Blvd North	5.719E-08	g/s
SSFUG1	Sonoma Blvd South	5.719E-08	g/s
SSFUG2	Sonoma Blvd South	5.719E-08	g/s
SSFUG3	Sonoma Blvd South	5.719E-08	g/s
SSFUG4	Sonoma Blvd South	5.719E-08	g/s
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SSFUG23	Sonoma Blvd South	5.719E-08	g/s
SSFUG24	Sonoma Blvd South	5.719E-08	g/s
SSFUG25	Sonoma Blvd South	5.719E-08	g/s
SSFUG26	Sonoma Blvd South	5.719E-08	g/s
SSFUG27	Sonoma Blvd South	5.719E-08	g/s
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SSFUG29	Sonoma Blvd South	5.719E-08	g/s

SSFUG30	Sonoma Blvd South	5.719E-08	g/s
SSFUG31	Sonoma Blvd South	5.719E-08	g/s
SMFUG1	Sonona South Of Magazine	4.499E-07	g/s
SMFUG2	Sonona South Of Magazine	4.499E-07	g/s
SMFUG3	Sonona South Of Magazine	4.499E-07	g/s
SMFUG4	Sonona South Of Magazine	4.499E-07	g/s
SMFUG5	Sonona South Of Magazine	4.499E-07	g/s
SMFUG6	Sonona South Of Magazine	4.499E-07	g/s
SMFUG7	Sonona South Of Magazine	4.499E-07	g/s
SMFUG8	Sonona South Of Magazine	4.499E-07	g/s
SMFUG9	Sonona South Of Magazine	4.499E-07	g/s
SMFUG10	Sonona South Of Magazine	4.499E-07	g/s
SMFUG11	Sonona South Of Magazine	4.499E-07	g/s
SMFUG12	Sonona South Of Magazine	4.499E-07	g/s
SMFUG13	Sonona South Of Magazine	4.499E-07	g/s
SMFUG14	Sonona South Of Magazine	4.499E-07	g/s
SMFUG15	Sonona South Of Magazine	4.499E-07	g/s
SMFUG16	Sonona South Of Magazine	4.499E-07	g/s
SMFUG17	Sonona South Of Magazine	4.499E-07	g/s
SMFUG18	Sonona South Of Magazine	4.499E-07	g/s
SMFUG19	Sonona South Of Magazine	4.499E-07	g/s
SMFUG20	Sonona South Of Magazine	4.499E-07	g/s
SMFUG21	Sonona South Of Magazine	4.499E-07	g/s
SMFUG22	Sonona South Of Magazine	4.499E-07	g/s
SMFUG23	Sonona South Of Magazine	4.499E-07	g/s
SMFUG24	Sonona South Of Magazine	4.499E-07	g/s
SMFUG25	Sonona South Of Magazine	4.499E-07	g/s
SMFUG26	Sonona South Of Magazine	4.499E-07	g/s
SMFUG27	Sonona South Of Magazine	4.499E-07	g/s
SMFUG28	Sonona South Of Magazine	4.499E-07	g/s
SMFUG29	Sonona South Of Magazine	4.499E-07	g/s
LEFUG1	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG2	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG3	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG4	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG5	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG6	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG7	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG8	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG9	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG10	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG11	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG12	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG13	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG14	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG15	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG16	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG17	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG18	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG19	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG20	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG21	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG22	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG23	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG24	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG25	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG26	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG27	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG28	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG29	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG30	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG31	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG32	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG33	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG34	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG35	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG36	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG37	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG38	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG39	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG40	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG41	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG42	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG43	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG44	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG45	Lemon East Of Sonoma	6.005E-07	g/s

LEFUG46	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG47	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG48	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG49	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG50	Lemon East Of Sonoma	6.005E-07	g/s
LEFUG51	Lemon East Of Sonoma	6.005E-07	g/s
VMTFUG1	VMT Only Exh	1.666E-07	g/s
VMTFUG2	VMT Only Exh	1.666E-07	g/s
VMTFUG3	VMT Only Exh	1.666E-07	g/s
VMTFUG4	VMT Only Exh	1.666E-07	g/s
VMTFUG5	VMT Only Exh	1.666E-07	g/s
VMTFUG6	VMT Only Exh	1.666E-07	g/s
VMTFUG7	VMT Only Exh	1.666E-07	g/s
VMTFUG8	VMT Only Exh	1.666E-07	g/s
VMTFUG9	VMT Only Exh	1.666E-07	g/s
VMTFUG10	VMT Only Exh	1.666E-07	g/s
VMTFUG11	VMT Only Exh	1.666E-07	g/s
VMTFUG12	VMT Only Exh	1.666E-07	g/s
VMTFUG13	VMT Only Exh	1.666E-07	g/s
VMTFUG14	VMT Only Exh	1.666E-07	g/s
VMTFUG15	VMT Only Exh	1.666E-07	g/s
VMTFUG16	VMT Only Exh	1.666E-07	g/s
VMTFUG17	VMT Only Exh	1.666E-07	g/s
VMTFUG18	VMT Only Exh	1.666E-07	g/s
VMTFUG19	VMT Only Exh	1.666E-07	g/s
FLS1F1	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F2	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F3	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F4	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F5	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F6	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F7	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F8	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F9	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F10	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F11	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F12	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F13	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F14	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F15	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F16	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F17	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F18	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F19	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F20	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F21	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F22	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F23	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F24	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F25	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS1F26	RMSP1 to Mhopper Exh	8.399E-06	g/s
FLS2F1	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F2	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F3	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F4	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F5	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F6	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F7	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F8	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F9	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F10	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F11	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F12	RMSP2 to Mhopper Exh	8.399E-06	g/s
FLS2F13	RMSP2 to Mhopper Exh	8.399E-06	g/s
FORK1	Forklift Operations	2.522E-05	g/s
TUG1	Tug Emissions	9.555E-06	g/s
TUG2	Tug Emissions	9.555E-06	g/s
TUG3	Tug Emissions	9.555E-06	g/s
TUG4	Tug Emissions	9.555E-06	g/s
TUG5	Tug Emissions	9.555E-06	g/s
TUG6	Tug Emissions	9.555E-06	g/s
TUG7	Tug Emissions	9.555E-06	g/s
TUG8	Tug Emissions	9.555E-06	g/s
TUG9	Tug Emissions	9.555E-06	g/s
TUG10	Tug Emissions	9.555E-06	g/s
TUG11	Tug Emissions	9.555E-06	g/s

TUG12	Tug Emissions	9.555E-06	g/s
TUG13	Tug Emissions	9.555E-06	g/s
TUG14	Tug Emissions	9.555E-06	g/s
TUG15	Tug Emissions	9.555E-06	g/s
TUG16	Tug Emissions	9.555E-06	g/s
TUG17	Tug Emissions	9.555E-06	g/s
TUG18	Tug Emissions	9.555E-06	g/s
TUG19	Tug Emissions	9.555E-06	g/s
TUG20	Tug Emissions	9.555E-06	g/s
TUG21	Tug Emissions	9.555E-06	g/s
TUG22	Tug Emissions	9.555E-06	g/s
TUG23	Tug Emissions	9.555E-06	g/s
TUG24	Tug Emissions	9.555E-06	g/s
TUG25	Tug Emissions	9.555E-06	g/s
TUG26	Tug Emissions	9.555E-06	g/s
RAILST1	rail switching	2.011E-06	g/s
RAILST2	rail switching	2.011E-06	g/s
RAILST3	rail switching	2.011E-06	g/s
RAILST4	rail switching	2.011E-06	g/s
RAILST5	rail switching	2.011E-06	g/s
RAILST6	rail switching	2.011E-06	g/s
RAILST7	rail switching	2.011E-06	g/s
RAILST8	rail switching	2.011E-06	g/s
RAILST9	rail switching	2.011E-06	g/s
RAILST10	rail switching	2.011E-06	g/s
RAILST11	rail switching	2.011E-06	g/s
RAILST12	rail switching	2.011E-06	g/s
RAILST13	rail switching	2.011E-06	g/s
RAILST14	rail switching	2.011E-06	g/s
RAILST15	rail switching	2.011E-06	g/s
RAILST16	rail switching	2.011E-06	g/s
RAILST17	rail switching	2.011E-06	g/s
RAILST18	rail switching	2.011E-06	g/s
RAILST19	rail switching	2.011E-06	g/s
RAILST20	rail switching	2.011E-06	g/s
RAILST21	rail switching	2.011E-06	g/s
RAILST22	rail switching	2.011E-06	g/s
RAILST23	rail switching	2.011E-06	g/s
RAILST24	rail switching	2.011E-06	g/s
RAILST25	rail switching	2.011E-06	g/s
RAILST26	rail switching	2.011E-06	g/s
RAILST27	rail switching	2.011E-06	g/s
RAILST28	rail switching	2.011E-06	g/s
RAILST29	rail switching	2.011E-06	g/s
RAILST30	rail switching	2.011E-06	g/s
RAILST31	rail switching	2.011E-06	g/s
RAILST32	rail switching	2.011E-06	g/s
RAILST33	rail switching	2.011E-06	g/s
RAILST34	rail switching	2.011E-06	g/s
RAILST35	rail switching	2.011E-06	g/s
RAILST36	rail switching	2.011E-06	g/s
RAILST37	rail switching	2.011E-06	g/s
RAILST38	rail switching	2.011E-06	g/s
RAILST39	rail switching	2.011E-06	g/s
RAILST40	rail switching	2.011E-06	g/s
RAILST41	rail switching	2.011E-06	g/s
RAILST42	rail switching	2.011E-06	g/s
RAILST43	rail switching	2.011E-06	g/s
RAILST44	rail switching	2.011E-06	g/s
RAILST45	rail switching	2.011E-06	g/s
RAILST46	rail switching	2.011E-06	g/s
RAILST47	rail switching	2.011E-06	g/s
RAILST48	rail switching	2.011E-06	g/s
RAILST49	rail switching	2.011E-06	g/s
RAILST50	rail switching	2.011E-06	g/s
RAILST51	rail switching	2.011E-06	g/s
RAILST52	rail switching	2.011E-06	g/s
RAILST53	rail switching	2.011E-06	g/s
RAILST54	rail switching	2.011E-06	g/s
RAILST55	rail switching	2.011E-06	g/s
RAILST56	rail switching	2.011E-06	g/s
RAILST57	rail switching	2.011E-06	g/s
RAILST58	rail switching	2.011E-06	g/s
RAILST59	rail switching	2.011E-06	g/s
RAILST60	rail switching	2.011E-06	g/s
RAILST61	rail switching	2.011E-06	g/s

RAILST62	rail switching	2.011E-06	g/s
RAILST63	rail switching	2.011E-06	g/s
RAILST64	rail switching	2.011E-06	g/s
RAILST65	rail switching	2.011E-06	g/s
RAILST66	rail switching	2.011E-06	g/s
RAILST67	rail switching	2.011E-06	g/s
RAILST68	rail switching	2.011E-06	g/s
RAILST69	rail switching	2.011E-06	g/s
RAILST70	rail switching	2.011E-06	g/s
RAILST71	rail switching	2.011E-06	g/s
RAILST72	rail switching	2.011E-06	g/s
RAILST73	rail switching	2.011E-06	g/s
RAILST74	rail switching	2.011E-06	g/s
RAILST75	rail switching	2.011E-06	g/s
RAILLN1	rail haul	8.679E-08	g/s
RAILLN2	rail haul	8.679E-08	g/s
RAILLN3	rail haul	8.679E-08	g/s
RAILLN4	rail haul	8.679E-08	g/s
RAILLN5	rail haul	8.679E-08	g/s
RAILLN6	rail haul	8.679E-08	g/s
RAILLN7	rail haul	8.679E-08	g/s
RAILLN8	rail haul	8.679E-08	g/s
RAILLN9	rail haul	8.679E-08	g/s
RAILLN10	rail haul	8.679E-08	g/s
RAILLN11	rail haul	8.679E-08	g/s
RAILLN12	rail haul	8.679E-08	g/s
RAILLN13	rail haul	8.679E-08	g/s
RAILLN14	rail haul	8.679E-08	g/s
RAILLN15	rail haul	8.679E-08	g/s
RAILLN16	rail haul	8.679E-08	g/s
RAILLN17	rail haul	8.679E-08	g/s
RAILLN18	rail haul	8.679E-08	g/s
RAILLN19	rail haul	8.679E-08	g/s
RAILLN20	rail haul	8.679E-08	g/s
RAILLN21	rail haul	8.679E-08	g/s
RAILLN22	rail haul	8.679E-08	g/s
RAILLN23	rail haul	8.679E-08	g/s
RAILLN24	rail haul	8.679E-08	g/s
RAILLN25	rail haul	8.679E-08	g/s
RAILLN26	rail haul	8.679E-08	g/s
RAILLN27	rail haul	8.679E-08	g/s
RAILLN28	rail haul	8.679E-08	g/s
RAILLN29	rail haul	8.679E-08	g/s
RAILLN30	rail haul	8.679E-08	g/s
RAILLN31	rail haul	8.679E-08	g/s
RAILLN32	rail haul	8.679E-08	g/s
RAILLN33	rail haul	8.679E-08	g/s
RAILLN34	rail haul	8.679E-08	g/s
RAILLN35	rail haul	8.679E-08	g/s
RAILLN36	rail haul	8.679E-08	g/s
RAILLN37	rail haul	8.679E-08	g/s
RAILLN38	rail haul	8.679E-08	g/s
RAILLN39	rail haul	8.679E-08	g/s
RAILLN40	rail haul	8.679E-08	g/s
RAILLN41	rail haul	8.679E-08	g/s
RAILLN42	rail haul (15km/hr)	2.893E-07	g/s
RAILLN43	rail haul (15km/hr)	2.893E-07	g/s
RAILLN44	rail haul (15km/hr)	2.893E-07	g/s
RAILLN45	rail haul (15km/hr)	2.893E-07	g/s
RAILLN46	rail haul (15km/hr)	2.893E-07	g/s
RAILLN47	rail haul (15km/hr)	2.893E-07	g/s
RAILLN48	rail haul (15km/hr)	2.893E-07	g/s
RAILLN49	rail haul (15km/hr)	2.893E-07	g/s
RAILLN50	rail haul (15km/hr)	2.893E-07	g/s
RAILLN51	rail haul (15km/hr)	2.893E-07	g/s
RAILLN52	rail haul (15km/hr)	2.893E-07	g/s
RAILLN53	rail haul (15km/hr)	2.893E-07	g/s
RAILLN54	rail haul (15km/hr)	2.893E-07	g/s
RAILLN55	rail haul (15km/hr)	2.893E-07	g/s
RAILLN56	rail haul (15km/hr)	2.893E-07	g/s
RAILLN57	rail haul (15km/hr)	2.893E-07	g/s
RAILLN58	rail haul (15km/hr)	2.893E-07	g/s
RAILLN59	rail haul (15km/hr)	2.893E-07	g/s
RAILLN60	rail haul (15km/hr)	2.893E-07	g/s
RAILLN61	rail haul (15km/hr)	2.893E-07	g/s
RAILLN62	rail haul (15km/hr)	2.893E-07	g/s

RAILLN63	rail haul (15km/hr)	2.893E-07	g/s
RAILLN64	rail haul (15km/hr)	2.893E-07	g/s
RAILLN65	rail haul (15km/hr)	2.893E-07	g/s
TUGB2	Tug Emissions	9.555E-06	g/s
TUGB3	Tug Emissions	9.555E-06	g/s
TUGB4	Tug Emissions	9.555E-06	g/s
TUGB5	Tug Emissions	9.555E-06	g/s
TUGB6	Tug Emissions	9.555E-06	g/s
TUGB7	Tug Emissions	9.555E-06	g/s
TUGB8	Tug Emissions	9.555E-06	g/s
TUGB9	Tug Emissions	9.555E-06	g/s
TUGB10	Tug Emissions	9.555E-06	g/s
TUGB11	Tug Emissions	9.555E-06	g/s
TUGB12	Tug Emissions	9.555E-06	g/s
TUGB13	Tug Emissions	9.555E-06	g/s
TUGB14	Tug Emissions	9.555E-06	g/s
TUGB15	Tug Emissions	9.555E-06	g/s
TUGB16	Tug Emissions	9.555E-06	g/s
TUGB17	Tug Emissions	9.555E-06	g/s
TUGB18	Tug Emissions	9.555E-06	g/s
TUGB19	Tug Emissions	9.555E-06	g/s
TUGB20	Tug Emissions	9.555E-06	g/s
TUGB21	Tug Emissions	9.555E-06	g/s
TUGB22	Tug Emissions	9.555E-06	g/s
TUGB23	Tug Emissions	9.555E-06	g/s
TUGB24	Tug Emissions	9.555E-06	g/s
TUGB25	Tug Emissions	9.555E-06	g/s
TUGB26	Tug Emissions	9.555E-06	g/s
TUGB1	Tug Emissions	9.555E-06	g/s
BARGE1	Barge	0.000E+00	g/s
BARGE2	Barge	0.000E+00	g/s
BARGE3	Barge	0.000E+00	g/s
BARGE4	Barge	0.000E+00	g/s
BARGE5	Barge	0.000E+00	g/s
BARGE6	Barge	0.000E+00	g/s
BARGE7	Barge	0.000E+00	g/s
BARGE8	Barge	0.000E+00	g/s
BARGE9	Barge	0.000E+00	g/s
BARGE10	Barge	0.000E+00	g/s
BARGE11	Barge	0.000E+00	g/s
BARGE12	Barge	0.000E+00	g/s
BARGE13	Barge	0.000E+00	g/s
BARGE14	Barge	0.000E+00	g/s
BARGE15	Barge	0.000E+00	g/s
BARGE16	Barge	0.000E+00	g/s
BARGE17	Barge	0.000E+00	g/s
BARGE18	Barge	0.000E+00	g/s
BARGE19	Barge	0.000E+00	g/s
BARGE20	Barge	0.000E+00	g/s
BARGE21	Barge	0.000E+00	g/s
BARGE22	Barge	0.000E+00	g/s
BARGE23	Barge	0.000E+00	g/s
BARGE24	Barge	0.000E+00	g/s
BARGE25	Barge	0.000E+00	g/s
BARGE26	Barge	0.000E+00	g/s
BARGE27	Barge	0.000E+00	g/s
BARGE28	Barge	0.000E+00	g/s
BARGE29	Barge	0.000E+00	g/s
BARGE30	Barge	0.000E+00	g/s
BARGE31	Barge	0.000E+00	g/s
BARGE32	Barge	0.000E+00	g/s
BARGE33	Barge	0.000E+00	g/s
BARGE34	Barge	0.000E+00	g/s
BARGE35	Barge	0.000E+00	g/s
BARGE36	Barge	0.000E+00	g/s
BARGE37	Barge	0.000E+00	g/s
BARGE38	Barge	0.000E+00	g/s
BARGE39	Barge	0.000E+00	g/s
BARGE40	Barge	0.000E+00	g/s
BARGE41	Barge	0.000E+00	g/s
BARGE42	Barge	0.000E+00	g/s
BARGE43	Barge	0.000E+00	g/s
BARGE44	Barge	0.000E+00	g/s
BARGE45	Barge	0.000E+00	g/s
BARGE46	Barge	0.000E+00	g/s
BARGE47	Barge	0.000E+00	g/s

BARGE48	Barge	0.000E+00	g/s
BARGE49	Barge	0.000E+00	g/s
BARGE50	Barge	0.000E+00	g/s
BARGE51	Barge	0.000E+00	g/s
BARGE52	Barge	0.000E+00	g/s
BARGE53	Barge	0.000E+00	g/s
BARGE54	Barge	0.000E+00	g/s
BARGE55	Barge	0.000E+00	g/s
BARGE56	Barge	0.000E+00	g/s
BARGE57	Barge	0.000E+00	g/s
BARGE58	Barge	0.000E+00	g/s
BARGE59	Barge	0.000E+00	g/s
BARGE60	Barge	0.000E+00	g/s
BARGE61	Barge	0.000E+00	g/s
BARGE62	Barge	0.000E+00	g/s
BARGE63	Barge	0.000E+00	g/s
BARGE64	Barge	0.000E+00	g/s
BARGE65	Barge	0.000E+00	g/s
BARGE66	Barge	0.000E+00	g/s
BARGE67	Barge	0.000E+00	g/s
BARGE68	Barge	0.000E+00	g/s
BARGE69	Barge	0.000E+00	g/s
BARGE70	Barge	0.000E+00	g/s
BARGE71	Barge	0.000E+00	g/s
BARGE72	Barge	0.000E+00	g/s
BARGE73	Barge	0.000E+00	g/s
BARGE74	Barge	0.000E+00	g/s
BARGE75	Barge	0.000E+00	g/s
BARGE76	Barge	0.000E+00	g/s
BARGE77	Barge	0.000E+00	g/s
BARGE78	Barge	0.000E+00	g/s
BARGE79	Barge	0.000E+00	g/s
BARGE80	Barge	0.000E+00	g/s
BARGE81	Barge	0.000E+00	g/s
BARGE82	Barge	0.000E+00	g/s
BARGE83	Barge	0.000E+00	g/s
BARGE84	Barge	0.000E+00	g/s
BARGE85	Barge	0.000E+00	g/s
BARGE86	Barge	0.000E+00	g/s
BARGE87	Barge	0.000E+00	g/s
BARGE88	Barge	0.000E+00	g/s
BARGE89	Barge	0.000E+00	g/s
BARGE90	Barge	0.000E+00	g/s
BARGE91	Barge	0.000E+00	g/s
BARGE92	Barge	0.000E+00	g/s
BARGE93	Barge	0.000E+00	g/s
BARGE94	Barge	0.000E+00	g/s
BARGE95	Barge	0.000E+00	g/s
BARGE96	Barge	0.000E+00	g/s
BARGE97	Barge	0.000E+00	g/s
BARGE98	Barge	0.000E+00	g/s
BARGE99	Barge	0.000E+00	g/s
BARG100	Barge	0.000E+00	g/s
BARG101	Barge	0.000E+00	g/s
BARG102	Barge	0.000E+00	g/s
BARG103	Barge	0.000E+00	g/s
BARG104	Barge	0.000E+00	g/s
BARG105	Barge	0.000E+00	g/s
BARG106	Barge	0.000E+00	g/s
BARG107	Barge	0.000E+00	g/s
BARG108	Barge	0.000E+00	g/s
BARG109	Barge	0.000E+00	g/s
BARG110	Barge	0.000E+00	g/s
BARG111	Barge	0.000E+00	g/s
BARG112	Barge	0.000E+00	g/s
BARG113	Barge	0.000E+00	g/s
BARG114	Barge	0.000E+00	g/s
BARG115	Barge	0.000E+00	g/s
BARG116	Barge	0.000E+00	g/s
BARG117	Barge	0.000E+00	g/s
BARG118	Barge	0.000E+00	g/s
BARG119	Barge	0.000E+00	g/s
BARG120	Barge	0.000E+00	g/s
BARG121	Barge	0.000E+00	g/s
BARG122	Barge	0.000E+00	g/s
BARG123	Barge	0.000E+00	g/s

BARG124	Barge	0.000E+00	g/s
BARG125	Barge	0.000E+00	g/s
BARG126	Barge	0.000E+00	g/s
NRAILST1	rail switching night	2.011E-06	g/s
NRAILST2	rail switching night	2.011E-06	g/s
NRAILST3	rail switching night	2.011E-06	g/s
NRAILST4	rail switching night	2.011E-06	g/s
NRAILST5	rail switching night	2.011E-06	g/s
NRAILST6	rail switching night	2.011E-06	g/s
NRAILST7	rail switching night	2.011E-06	g/s
NRAILST8	rail switching night	2.011E-06	g/s
NRAILST9	rail switching night	2.011E-06	g/s
NRAILS10	rail switching night	2.011E-06	g/s
NRAILS11	rail switching night	2.011E-06	g/s
NRAILS12	rail switching night	2.011E-06	g/s
NRAILS13	rail switching night	2.011E-06	g/s
NRAILS14	rail switching night	2.011E-06	g/s
NRAILS15	rail switching night	2.011E-06	g/s
NRAILS16	rail switching night	2.011E-06	g/s
NRAILS17	rail switching night	2.011E-06	g/s
NRAILS18	rail switching night	2.011E-06	g/s
NRAILS19	rail switching night	2.011E-06	g/s
NRAILS20	rail switching night	2.011E-06	g/s
NRAILS21	rail switching night	2.011E-06	g/s
NRAILS22	rail switching night	2.011E-06	g/s
NRAILS23	rail switching night	2.011E-06	g/s
NRAILS24	rail switching night	2.011E-06	g/s
NRAILS25	rail switching night	2.011E-06	g/s
NRAILS26	rail switching night	2.011E-06	g/s
NRAILS27	rail switching night	2.011E-06	g/s
NRAILS28	rail switching night	2.011E-06	g/s
NRAILS29	rail switching night	2.011E-06	g/s
NRAILS30	rail switching night	2.011E-06	g/s
NRAILS31	rail switching night	2.011E-06	g/s
NRAILS32	rail switching night	2.011E-06	g/s
NRAILS33	rail switching night	2.011E-06	g/s
NRAILS34	rail switching night	2.011E-06	g/s
NRAILS35	rail switching night	2.011E-06	g/s
NRAILS36	rail switching night	2.011E-06	g/s
NRAILS37	rail switching night	2.011E-06	g/s
NRAILS38	rail switching night	2.011E-06	g/s
NRAILS39	rail switching night	2.011E-06	g/s
NRAILS40	rail switching night	2.011E-06	g/s
NRAILS41	rail switching night	2.011E-06	g/s
NRAILS42	rail switching night	2.011E-06	g/s
NRAILS43	rail switching night	2.011E-06	g/s
NRAILS44	rail switching night	2.011E-06	g/s
NRAILS45	rail switching night	2.011E-06	g/s
NRAILS46	rail switching night	2.011E-06	g/s
NRAILS47	rail switching night	2.011E-06	g/s
NRAILS48	rail switching night	2.011E-06	g/s
NRAILS49	rail switching night	2.011E-06	g/s
NRAILS50	rail switching night	2.011E-06	g/s
NRAILS51	rail switching night	2.011E-06	g/s
NRAILS52	rail switching night	2.011E-06	g/s
NRAILS53	rail switching night	2.011E-06	g/s
NRAILS54	rail switching night	2.011E-06	g/s
NRAILS55	rail switching night	2.011E-06	g/s
NRAILS56	rail switching night	2.011E-06	g/s
NRAILS57	rail switching night	2.011E-06	g/s
NRAILS58	rail switching night	2.011E-06	g/s
NRAILS59	rail switching night	2.011E-06	g/s
NRAILS60	rail switching night	2.011E-06	g/s
NRAILS61	rail switching night	2.011E-06	g/s
NRAILS62	rail switching night	2.011E-06	g/s
NRAILS63	rail switching night	2.011E-06	g/s
NRAILS64	rail switching night	2.011E-06	g/s
NRAILS65	rail switching night	2.011E-06	g/s
NRAILS66	rail switching night	2.011E-06	g/s
NRAILS67	rail switching night	2.011E-06	g/s
NRAILS68	rail switching night	2.011E-06	g/s
NRAILS69	rail switching night	2.011E-06	g/s
NRAILS70	rail switching night	2.011E-06	g/s
NRAILS71	rail switching night	2.011E-06	g/s
NRAILS72	rail switching night	2.011E-06	g/s
NRAILS73	rail switching night	2.011E-06	g/s

NRAILS74	rail switching night	2.011E-06	g/s
NRAILS75	rail switching night	2.011E-06	g/s
NRAILLN1	rail haul night	8.679E-08	g/s
NRAILLN2	rail haul night	8.679E-08	g/s
NRAILLN3	rail haul night	8.679E-08	g/s
NRAILLN4	rail haul night	8.679E-08	g/s
NRAILLN5	rail haul night	8.679E-08	g/s
NRAILLN6	rail haul night	8.679E-08	g/s
NRAILLN7	rail haul night	8.679E-08	g/s
NRAILLN8	rail haul night	8.679E-08	g/s
NRAILLN9	rail haul night	8.679E-08	g/s
NRAILN10	rail haul night	8.679E-08	g/s
NRAILN11	rail haul night	8.679E-08	g/s
NRAILN12	rail haul night	8.679E-08	g/s
NRAILN13	rail haul night	8.679E-08	g/s
NRAILN14	rail haul night	8.679E-08	g/s
NRAILN15	rail haul night	8.679E-08	g/s
NRAILN16	rail haul night	8.679E-08	g/s
NRAILN17	rail haul night	8.679E-08	g/s
NRAILN18	rail haul night	8.679E-08	g/s
NRAILN19	rail haul night	8.679E-08	g/s
NRAILN20	rail haul night	8.679E-08	g/s
NRAILN21	rail haul night	8.679E-08	g/s
NRAILN22	rail haul night	8.679E-08	g/s
NRAILN23	rail haul night	8.679E-08	g/s
NRAILN24	rail haul night	8.679E-08	g/s
NRAILN25	rail haul night	8.679E-08	g/s
NRAILN26	rail haul night	8.679E-08	g/s
NRAILN27	rail haul night	8.679E-08	g/s
NRAILN28	rail haul night	8.679E-08	g/s
NRAILN29	rail haul night	8.679E-08	g/s
NRAILN30	rail haul night	8.679E-08	g/s
NRAILN31	rail haul night	8.679E-08	g/s
NRAILN32	rail haul night	8.679E-08	g/s
NRAILN33	rail haul night	8.679E-08	g/s
NRAILN34	rail haul night	8.679E-08	g/s
NRAILN35	rail haul night	8.679E-08	g/s
NRAILN36	rail haul night	8.679E-08	g/s
NRAILN37	rail haul night	8.679E-08	g/s
NRAILN38	rail haul night	8.679E-08	g/s
NRAILN39	rail haul night	8.679E-08	g/s
NRAILN40	rail haul night	8.679E-08	g/s
NRAILN41	rail haul night	8.679E-08	g/s
NRAILN42	rail haul (15km/hr)	2.893E-07	g/s
NRAILN43	rail haul (15km/hr)	2.893E-07	g/s
NRAILN44	rail haul (15km/hr)	2.893E-07	g/s
NRAILN45	rail haul (15km/hr)	2.893E-07	g/s
NRAILN46	rail haul (15km/hr)	2.893E-07	g/s
NRAILN47	rail haul (15km/hr)	2.893E-07	g/s
NRAILN48	rail haul (15km/hr)	2.893E-07	g/s
NRAILN49	rail haul (15km/hr)	2.893E-07	g/s
NRAILN50	rail haul (15km/hr)	2.893E-07	g/s
NRAILN51	rail haul (15km/hr)	2.893E-07	g/s
NRAILN52	rail haul (15km/hr)	2.893E-07	g/s
NRAILN53	rail haul (15km/hr)	2.893E-07	g/s
NRAILN54	rail haul (15km/hr)	2.893E-07	g/s
NRAILN55	rail haul (15km/hr)	2.893E-07	g/s
NRAILN56	rail haul (15km/hr)	2.893E-07	g/s
NRAILN57	rail haul (15km/hr)	2.893E-07	g/s
NRAILN58	rail haul (15km/hr)	2.893E-07	g/s
NRAILN59	rail haul (15km/hr)	2.893E-07	g/s
NRAILN60	rail haul (15km/hr)	2.893E-07	g/s
NRAILN61	rail haul (15km/hr)	2.893E-07	g/s
NRAILN62	rail haul (15km/hr)	2.893E-07	g/s
NRAILN63	rail haul (15km/hr)	2.893E-07	g/s
NRAILN64	rail haul (15km/hr)	2.893E-07	g/s
NRAILN65	rail haul (15km/hr)	2.893E-07	g/s
NTUG1	Tug Emissions	9.555E-06	g/s
NTUG2	Tug Emissions	9.555E-06	g/s
NTUG3	Tug Emissions	9.555E-06	g/s
NTUG4	Tug Emissions	9.555E-06	g/s
NTUG5	Tug Emissions	9.555E-06	g/s
NTUG6	Tug Emissions	9.555E-06	g/s
NTUG7	Tug Emissions	9.555E-06	g/s
NTUG8	Tug Emissions	9.555E-06	g/s
NTUG9	Tug Emissions	9.555E-06	g/s

NTUG10	Tug Emissions	9.555E-06	g/s
NTUG11	Tug Emissions	9.555E-06	g/s
NTUG12	Tug Emissions	9.555E-06	g/s
NTUG13	Tug Emissions	9.555E-06	g/s
NTUG14	Tug Emissions	9.555E-06	g/s
NTUG15	Tug Emissions	9.555E-06	g/s
NTUG16	Tug Emissions	9.555E-06	g/s
NTUG17	Tug Emissions	9.555E-06	g/s
NTUG18	Tug Emissions	9.555E-06	g/s
NTUG19	Tug Emissions	9.555E-06	g/s
NTUG20	Tug Emissions	9.555E-06	g/s
NTUG21	Tug Emissions	9.555E-06	g/s
NTUG22	Tug Emissions	9.555E-06	g/s
NTUG23	Tug Emissions	9.555E-06	g/s
NTUG24	Tug Emissions	9.555E-06	g/s
NTUG25	Tug Emissions	9.555E-06	g/s
NTUG26	Tug Emissions	9.555E-06	g/s
NTUGB2	Tug Emissions	9.555E-06	g/s
NTUGB3	Tug Emissions	9.555E-06	g/s
NTUGB4	Tug Emissions	9.555E-06	g/s
NTUGB5	Tug Emissions	9.555E-06	g/s
NTUGB6	Tug Emissions	9.555E-06	g/s
NTUGB7	Tug Emissions	9.555E-06	g/s
NTUGB8	Tug Emissions	9.555E-06	g/s
NTUGB9	Tug Emissions	9.555E-06	g/s
NTUGB10	Tug Emissions	9.555E-06	g/s
NTUGB11	Tug Emissions	9.555E-06	g/s
NTUGB12	Tug Emissions	9.555E-06	g/s
NTUGB13	Tug Emissions	9.555E-06	g/s
NTUGB14	Tug Emissions	9.555E-06	g/s
NTUGB15	Tug Emissions	9.555E-06	g/s
NTUGB16	Tug Emissions	9.555E-06	g/s
NTUGB17	Tug Emissions	9.555E-06	g/s
NTUGB18	Tug Emissions	9.555E-06	g/s
NTUGB19	Tug Emissions	9.555E-06	g/s
NTUGB20	Tug Emissions	9.555E-06	g/s
NTUGB21	Tug Emissions	9.555E-06	g/s
NTUGB22	Tug Emissions	9.555E-06	g/s
NTUGB23	Tug Emissions	9.555E-06	g/s
NTUGB24	Tug Emissions	9.555E-06	g/s
NTUGB25	Tug Emissions	9.555E-06	g/s
NTUGB26	Tug Emissions	9.555E-06	g/s
NTUGB1	Tug Emissions	9.555E-06	g/s
TRANS33	transit33	3.790E-06	g/s
TRANS32	transit32	3.790E-06	g/s
TRANS31	transit31	3.790E-06	g/s
TRANS30	transit30	3.790E-06	g/s
TRANS29	transit29	3.790E-06	g/s
TRANS28	transit28	3.790E-06	g/s
TRANS27	transit27	3.790E-06	g/s
TRANS26	transit26	3.790E-06	g/s
TRANS25	transit25	3.790E-06	g/s
TRANS24	transit24	3.790E-06	g/s
TRANS23	transit23	3.790E-06	g/s
TRANS22	transit22	3.790E-06	g/s
TRANS21	transit21	3.790E-06	g/s
TRANS20	transit20	3.790E-06	g/s
TRANS19	transit19	3.790E-06	g/s
TRANS18	transit18	3.790E-06	g/s
TRANS17	transit17	3.790E-06	g/s
TRANS16	transit16	3.790E-06	g/s
TRANS15	transit15	3.790E-06	g/s
TRANS14	transit14	3.790E-06	g/s
TRANS13	transit13	3.790E-06	g/s
TRANS12	transit12	3.790E-06	g/s
TRANS11	transit11	3.790E-06	g/s
TRANS10	transit10	3.790E-06	g/s
TRANS9	transit9	3.790E-06	g/s
TRANS8	transit8	3.790E-06	g/s
TRANS7	transit7	3.790E-06	g/s
TRANS6	transit6	3.790E-06	g/s
TRANS5	transit5	3.790E-06	g/s
TRANS4	transit4	3.790E-06	g/s
TRANS3	transit3	3.790E-06	g/s
TRANS2	transit2	3.790E-06	g/s
TRANS1	transit1	3.790E-06	g/s

TRANS34	transit34	3.790E-06	g/s
TRANS35	transit35	7.081E-06	g/s
TRANS36	transit36	7.081E-06	g/s
TRANS37	transit37	7.081E-06	g/s
TRANS38	transit38	7.081E-06	g/s
TRANS39	transit39	7.081E-06	g/s
TRANS40	transit40	7.081E-06	g/s
TRANS41	transit41	7.081E-06	g/s
TRANS42	transit42	7.081E-06	g/s
TRANS43	transit43	7.081E-06	g/s
TRANS44	transit44	7.081E-06	g/s
TRANS45	transit45	7.081E-06	g/s
TRANS46	transit46	7.081E-06	g/s
TRANS47	transit47	7.081E-06	g/s
TRANS48	transit48	7.081E-06	g/s
TRANS49	transit49	7.081E-06	g/s
TRANS50	transit50	7.081E-06	g/s
TRANS51	transit51	7.081E-06	g/s
TRANS52	transit52	7.081E-06	g/s
TRANS53	transit53	7.081E-06	g/s
TRANS54	transit54	7.081E-06	g/s
TRANS55	transit55	7.081E-06	g/s
TRANS56	transit56	7.081E-06	g/s
TRANS57	transit57	7.081E-06	g/s
TRANS58	transit58	7.081E-06	g/s
TRANS59	transit59	7.081E-06	g/s
TRANS60	transit60	7.081E-06	g/s
TRANS61	transit61	7.081E-06	g/s
TRANS62	transit62	7.081E-06	g/s
TRANS63	transit63	7.081E-06	g/s
TRANS64	transit64	7.081E-06	g/s
TRANS65	transit65	7.081E-06	g/s
TRANS66	transit66	7.081E-06	g/s
TRANS67	transit67	7.081E-06	g/s
TRANS68	transit68	7.081E-06	g/s
TRANS69	transit69	7.081E-06	g/s
TRANS70	transit70	7.081E-06	g/s
TRANS71	transit71	7.081E-06	g/s
TRANS72	transit72	7.081E-06	g/s
TRANS73	transit73	7.081E-06	g/s
TRANS74	transit74	7.081E-06	g/s
TRANS75	transit75	7.081E-06	g/s
TRANS76	transit76	7.081E-06	g/s
TRANS77	transit77	7.081E-06	g/s
TRANS78	transit78	7.081E-06	g/s
TRANS79	transit79	7.081E-06	g/s
TRANS80	transit80	7.081E-06	g/s
TRANS81	transit81	7.081E-06	g/s
TRANS82	transit82	7.081E-06	g/s
TRANS83	transit83	7.081E-06	g/s
TRANS84	transit84	7.081E-06	g/s
TRANS85	transit85	7.081E-06	g/s
TRANS86	transit86	7.081E-06	g/s
TRANS87	transit87	7.081E-06	g/s
TRANS88	transit88	7.081E-06	g/s
TRANS89	transit89	7.081E-06	g/s
TRANS90	transit90	7.081E-06	g/s
TRANS91	transit91	7.081E-06	g/s
TRANS92	transit92	7.081E-06	g/s
TRANS93	transit93	7.081E-06	g/s
TRANS94	transit94	7.081E-06	g/s
TRANS95	transit95	7.081E-06	g/s
TRANS96	transit96	7.081E-06	g/s
TRANS97	transit97	7.081E-06	g/s
TRANS98	transit98	7.081E-06	g/s
TRANS99	transit99	7.081E-06	g/s
MANV1	maneuv1	1.835E-05	g/s
MANV2	maneuv2	1.835E-05	g/s
MANV3	maneuv3	1.835E-05	g/s
MANV4	maneuv4	1.835E-05	g/s
MANV5	maneuv5	1.835E-05	g/s
MANV6	maneuv6	1.835E-05	g/s
MANV7	maneuv7	1.835E-05	g/s
MANV8	maneuv8	1.835E-05	g/s
MANV9	maneuv9	1.835E-05	g/s
MANV10	maneuv10	1.835E-05	g/s

MANV11	maneuv11	1.835E-05	g/s	
MANV12	maneuv12	1.835E-05	g/s	
MANV13	maneuv13	1.835E-05	g/s	
MANV14	maneuv14	1.835E-05	g/s	
MANV15	maneuv15	1.835E-05	g/s	
MANV16	MANV16	1.835E-05	g/s	
MANV17	MANV17	1.835E-05	g/s	
MANV18	MANV18	1.835E-05	g/s	
MANV19	MANV19	1.835E-05	g/s	
MANV20	MANV20	1.835E-05	g/s	
MANV21	MANV21	1.835E-05	g/s	
MANV22	MANV22	1.835E-05	g/s	
MANV23	MANV23	1.835E-05	g/s	
MANV24	MANV24	1.835E-05	g/s	
MANV25	MANV25	1.835E-05	g/s	
MANV26	MANV26	1.835E-05	g/s	
FL_PH1	Front Loader Phase1	4.058E-04	g/s	
GYPSFUG1	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG2	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG3	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG4	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG5	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG6	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG7	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG8	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPSFUG9	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPFUG10	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPFUG11	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
GYPFUG12	Gypsum to MHopper Fug & Exh	1.87E-06	g/s	
SHP_UPLD	ship upload 1	1.49E-05	g/s	new
SHPUPLD2	ship upload 2	1.49E-05	g/s	new
INTAKEH	intake hopper	2.97E-05	g/s	new
MILLFEED	mill feed hopper	3.06E-05	g/s	new
MAINSILO	mill silo	2.97E-05	g/s	new
MILLIN	mill intake	3.06E-05	g/s	new
FL_S1	Front Loader S1 Material Handing	1.49E-05	g/s	new
FL_S2	Front Loader S2 Material Handing	1.49E-05	g/s	new
EC_HAND1	excavator material loading & unloadir	2.97E-05	g/s	new
EC_HAND2	excavator material loading & unloadir	2.97E-05	g/s	new
GYP_MH	gypsum material handling	8.92E-07	g/s	new
HOPPER	mobile hopper 1	7.27E-05	g/s	new
HOPPER2	mobile hopper 2	7.27E-05	g/s	new
HOPPER3	mobile hopper 3	3.63E-05	g/s	new
HOPPER4	mobile hopper 4	2.42E-05	g/s	new
HOPPER5	mobile hopper 5	2.42E-05	g/s	new
HOPPER6	mobile hopper 6	2.42E-05	g/s	new
HOPPER7	mobile hopper 7	2.42E-05	g/s	new
FL_TRDP	FL1 Truck Drop1	1.94E-05	g/s	new
FL_TRU1	FL1 Truck Uploading	1.94E-05	g/s	new
FL_RL_U	FL Rail Upload	5.45E-05	g/s	new
FL_RL_D	FL Rail Drop	5.45E-05	g/s	new
RAIL_DP	Rail Unloading	5.45E-05	g/s	new
GYPSILO	gypsum silo	8.92E-07	g/s	new
ELEVAT	elevator drop	3.06E-05	g/s	new
GYPCONV	gypsum to conveyor	8.92E-07	g/s	new
MAINCON	main silo to conveyor	2.97E-05	g/s	new

NO_2 Cumulative Assessment **(including background)**

(units $\mu g/m^3$)

Conoco Phililips Rodeo	Max 1-hr	98th%ile Daily Max	Annual mean
2007			39.7
2008			40.2
2009	230.4	173.2	38.8
2010			37.7
2012			40.5
	339	**188**	**57.0**

Notes

NO2 background filled using CAPCOA guidance
Ozone data using same guidance
OLM-GROUP Method used.
NO2/NOX In-stack Ratio **varies 0.11 - 0.25**

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported	
Production Capacity	100 tonnes per hour	
Hours Of Operation	7600 hour per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)	
Shipment Load	40,0000 tonnes (19 times per year, every 2.7 weeks)	
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days
Duration of ship unloading	132	hrs (5.5 days)

Operations	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Mitigation Reduction (%)**	**Mitigation Required**
Handymax Ship	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	19	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for milestone 5 manuverving = 2hrs x 19 = 38hrs.	**30%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Excavator)	Ongoing	Based on hours of operation of 24 hrs per day Monday - Saturday (7600 hrs per year as a worst-case). Front loader tonnage will be 14.6 mtonnes per trip. Number of trips per hour = (100 tonnes per hour / 14.6 tonnes) = 6.8 trips per hour	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Stack	Ongoing	Based on hours of operation of 24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case).	**N/A**	No Mitigation Apart From 50m Stack Height
Rail	100	Rail will replace trucks - as truck movements decrease rail movements increase. Total tonnage unchanged at 760000 tonnes / year. Worst-case assumes no decrease in trucks.	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in PM10 compared to Tier II EPA emission rates.

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600	per year			
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**NOX**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	453	lbs/day

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**NOX**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	24003	lbs/year

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**NOX**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	24003	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaken for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	
Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	2.42	NOX at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	1.21	NOX at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2012)	
Maneuvering	0.275	POLA (2012)	
Transit	0.104	POLA (2012)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**NOX**
ALL	Marine Distillate (0.1% S)	**13.74815306**
Medium	Marine Distillate (0.1% S)	**13.2**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**NOX**
ALL	Marine Distillate (0.1% S)	**13.74815306**
Medium	Marine Distillate (0.1% S)	**13.2**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**NOX**
Medium	Marine Distillate (0.1% S)	**10.53415983**
		g/kW-HR

Boiler

	NOX
Marine Distillate (0.1% S)	**2.00**
	g/kW-HR

Tug

	NOX
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

		Emission Factors (g/kW-hr)								
Year	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	0.195542	0.001767
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	0.195032	0.001765
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category

With fuel regulations and MARPOL standards

Golden Gat	Dock	23.13	nm	23.13		AWN	73673	
Sea Buoy	GG	8.72		8.91			1700	
At Buoy		1.5		1.5			1300	
North	Sea Buoy	7.4		6.1	Link not included			
		40.75	nm	39.64			76673	meters
	1.1508	46.8951					41.43703	nm
		75454.22						
		72454.22						
		33.35		33.54	nm			
			1.1508	38.59783	statute miles			
				62103.91	meters			
				59103.91	meters - 3000 meters for maneuvering			

			g/hp-hr					
Calendar Y	Area	Engine	NOx	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.48	0.18	0.57	3.76	0.0060	587.2
2016	Tow Boats	AE	5.74	0.27	0.88	4.18	0.0060	587.2
2016	Tug Boats	ME	5.99	0.22	0.59	3.74	0.0060	587.2
2016	Tug Boats	AE	5.69	0.24	0.86	4.11	0.0060	587.2
2017	Tow Boats	ME	5.12	0.15	0.57	3.93	0.0060	587.2
2017	Tow Boats	AE	5.48	0.23	0.88	4.19	0.0060	587.2
2017	Tug Boats	ME	5.58	0.19	0.58	3.95	0.0060	587.2
2017	Tug Boats	AE	5.32	0.21	0.85	4.19	0.0060	587.2
2018	Tow Boats	ME	5.11	0.15	0.57	3.97	0.0060	587.2
2018	Tow Boats	AE	5.49	0.23	0.88	4.21	0.0060	587.2
2018	Tug Boats	ME	5.54	0.19	0.59	4.01	0.0060	587.2
2018	Tug Boats	AE	5.31	0.20	0.86	4.21	0.0060	587.2
2019	Tow Boats	ME	5.09	0.15	0.57	4.01	0.0060	587.2
2019	Tow Boats	AE	5.50	0.23	0.89	4.23	0.0060	587.2
2019	Tug Boats	ME	5.54	0.19	0.59	4.06	0.0060	587.2
2019	Tug Boats	AE	5.33	0.21	0.87	4.24	0.0060	587.2
2020	Tow Boats	ME	4.66	0.12	0.57	4.22	0.0060	587.2
2020	Tow Boats	AE	5.45	0.22	0.89	4.23	0.0060	587.2
2020	Tug Boats	ME	5.20	0.16	0.59	4.24	0.0060	587.2
2020	Tug Boats	AE	5.29	0.20	0.87	4.24	0.0060	587.2

http://www.arb.ca.gov/msei/categories.htm#chc_category

lbs to grams	453.59	0.002205
tonnes to tons	1.1023	

Diesel Hoppers / Conveyors

OFFROAD2011	Load Factor	kw	NOx
Hopper / Conveyor	0.40	201	0.2700
			g/(hp-hr)
Deterioration Rate	3.56E-06	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.948		
Emission Rate	22.37	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate / Hopper/Conveyor CO	0.006213	g/s

	tonnage	hours of operation	NOx g/hr	NOx lbs/day	NOx MTPA	NOx tpa	NOx lbs/yr	Annual Mean g/sec
milestone 1	120000	180	22.367	1.1837	0.0040	0.0044	8.876	1.28E-04
milestone 2	240000	360	22.367	1.1837	0.0081	0.0089	17.752	2.55E-04
milestone 3	360000	540	22.367	1.1837	0.0121	0.0133	26.628	3.83E-04
milestone 4	480000	720	22.367	1.1837	0.0161	0.0178	35.504	5.11E-04
milestone 5	760000	1140	22.367	1.1837	0.0255	0.0281	56.215	8.09E-04

Unpaved Road - Industrial (Excavator in stockpile)

OFFROAD2011	Load Factor	HP	NOX
Excavator	0.3819	175	0.27
			g/(hp-hr)
Deterioration Rate	3.75E-06	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1396	hours/year	Based on average age of 5 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	0.948		
Emission Rate	18.8	g/hr	

Activity Factor	0.25	Fractional usage per hour
Emission Rate / Excavator	0.00130	g/s

Unpaved Road - Industrial (Front Loader stockpile to hopper)

OFFROAD2011	Load Factor	HP	NOX (diesel with controls)
Front Loader	0.3618	369	0.27
CAT980K			g/(hp-hr)
Deterioration Rate	3.75E-06	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	38.44	g/hr	

Activity Factor	0.75	Fractional usage per hour	
Emission Rate / Front Loader & Excavator	0.009	g/s	Both excavator and front loader

	24-HR Maximum	Annual
Sources (Slag Heap N)	12	26
Sources (Slag Heap S)	5	13

	24-HR Maximum	Annual	
Emission Rate / Front Loader & Excavator / Source (SHN)	0.00078	0.00036	g/s
Emission Rate / Front Loader & Excavator/ Source (SHS)	0.00186	0.00072	g/s

NOX (diesel with controls)	Front Loader - Gypsum Loading			
Emission Rate	38.44	g/hr		
	0.0107	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	2.40	g/km		Tonnage / front loader
Gypsum Storage Sources	12			Tons / front loader
Spacing storage	0.010	km		Gypsum Tonnage
				3,522
Distance Travelled S3	0.240	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.22	14,088
				22,306
Emissions per hour S3	0.58	g/hr	0.126	
Emissions per sec S3	0.00016	g/sec	0.00004	
	NOX Maximum Day		NOX Annual	
Emissions per sec S3/source	1.33E-05	g/sec	2.92E-06	

NO_X Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SF)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	NOX_run		
						(gms/mile)		
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	14.90	Annual	
						17.11	Summer	
						18.07	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NOX (g/hr-veh)	
2020	HHDT	D	SF	A		
					25.48	annual
	Speed	5	miles/hr		61.99	summer
		8.046	km/hr		57.39	winter

HHDT Emission Factor					
		NOX_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	10.63	17.11	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	11.23	18.07	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	9.26	14.90	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (Win)	g/vkt	7.13	11.48	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	3.17	5.10	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	10.41	16.76	Sum	
Composite Emission Factor (Win)	g/vkt	10.92	17.58	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	8.80	14.16	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	10	0.159	1.084	0.159
2016	Annual	LDA	DSL	Aggregated	10	0.692	0.000	0.692
2016	Summer	LDA	GAS	Aggregated	10	0.145	0.965	0.145

2016	Summer	LDA	DSL	Aggregated	10	0.662	0.000	0.662
2016	Winter	LDA	GAS	Aggregated	10	0.178	1.196	0.178
2016	Winter	LDA	DSL	Aggregated	10	0.702	0.000	0.702

LDA Idling Calculation								
2016	**Annual**	**LDA**	**GAS**	**Aggregated**		**NOX_RUNEX**		
						Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.183	0.205	0.166
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.755	0.765	0.722

		NOX_run	**g/mile**		**Comment**
Tailpipe Gas LDA (ann)	g/vkt	1.534	**2.469**	EMFAC2011	**start emissions - onsite only**
Tailpipe DSL LDA (ann)	g/vkt	0.430	**0.692**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	1.694	**2.727**	EMFAC2011	**start emissions - onsite only**
Tailpipe DSL LDA (winter)	g/vkt	0.436	**0.702**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.114	**0.183**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.469	**0.755**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	**0.205**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	**0.765**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	1.428	**2.298**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.433	**0.697**	sum	
Composite Emission Factor Gas (winter)	g/vkt	1.577	**2.538**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.439	**0.707**	sum	
% Of Diesel LDA	0.38%				**Based on ratio of gas:diesel VMT**
Composite Emission Factor (Ann)	g/vkt	**1.424**	**2.292**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**1.573**	**2.531**	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

		HHDT		**LDA**	
		NOX		**NOX**	
Spacing of volume sources		**9**	**m**	**9**	
AERMOD volume Sources		**83**		**83**	
Distance Travelled Onsite		**0.755**	**km**	**0.755**	
		0.469		**0.469**	
Emission Factor/vehicle		**8.245**	**g/hr**	**1.187**	**based on winter**
Emission Factor/vehicle		**6.645**	**g/hr**	**1.075**	**based on annual**
Emission Factor/vehicle		**0.00229**	**g/sec**	**0.00528**	**includes all trips/shift**
Emission Factor/vehicle		**0.00185**	**g/sec**	**0.00478**	**includes all trips/shift**
Emission Factor/vehicle/AERMOD Source		**2.76E-05**	**g/sec**	**6.36E-05**	**based on winter**

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Emission Factor/vehicle/AERMOD Source		2.22E-05	g/sec	5.76E-05	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	NOX Emission Factor	NOX Vehicles / hr	NOX Emission Factor	NOX Including LDA
1	2.76E-05	5	1.34E-04	1.978E-04
2	2.76E-05	6	1.79E-04	1.790E-04
3	2.76E-05	10	2.68E-04	2.684E-04
4	2.76E-05	11	3.13E-04	3.132E-04
5	2.76E-05	13	3.58E-04	3.579E-04
6	2.76E-05	13	3.58E-04	3.579E-04
7	2.76E-05	13	3.58E-04	3.579E-04
8	2.76E-05	13	3.58E-04	3.579E-04
9	2.76E-05	13	3.58E-04	4.851E-04
10	2.76E-05	13	3.58E-04	3.579E-04
11	2.76E-05	15	4.13E-04	4.131E-04
12	2.76E-05	13	3.58E-04	3.579E-04
13	2.76E-05	11	3.13E-04	3.132E-04
14	2.76E-05	5	1.34E-04	1.342E-04
15	2.76E-05	7	1.89E-04	1.894E-04
16	2.76E-05	0	0.00E+00	0.000E+00
17	2.76E-05	0	0.00E+00	6.358E-05
18	2.76E-05	0	0.00E+00	0.000E+00
19	2.76E-05	0	0.00E+00	0.000E+00
20	2.76E-05	0	0.00E+00	0.000E+00
21	2.76E-05	0	0.00E+00	0.000E+00
22	2.76E-05	0	0.00E+00	0.000E+00
23	2.76E-05	2	4.47E-05	4.474E-05
24	2.76E-05	3	8.95E-05	8.948E-05

Total HHDT/Day	166.1
	including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	NOX Emission Factor	Milestone5 Vehicles / hr	NOX Emission Factor	24-Hour Maximum NOX Including LDA
1	2.76E-05	5	1.34E-04	0.000198
2	2.76E-05	6	1.79E-04	0.000179
3	2.76E-05	10	2.68E-04	0.000268
4	2.76E-05	11	3.13E-04	0.000313
5	2.76E-05	13	3.58E-04	0.000358
6	2.76E-05	13	3.58E-04	0.000358
7	2.76E-05	13	3.58E-04	0.000358

24-Hour Maximum

VMT NOX Including LDA	Cumulative NOX Including LDA
7.446E-05	2.72E-04
0.000E+00	1.79E-04
0.000E+00	2.68E-04
0.000E+00	3.13E-04
0.000E+00	3.58E-04
0.000E+00	3.58E-04
0.000E+00	3.58E-04

8	2.76E-05	19	5.23E-04	0.000523	0.000E+00	5.23E-04
9	2.76E-05	19	5.23E-04	0.000651	1.489E-04	8.00E-04
10	2.76E-05	19	5.23E-04	0.000523	5.499E-05	5.78E-04
11	2.76E-05	21	5.79E-04	0.000579	0.000E+00	5.79E-04
12	2.76E-05	19	5.23E-04	0.000523	0.000E+00	5.23E-04
13	2.76E-05	17	4.79E-04	0.000479	0.000E+00	4.79E-04
14	2.76E-05	11	3.00E-04	0.000300	5.499E-05	3.55E-04
15	2.76E-05	13	3.55E-04	0.000355	0.000E+00	3.55E-04
16	2.76E-05	6	1.66E-04	0.000166	0.000E+00	1.66E-04
17	2.76E-05	6	1.66E-04	0.000229	7.446E-05	3.04E-04
18	2.76E-05	0	0.00E+00	0.000000	0.000E+00	0.00E+00
19	2.76E-05	0	0.00E+00	0.000000	0.000E+00	0.00E+00
20	2.76E-05	0	0.00E+00	0.000000	0.000E+00	0.00E+00
21	2.76E-05	0	0.00E+00	0.000000	0.000E+00	0.00E+00
22	2.76E-05	0	0.00E+00	0.000000	0.000E+00	0.00E+00
23	2.76E-05	2	4.47E-05	0.000045	0.000E+00	4.47E-05
24	2.76E-05	3	8.95E-05	0.000089	0.000E+00	8.95E-05

Total HHDT/Day	226.1
	including deliveries (2 per day, 10am, 2pm)

Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

Annualised Emission Rate

	NOX Emission Factor	Milestone5 Vehicles / hr	NOX Emission Factor	NOX Including LDA	Annualised Emission Rate NOX Including LDA	VMT NOX Including LDA	Cumulative NOX Including LDA
1	2.22E-05	4.86	1.08E-04	1.66E-04	1.44E-04	8.22E-05	2.26E-04
2	2.22E-05	6.49	1.44E-04	1.44E-04	1.25E-04	0.00E+00	1.25E-04
3	2.22E-05	9.73	2.16E-04	2.16E-04	1.88E-04	0.00E+00	1.88E-04
4	2.22E-05	11.35	2.52E-04	2.52E-04	2.19E-04	4.58E-05	2.65E-04
5	2.22E-05	12.97	2.88E-04	2.88E-04	2.50E-04	6.11E-05	3.11E-04
6	2.22E-05	12.97	2.88E-04	2.88E-04	2.50E-04	6.11E-05	3.11E-04
7	2.22E-05	12.97	2.88E-04	2.88E-04	2.50E-04	6.11E-05	3.11E-04
8	2.22E-05	13.76	3.06E-04	3.06E-04	2.65E-04	6.11E-05	3.27E-04
9	2.22E-05	13.76	3.06E-04	4.21E-04	3.65E-04	2.25E-04	5.91E-04
10	2.22E-05	13.76	3.06E-04	3.06E-04	2.65E-04	9.16E-05	3.57E-04
11	2.22E-05	15.76	3.50E-04	3.50E-04	3.04E-04	6.11E-05	3.65E-04

12	2.22E-05	13.76	3.06E-04	3.06E-04	2.65E-04	6.11E-05	3.27E-04
13	2.22E-05	12.14	2.70E-04	2.70E-04	2.34E-04	6.11E-05	2.95E-04
14	2.22E-05	5.65	1.26E-04	1.26E-04	1.09E-04	9.16E-05	2.01E-04
15	2.22E-05	7.65	1.70E-04	1.70E-04	1.48E-04	6.11E-05	2.09E-04
16	2.22E-05	0.79	1.76E-05	1.76E-05	1.52E-05	6.11E-05	7.63E-05
17	2.22E-05	0.79	1.76E-05	7.51E-05	6.52E-05	1.43E-04	2.08E-04
18	2.22E-05	0.00	0.00E+00	0.00E+00	0.00E+00	6.11E-05	6.11E-05
19	2.22E-05	0.00	0.00E+00	0.00E+00	0.00E+00	6.11E-05	6.11E-05
20	2.22E-05	0.00	0.00E+00	0.00E+00	0.00E+00	6.11E-05	6.11E-05
21	2.22E-05	0.00	0.00E+00	0.00E+00	0.00E+00	6.11E-05	6.11E-05
22	2.22E-05	0.00	0.00E+00	0.00E+00	0.00E+00	6.11E-05	6.11E-05
23	2.22E-05	1.62	3.61E-05	3.61E-05	3.13E-05	6.11E-05	9.23E-05
24	2.22E-05	3.24	7.21E-05	7.21E-05	6.26E-05	6.11E-05	1.24E-04

			VMT	Cumulative
Total HHDT/Day	174.0	Annualised	Annualised	Annualised
including deliveries (2 per day, 10am, 2pm)		1.48E-04	6.90E-05	2.17E-04

Annual					Maximum Day	Annual Mean				
HGV Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	8.245	6.645	4.111	0.0564	0.0621	124.24
milestone 2	240000		14578	0.755	8.245	6.645	4.111	0.0969	0.1068	213.55
milestone 3	360000		20676	0.755	8.245	6.645	4.111	0.1374	0.1514	302.87
milestone 4	480000		22723	0.755	8.245	6.645	4.111	0.1510	0.1664	332.86
milestone 5	760000		32534	0.755	8.245	6.645	4.111	0.2162	0.2383	476.58
					Maximum Day	Annual Mean				
LDA Traffic					NOX	NOX	NOX	NOX	NOX	NOX
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1		14	2184	0.755	1.187	1.075	0.037	0.0023	0.0026	5.18
milestone 2		24	4992	0.755	1.187	1.075	0.063	0.0054	0.0059	11.83
milestone 3		24	6240	0.755	1.187	1.075	0.063	0.0067	0.0074	14.79
milestone 4		64	16640	0.755	1.187	1.075	0.168	0.0179	0.0197	39.44
milestone 5		64	19968	0.755	1.187	1.075	0.168	0.0215	0.0237	47.33
									tpa	
							NOX			
							lbs/day	MTPA	tpa	lbs/year
					Combined	milestone 1	4.15	0.0587	0.0647	129.4
						milestone 2	4.17	0.1022	0.1127	225.4
						milestone 3	4.17	0.1441	0.1588	317.7
						milestone 4	4.28	0.1689	0.1862	372.3
						milestone 5	4.28	0.2376	0.2620	523.9

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor NOx

EMFAC2011 Emission Rates								0.6214
Region Type:	**GAI**							mile to km
Region:	**Solano (SF)**							
Calendar Year:	**2020**							
Season:	**Annual**							
Speed:	**20**	**miles/hr**						
Vehicle Classification:	**EMFAC2011 Categories**					**Annual**		
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**NO2_run**		
						(gms/mile)		
Solano (SF)	**2020**	**Annual**	**T7 Single**	**DSL**	**Aggregated**	**7.02**	**Annual**	
						9.05	**Summer**	
						9.56	**Winter**	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NO2 (g/hr-veh)	
2020	**HHDT**	**D**	**SF**	**A**		
					25.48	**annual**
	Speed	**5**	**miles/hr**		**61.99**	**summer**
		8.046	**km/hr**		**57.39**	**winter**

HHDT Emission Factor

		NO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	4.36	7.02	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	5.63	9.05	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	5.94	9.56	EMFAC2011	
Idling T7 Single (ann)	g/vkt	3.17	5.10	EMFAC2011	
Idling T7 Single (summer)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (winter)	g/vkt	7.13	11.48	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**4.27**	**6.88**	Sum	
Composite Emission Factor (summer)	g/vkt	5.78	9.30	Sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor (winter)	g/vkt	**6.03**	**9.70**	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	**20**	0.131		0.131
2016	Annual	LDA	DSL	Aggregated	**20**	0.532		0.532
2016	Summer	LDA	GAS	Aggregated	**20**	0.115		0.115
2016	Summer	LDA	DSL	Aggregated	**20**	0.510		0.510
2016	Winter	LDA	GAS	Aggregated	**20**	0.147		0.147
2016	Winter	LDA	DSL	Aggregated	**20**	0.541		0.541

Idling Calculation							
2016	**Annual**	**LDA**	**GAS**	**Aggregated**	**NOx**		
					Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	0.1833	0.2054	0.1659
	8.046	**km/hr**	DSL	Aggregated	0.7546	0.7652	0.7218

		NOx	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.081	**0.131**	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	0.331	**0.532**	EMFAC2011	**No start emissions - onsite only**
Tailpipe Gas LDA (winter)	g/vkt	0.092	**0.147**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.336	**0.541**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.114	**0.183**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.469	**0.755**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	**0.205**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	**0.765**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.084	**0.135**	sum	

Composite Emission Factor DSL (ann)	g/vkt	0.341	**0.549**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor Gas (winter)	g/vkt	0.094	**0.152**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.346	**0.557**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**0.085**	**0.136**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**0.095**	**0.153**	sum	

AERMOD Model Inputs

Paved road modelled as a series of volume sources

Lemon Street (West)		**HHDT NOx**		**LDA NOx**	
Spacing of volume sources		**14**	**m**	**14**	2-way roadway
AERMOD volume Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**4.341**	**g/hr**	**0.069**	based on Winter
Emission Factor/vehicle		**3.077**	**g/hr**	**0.061**	based on Annual
Emission Factor/vehicle		**0.00121**	**g/sec**	**0.000305**	includes shift trips/day
Emission Factor/vehicle		**0.00085**	**g/sec**	**0.000271**	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		**2.36E-05**	**g/sec**	**5.98E-06**	**based on winter**
Emission Factor/vehicle/AERMOD Source		**1.68E-05**	**g/sec**	**5.31E-06**	**based on annual**

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

	Maximum Day	**Annual**			**Maximum Day**		**Annual Mean**
Weekday Hours	**NOx Emission Factor**	**Milestone5 VMT**	**Milestone5 Trucks**	**NOx Emission Factor**	**NOx Including LDA**	**Milestone5 Trucks**	**Milestone5 Including LDA**
1	**2.36E-05**	**1.68E-05**	**4.86**	**2.30E-04**	**2.36E-04**	**1.63E-04**	**1.68E-04**
2	**2.36E-05**	**1.68E-05**	**6.49**	**3.07E-04**	**3.07E-04**	**2.17E-04**	**2.17E-04**
3	**2.36E-05**	**1.68E-05**	**9.73**	**4.60E-04**	**4.60E-04**	**3.26E-04**	**3.26E-04**
4	**2.36E-05**	**1.68E-05**	**11.35**	**5.37E-04**	**5.37E-04**	**3.80E-04**	**3.80E-04**
5	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
6	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
7	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
8	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
9	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.25E-04**	**4.35E-04**	**4.45E-04**
10	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
11	**2.36E-05**	**1.68E-05**	**14.97**	**7.08E-04**	**7.08E-04**	**5.02E-04**	**5.02E-04**
12	**2.36E-05**	**1.68E-05**	**12.97**	**6.13E-04**	**6.13E-04**	**4.35E-04**	**4.35E-04**
13	**2.36E-05**	**1.68E-05**	**11.35**	**5.37E-04**	**5.37E-04**	**3.80E-04**	**3.80E-04**
14	**2.36E-05**	**1.68E-05**	**4.86**	**2.30E-04**	**2.30E-04**	**1.63E-04**	**1.63E-04**
15	**2.36E-05**	**1.68E-05**	**6.86**	**3.25E-04**	**3.25E-04**	**2.30E-04**	**2.30E-04**
16	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
17	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**5.98E-06**	**0.00E+00**	**5.31E-06**
18	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
19	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
20	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
21	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
22	**2.36E-05**	**1.68E-05**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
23	**2.36E-05**	**1.68E-05**	**1.62**	**7.67E-05**	**7.67E-05**	**5.43E-05**	**5.43E-05**
24	**2.36E-05**	**1.68E-05**	**3.24**	**1.53E-04**	**1.53E-04**	**1.09E-04**	**1.09E-04**

	166.1
including deliveries (2 per day, 10am, 2pm)	

Maximum 24-Hr

VMT	**Cumulative**
NO2 Including LDA	**NO2 Including LDA**
7.47E-06	**2.43E-04**
0.00E+00	**3.07E-04**
0.00E+00	**4.60E-04**
0.00E+00	**5.37E-04**
0.00E+00	**6.13E-04**
0.00E+00	**6.13E-04**
0.00E+00	**6.13E-04**
0.00E+00	**6.13E-04**
1.49E-05	**6.40E-04**
9.46E-05	**7.08E-04**
0.00E+00	**7.08E-04**
0.00E+00	**6.13E-04**
0.00E+00	**5.37E-04**
9.46E-05	**3.25E-04**
0.00E+00	**3.25E-04**
0.00E+00	**0.00E+00**
7.47E-06	**1.35E-05**
0.00E+00	**0.00E+00**
0.00E+00	**0.00E+00**
0.00E+00	**0.00E+00**
0.00E+00	**0.00E+00**
0.00E+00	**0.00E+00**
0.00E+00	**7.67E-05**
0.00E+00	**1.53E-04**

Lemon Street (West)

Annualised Emission Rate NOx Including LDA
1.46E-04
1.89E-04
2.83E-04
3.30E-04
3.77E-04
3.77E-04
3.77E-04
3.77E-04
3.86E-04
3.77E-04
4.35E-04
3.77E-04
3.30E-04
1.41E-04
2.00E-04
0.00E+00
4.61E-06
0.00E+00
0.00E+00
0.00E+00
0.00E+00
0.00E+00
4.72E-05
9.43E-05

Annualised
2.02E-04

	Deliveries	**Staff**
Distance Travelled	**80.47**	**39.91**
Units	**km**	**km**
Estimated Average Mileage (2-way)	**(50 miles)**	**(24.8 miles)**

Annual HGV Traffic	**tonnage**		**trucks per year**	**distance travelled (km)**	**Maximum Day NOx g/trip**	**Annual Mean NOx g/trip**	**NOx lbs/day**	**NOx MTPA**	**NOx tpa**	**NOx lbs/year**
milestone 1	**120000**		**8481**	**80.47**	**485.20**	**343.91**	**177.7**	**2.9**	**3.2**	**6430.4**
milestone 2	**240000**		**14578**	**80.47**	**485.20**	**343.91**	**177.7**	**5.0**	**5.5**	**11053.3**
milestone 3	**360000**		**20676**	**80.47**	**485.20**	**343.91**	**177.7**	**7.1**	**7.8**	**15676.2**
milestone 4	**480000**		**22723**	**80.47**	**485.20**	**343.91**	**177.7**	**7.8**	**8.6**	**17228.5**
milestone 5	**760000**		**32534**	**80.47**	**485.20**	**343.91**	**177.7**	**11.2**	**12.3**	**24667.3**
LDA Traffic		**movements/day**	**movement per year**	**distance travelled (km)**	**NOx g/trip**	**NOx g/trip**	**NOx lbs/day**	**NOx MTPA**	**NOx tpa**	**NOx lbs/year**
milestone 1		**14**	**2184**	**39.91**	**3.80**	**3.38**	**0.104**	**0.007**	**0.008**	**16.3**
milestone 2		**24**	**4992**	**39.91**	**3.80**	**3.38**	**0.179**	**0.017**	**0.019**	**37.2**
milestone 3		**24**	**6240**	**39.91**	**3.80**	**3.38**	**0.179**	**0.021**	**0.023**	**46.5**
milestone 4		**64**	**16640**	**39.91**	**3.80**	**3.38**	**0.477**	**0.056**	**0.062**	**123.9**
milestone 5		**64**	**19968**	**39.91**	**3.80**	**3.38**	**0.477**	**0.067**	**0.074**	**148.7**
									tpa	
							NOx lbs/day	**MTPA**	**tpa**	**lbs/year**
				Combined		**milestone 1**	**177.8**	**2.9**	**3.2**	**6447**
						milestone 2	**177.9**	**5.0**	**5.5**	**11090**

milestone 3	177.9	7.1	7.9	15723
milestone 4	178.2	7.9	8.7	17352
milestone 5	178.2	11.3	12.4	24816

		Length	Width	Area
SONOM_S	Sonoma South of Lemon	735	24	17640
SONOM_N	Sonoma North of Lemon	525	24	12600
LEMON_E	Lemon East of Sonoma	820	16	13120
SONOM_S2	Sonoma South of Magazine	698	24	16752

2016		HHDT	LDA	
Emission factor, E	g/VKT	6.030	0.095	Lemon
Emission factor, E (winter)	g/VKT	5.061	0.078	Sonoma Blvd
Emission factor, E (annual)	g/VKT	5.014	0.070	Sonoma Blvd

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT NOx		LDA NOx	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Sonoma North)		0.525	km	0.525	
Emission Factor/vehicle		2.657	g/hr	0.041	based on winter
Emission Factor/vehicle		0.000738	g/sec	0.000182	includes shift trips/day
Emission factor, E		3.36E-05	g/sec	8.28E-06	

Sonoma North of Lemon		0.525
Split	0.05	km

Milestone 5

Maximum 24-Hr

Sonoma North of Lemon

Annualised Emission Rate

Weekday Hours	NOx Emission Factor	Milestone5 VMT	NOx Emission Factor	NOx Including LDA	VMT NO2 Including LDA	Cumulative NO2 Including LDA	Annualised Emission Rate NOx Including LDA	VMT NO2 Including LDA	Cumulative NO2 Including LDA
1	3.36E-05	0.24	1.63E-05	1.67E-05	5.18E-07	1.73E-05	1.45E-05	5.18E-07	1.50E-05
2	3.36E-05	0.32	2.18E-05	2.18E-05	0.00E+00	2.18E-05	1.89E-05	0.00E+00	1.89E-05
3	3.36E-05	0.49	3.26E-05	3.26E-05	0.00E+00	3.26E-05	2.83E-05	0.00E+00	2.83E-05
4	3.36E-05	0.57	3.81E-05	3.81E-05	0.00E+00	3.81E-05	3.30E-05	5.59E-06	3.86E-05
5	3.36E-05	0.65	4.35E-05	4.35E-05	0.00E+00	4.35E-05	3.78E-05	7.45E-06	4.52E-05
6	3.36E-05	0.65	4.35E-05	4.35E-05	0.00E+00	4.35E-05	3.78E-05	7.45E-06	4.52E-05
7	3.36E-05	0.65	4.35E-05	4.35E-05	0.00E+00	4.35E-05	3.78E-05	7.45E-06	4.52E-05
8	3.36E-05	0.65	4.35E-05	4.35E-05	0.00E+00	4.35E-05	3.78E-05	7.45E-06	4.52E-05
9	3.36E-05	0.65	4.35E-05	4.43E-05	1.04E-06	4.54E-05	3.85E-05	8.49E-06	4.70E-05
10	3.36E-05	0.65	4.35E-05	4.35E-05	6.71E-06	5.02E-05	3.78E-05	1.12E-05	4.89E-05
11	3.36E-05	0.75	5.02E-05	5.02E-05	0.00E+00	5.02E-05	4.36E-05	7.45E-06	5.10E-05
12	3.36E-05	0.65	4.35E-05	4.35E-05	0.00E+00	4.35E-05	3.78E-05	7.45E-06	4.52E-05
13	3.36E-05	0.57	3.81E-05	3.81E-05	0.00E+00	3.81E-05	3.30E-05	7.45E-06	4.05E-05
14	3.36E-05	0.24	1.63E-05	1.63E-05	6.71E-06	2.30E-05	1.42E-05	1.12E-05	2.53E-05
15	3.36E-05	0.34	2.30E-05	2.30E-05	0.00E+00	2.30E-05	2.00E-05	7.45E-06	2.74E-05
16	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06
17	3.36E-05	0.00	0.00E+00	4.14E-07	5.18E-07	9.32E-07	3.59E-07	7.97E-06	8.33E-06
18	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06
19	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06
20	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06
21	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06

22	3.36E-05	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-06	7.45E-06
23	3.36E-05	0.08	5.44E-06	5.44E-06	0.00E+00	5.44E-06	4.72E-06	7.45E-06	1.22E-05
24	3.36E-05	0.16	1.09E-05	1.09E-05	0.00E+00	1.09E-05	9.44E-06	7.45E-06	1.69E-05
				g/sec					

8.31	
including deliveries (2 per day, 10am, 2pm)	

	Annualised	Annualised
	2.02E-05	6.84E-06 / 2.70E-05

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		NOx		NOx	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Sonoma South)		0.735	km	0.735	
Emission Factor/vehicle		3.72	g/hr	0.057	based on winter
Emission Factor/vehicle		0.00103	g/sec	0.000255	includes shift trips/day
Emission factor, E		3.33E-05	g/sec	8.23E-06	

Sonoma South of Lemon		0.735
Split	0.39	km

Milestone 5

Weekday Hours	NOx Emission Factor	Milestone5 VMT	NOx Emission Factor	NOx Including LDA	Maximum 24-Hr VMT NO2 Including LDA	Maximum 24-Hr Cumulative NO2 Including LDA	Annualised Emission Rate NOx Including LDA	Sonoma South of Lemon Annualised Emission Rate VMT NO2 Including LDA	Sonoma South of Lemon Annualised Emission Rate Cumulative NO2 Including LDA
1	3.33E-05	2	1.26E-04	1.30E-04	4.01E-06	1.34E-04	1.13E-04	4.01E-06	1.17E-04
2	3.33E-05	3	1.69E-04	1.69E-04	0.00E+00	1.69E-04	1.46E-04	0.00E+00	1.46E-04
3	3.33E-05	4	2.53E-04	2.53E-04	0.00E+00	2.53E-04	2.19E-04	0.00E+00	2.19E-04
4	3.33E-05	4	2.95E-04	2.95E-04	0.00E+00	2.95E-04	2.56E-04	4.33E-05	2.99E-04
5	3.33E-05	5	3.37E-04	3.37E-04	0.00E+00	3.37E-04	2.93E-04	5.77E-05	3.50E-04
6	3.33E-05	5	3.37E-04	3.37E-04	0.00E+00	3.37E-04	2.93E-04	5.77E-05	3.50E-04
7	3.33E-05	5	3.37E-04	3.37E-04	0.00E+00	3.37E-04	2.93E-04	5.77E-05	3.50E-04
8	3.33E-05	5	3.37E-04	3.37E-04	0.00E+00	3.37E-04	2.93E-04	5.77E-05	3.50E-04
9	3.33E-05	5	3.37E-04	3.44E-04	8.02E-06	3.52E-04	2.98E-04	6.58E-05	3.64E-04
10	3.33E-05	5	3.37E-04	3.37E-04	5.20E-05	3.89E-04	2.93E-04	8.66E-05	3.79E-04
11	3.33E-05	6	3.89E-04	3.89E-04	0.00E+00	3.89E-04	3.38E-04	5.77E-05	3.95E-04
12	3.33E-05	5	3.37E-04	3.37E-04	0.00E+00	3.37E-04	2.93E-04	5.77E-05	3.50E-04
13	3.33E-05	4	2.95E-04	2.95E-04	0.00E+00	2.95E-04	2.56E-04	5.77E-05	3.14E-04
14	3.33E-05	2	1.26E-04	1.26E-04	5.20E-05	1.78E-04	1.10E-04	8.66E-05	1.96E-04
15	3.33E-05	3	1.78E-04	1.78E-04	0.00E+00	1.78E-04	1.55E-04	5.77E-05	2.13E-04
16	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
17	3.33E-05	0	0.00E+00	3.21E-06	4.01E-06	7.22E-06	2.78E-06	6.18E-05	6.45E-05
18	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
19	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
20	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
21	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
22	3.33E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.77E-05	5.77E-05
23	3.33E-05	1	4.22E-05	4.22E-05	0.00E+00	4.22E-05	3.66E-05	5.77E-05	9.43E-05
24	3.33E-05	1	8.43E-05	8.43E-05	0.00E+00	8.43E-05	7.31E-05	5.77E-05	1.31E-04
				g/hr					

64.8	
including deliveries (2 per day, 10am, 2pm)	

	Annualised
	1.57E-04

	Annualised
5.30E-05	2.10E-04

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT		LDA	
	NOx		NOx	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street East)	0.820	km	0.820	
Emission Factor/vehicle	4.944	g/hr	0.078	based on winter
Emission Factor/vehicle	0.00137	g/sec	0.000347	includes shift trips/day
Emission factor, E	2.69E-05	g/sec	6.81E-06	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Maximum 24-Hr (VMT, Cumulative); Annualised Emission Rate; Lemon St East Of Sonoma Annualised Emission Rate (VMT, Cumulative)

Weekday Hours	NOx Emission Factor	Milestone5 VMT	NOx Emission Factor	NOx Including LDA	VMT NO2 Including LDA	Cumulative NO2 Including LDA	Annualised Emission Rate NOx Including LDA	VMT NO2 Including LDA	Cumulative NO2 Including LDA
1	2.69E-05	3	1.47E-04	1.51E-04	4.77E-06	1.55E-04	1.31E-04	4.77E-06	1.35E-04
2	2.69E-05	4	1.96E-04	1.96E-04	0.00E+00	1.96E-04	1.70E-04	0.00E+00	1.70E-04
3	2.69E-05	5	2.93E-04	2.93E-04	0.00E+00	2.93E-04	2.55E-04	0.00E+00	2.55E-04
4	2.69E-05	6	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.02E-05	3.47E-04
5	2.69E-05	7	3.91E-04	3.91E-04	0.00E+00	3.91E-04	3.39E-04	6.70E-05	4.06E-04
6	2.69E-05	7	3.91E-04	3.91E-04	0.00E+00	3.91E-04	3.39E-04	6.70E-05	4.06E-04
7	2.69E-05	7	3.91E-04	3.91E-04	0.00E+00	3.91E-04	3.39E-04	6.70E-05	4.06E-04
8	2.69E-05	7	3.91E-04	3.91E-04	0.00E+00	3.91E-04	3.39E-04	6.70E-05	4.06E-04
9	2.69E-05	7	3.91E-04	3.99E-04	9.53E-06	4.08E-04	3.46E-04	7.65E-05	4.23E-04
10	2.69E-05	7	3.91E-04	3.91E-04	6.03E-05	4.52E-04	3.39E-04	1.00E-04	4.40E-04
11	2.69E-05	8	4.52E-04	4.52E-04	0.00E+00	4.52E-04	3.92E-04	6.70E-05	4.59E-04
12	2.69E-05	7	3.91E-04	3.91E-04	0.00E+00	3.91E-04	3.39E-04	6.70E-05	4.06E-04
13	2.69E-05	6	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	6.70E-05	3.64E-04
14	2.69E-05	3	1.47E-04	1.47E-04	6.03E-05	2.07E-04	1.27E-04	1.00E-04	2.28E-04
15	2.69E-05	4	2.07E-04	2.07E-04	0.00E+00	2.07E-04	1.80E-04	6.70E-05	2.47E-04
16	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
17	2.69E-05	0	0.00E+00	3.81E-06	4.77E-06	8.58E-06	3.31E-06	7.18E-05	7.51E-05
18	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
19	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
20	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
21	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
22	2.69E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.70E-05	6.70E-05
23	2.69E-05	1	4.89E-05	4.89E-05	0.00E+00	4.89E-05	4.24E-05	6.70E-05	1.09E-04
24	2.69E-05	2	9.78E-05	9.78E-05	0.00E+00	9.78E-05	8.49E-05	6.70E-05	1.52E-04
				g/hr					

93.0	
including deliveries (2 per day, 10am, 2pm)	

	Annualised
	1.82E-04

	Annualised
6.15E-05	2.43E-04

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT NOx		LDA NOx	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Sonoma South Magazine)	0.698	km	0.698	
Emission Factor/vehicle	3.533	g/hr	0.055	based on winter
Emission Factor/vehicle	0.00098	g/sec	0.000242	includes shift trips/day
Emission factor, E	3.38E-05	g/sec	8.35E-06	

Sonoma South of Magazine		0.698
Split	0.39	km

Milestone 5

Weekday Hours	NOx Emission Factor	Milestone5 VMT	NOx Emission Factor	NOx Including LDA	Maximum 24-Hr VMT NO2 Including LDA	Maximum 24-Hr Cumulative NO2 Including LDA	Annualised Emission Rate NOx Including LDA	Sonoma South of Magazine Annualised Emission Rate VMT NO2 Including LDA	Sonoma South of Magazine Annualised Emission Rate Cumulative NO2 Including LDA
1	3.38E-05	2	1.28E-04	1.32E-04	4.07E-06	1.36E-04	1.14E-04	4.07E-06	1.18E-04
2	3.38E-05	3	1.71E-04	1.71E-04	0.00E+00	1.71E-04	1.49E-04	0.00E+00	1.49E-04
3	3.38E-05	4	2.57E-04	2.57E-04	0.00E+00	2.57E-04	2.23E-04	0.00E+00	2.23E-04
4	3.38E-05	4	3.00E-04	3.00E-04	0.00E+00	3.00E-04	2.60E-04	4.40E-05	3.04E-04
5	3.38E-05	5	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.86E-05	3.56E-04
6	3.38E-05	5	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.86E-05	3.56E-04
7	3.38E-05	5	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.86E-05	3.56E-04
8	3.38E-05	5	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.86E-05	3.56E-04
9	3.38E-05	5	3.42E-04	3.49E-04	8.15E-06	3.57E-04	3.03E-04	6.68E-05	3.69E-04
10	3.38E-05	5	3.42E-04	3.42E-04	5.28E-05	3.95E-04	2.97E-04	8.79E-05	3.85E-04
11	3.38E-05	6	3.95E-04	3.95E-04	0.00E+00	3.95E-04	3.43E-04	5.86E-05	4.01E-04
12	3.38E-05	5	3.42E-04	3.42E-04	0.00E+00	3.42E-04	2.97E-04	5.86E-05	3.56E-04
13	3.38E-05	4	3.00E-04	3.00E-04	0.00E+00	3.00E-04	2.60E-04	5.86E-05	3.19E-04
14	3.38E-05	2	1.28E-04	1.28E-04	5.28E-05	1.81E-04	1.11E-04	8.79E-05	1.99E-04
15	3.38E-05	3	1.81E-04	1.81E-04	0.00E+00	1.81E-04	1.57E-04	5.86E-05	2.16E-04
16	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
17	3.38E-05	0	0.00E+00	3.26E-06	4.07E-06	7.33E-06	2.83E-06	6.27E-05	6.55E-05
18	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
19	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
20	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
21	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
22	3.38E-05	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.86E-05	5.86E-05
23	3.38E-05	1	4.28E-05	4.28E-05	0.00E+00	4.28E-05	3.71E-05	5.86E-05	9.57E-05
24	3.38E-05	1	8.56E-05	8.56E-05	0.00E+00	8.56E-05	7.43E-05	5.86E-05	1.33E-04
				g/s					
		64.8 including deliveries (2 per day, 10am, 2pm)				Annualised 1.88E-04	Annualised 1.59E-04	5.38E-05	Annualised 2.13E-04

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 7% O2, Dry	11,784	1.04	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	30	ppm at 3% O2	0.140	ratio
NOX Emission Level	30.0	ppm at 3% O2		

convert from	converrt to	
	m3/hr	
cfm	1.699	
	cfm	
m3/hr	0.589	49371
		ACFM

PM10
PM2.5
NOX (as NO2)
SO2

Normalised To 298K	Conc. (ppm)	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day	Emission tons/yr
NOX (as NO2)	**30.00**	**56.60**	2.00	3.142	381.05	1.33	1.04	11784	0.67	667	**0.185**	1.4705	35.29	5.59
SO2	1.06	1.82	2.00	3.142	381.05	1.33	1.04	11784	0	21	0.006	0.0472	1.13	0.18
CO	153.50	115.06	2.00	3.142	381.05	1.33	1.04	11784	1.36	1356	0.377	2.9889	71.73	11.36
PM10	115.06	10.41	2.00	3.142	381.05	1.33	1.04	11784	0.12	123	**0.034**	0.2704	6.49	1.03
PM2.5	103.55	10.41	2.00	3.142	381.05	1.33	1.04	11784	0.12	123	**0.034**	0.2704	6.49	1.03
TOC	46.90	15.07	2.00	3.142	381.05	1.33	1.04	11784	0.18	178	0.049	0.3914	9.39	1.49
CO2	66957	120523	2.00	3.142	381.05	1.33	1.04	11784	1420.19	1420186	394.496	3130.9432	75142.64	11898.84
CH4	7.33	4.81	2.00	3.142	381.05	1.33	1.04	11784	0.06	57	0.016	0.1250	3.00	0.47
N2O	0.75	1.34	2.00	3.142	381.05	1.33	1.04	11784	0.02	16	0.004	0.0348	0.84	0.13
Actual	(ppm)	(mg/Nm3)	Diameter (m)	(m2)	(K)	(m/s)	(m/s)	(m3/hr)	Rate (kg/hr)	g/hr	g/s	g/kWh		
NOX (as NO2)	4.21	7.95	2.00	3.142	381.05	7.57	7.41	83821	0.67	666	0.185	0.0760	0.081	
SO2	0.15	0.26	2.00	3.142	381.05	7.57	7.41	83821	0	21	0.006	0.0020		
CO	21.56	16.16	2.00	3.142	381.05	7.57	7.41	83821	1.35	1355	0.376	0.1253		
PM	16.16	1.46	2.00	3.142	381.05	7.57	7.41	83821	0.12	123	0.034	0.0113		
TOC	6.59	2.12	2.00	3.142	381.05	7.57	7.41	83821	0.18	177	0.049	0.0164		

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 7% O2, Dry	12,370	1.09	mass emission calculation	
Actual	68,436	6.05	**model input**	
NOX Emission Level	30	ppm at 3% O2	0.181	ratio
NOX Emission Level	23.3	ppm at 7% O2		

convert from	converrt to	
	m3/hr	
cfm	1.699	
	cfm	
m3/hr	0.589	40308.804
		ACFM

PM10
PM2.5
NOX (as NO2)
SO2

Normalised To 298K	Conc. (ppm)	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day	Emission tons/yr
NOX (as NO2)	**30.00**	**43.96**	2.00	3.142	381.65	1.40	1.09	12370	0.54	544	**0.151**	1.1987	28.77	109.32
SO2	1.06	1.82	2.00	3.142	381.65	1.40	1.09	12370	0	22	0.006	0.0495	1.19	4.52
CO	153.50	115.06	2.00	3.142	381.65	1.40	1.09	12370	1.42	1423	0.395	3.1376	75.30	286.15
PM10	115.06	10.41	2.00	3.142	381.65	1.40	1.09	12370	0.13	129	**0.036**	0.2839	6.81	25.89
PM2.5	103.55	10.41	2.00	3.142	381.65	1.40	1.09	12370	0.13	129	**0.036**	0.2839	6.81	25.89
TOC	46.90	15.07	2.00	3.142	381.65	1.40	1.09	12370	0.19	186	0.052	0.4109	9.86	37.47
CO2	66957	120523	2.00	3.142	381.65	1.40	1.09	12370	1490.84	1490844	414.123	3286.7138	78881.13	299748
CH4	7.33	4.81	2.00	3.142	381.65	1.40	1.09	12370	0.06	59	0.017	0.1312	3.15	11.96
N2O	0.75	1.34	2.00	3.142	381.65	1.40	1.09	12370	0.02	17	0.005	0.0365	0.88	3.33

Actual	(ppm)	(mg/Nm3)	Diameter (m)	(m2)	(K)	(m/s)	(m/s)	(m3/hr)	Rate (kg/hr)	g/hr	g/s	g/kWh	
NOX (as NO2)	4.21	7.95	2.00	3.142	381.65	6.19	6.05	68436	0.54	544	0.151	0.0760	0.066
SO2	0.19	0.33	2.00	3.142	381.65	6.19	6.05	68436	0	22	0.006	0.0020	
CO	27.76	20.81	2.00	3.142	381.65	6.19	6.05	68436	1.42	1424	0.396	0.1253	
PM	20.81	1.88	2.00	3.142	381.65	6.19	6.05	68436	0.13	129	0.036	0.0113	
TOC	8.48	2.73	2.00	3.142	381.65	6.19	6.05	68436	0.19	186	0.052	0.0164	

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	NOX (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	8.45
1	4.76%	33.32	5.00%	1.67	5.61
2	14.18%	99.26	25.00%	24.82	83.63
3	27.80%	194.6	2.30%	4.48	15.08
4	42.07%	294.49	21.50%	63.32	213.37
5	57.30%	401.1	1.50%	6.02	20.28
6	72.51%	507.57	1.60%	8.12	27.37
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.94**				

Natural Gas Combustion (USEPA AP-42 1.4)

HGG	10.82	MW	
	36.92	MMBtu/hr	
Natural Gas Combustion	10.08	Nm3/Tonne	(assumed normalised)
Based on 100 tonnes/hr of raw material	1008	m3/hr	of natural gas
Convert to SCF	35582.4	scf/hr	of natural gas

USEPA Emission Factors									
Combustor Type									
<100 MMBtu/hr	**NOX**	**CO**	**PM**	**SO2**	**SO2**	**TOC**	**VOC**	**CO2**	**CH4**
lb/10E+6 SCF	**100**	**84**	**7.6**	**n/a**	**0.6**	**11**	**5.5**	**120,000**	**2.3**
Emissions (lbs/hr)	3.558	2.989	0.270	n/a	0.021	0.391	0.196	4270	0.0818
Emissions (g/hr)	1614	1356	123	21.4	10	178	89	1936821	37.1
Emissions (g/sec)	0.448	0.377	**0.034**	0.0059	0.0027	0.0493	0.0247	538.0	0.01031
Volume Flow (Nm3/hr)	11784	11784	11784	11784	11784	11784	11784	11784	11784
(assumed 0% H20, 7% O2,298K)									
Emission Concentration (mg/m3)	137.0	115.1	10.41	1.816	0.822	15.07	7.533	164367	3.15
Molecular Weight	46	28		64	64	12	12	44	16
Emission Concentration (ppm)	72.8	100.5	N/A	0.694	0.314	30.7	15.3	91335.6	4.8
(Referenced to 25C)				BAAQMD Maximum	USEPA Default	(as C)	(as C)		

1.881

ppm = (mg/m^3 value)(24.45)/(molecular weight)

mg/m^3 = (ppm value)(molecular weight)/24.45

24.45 is a conversion factor that represents the volume of one mole of gas.
Note: this calculation assumes a temperature of 25°C (77°F) and a pressure of 1 atmosphere (760 torr or 760 mm Hg).

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000	tons per year of sand / aggregate imported
Hours Of Operation	5760	hrs
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,000	metric tonnes
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days
Duration of ship unloading	132	hrs (5.5 days)
Rail Loading	9072	mtonnes per day

Operations	Number Of Events / Year	Hours Of Operation (per year)	Mitigation Reduction (%)	Mitigation Required
Handymax Ship	29	Each shipmment in first hour has transit and manouvering emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouvering and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	29	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for Phase 2 Alternative manuverving = 2hrs x 29 = 58hrs.	**25%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Forklift)	Ongoing	Based on hours of operation of 20 hrs per day Monday - Saturday (5760 hrs per year as a worst-case).	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Rail	Varies	Rail will replace trucks - as truck movements decrease rail movements increase under various scenarios	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in NOX compared to Tier II EPA emission rates.

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
NO2 **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs		lbs/day
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	62.4	lbs/day

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
NO2 **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	452.7	lbs/day
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	62.4	lbs/day

VMT, Phase 2 (Alternative) - Based On Year 2020

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)		NO2	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Phase 2 Alternative	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	36636.2	lbs/year
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	1497.9	lbs/year

VMT, Phase 2 (Alternative) - Based On Year 2020

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)		**NO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Phase 2 Alternative	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	36636.2	lbs/year
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	1497.9	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Source: (CARB (2011) Appendix D)

Assumption	**Phase 2 Alternative**	
Visits Per Year	29	visits
Hours Per Visit	138	hrs
Ship Capacity	40000	metric tonne
Hotelling Time	132	hrs
Hotelling Time (Highest Day)	20.82	hrs
Transit & Maneuvering Time	6	hours (roundtrip)
Transit distance assessed (>3km)	59103.91169	metres
Transit Distance (within 3km)	1700	metres
Maneurvering Distance	1300	metres

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57

Main Engine

Transit

Engine Speed	**Fuel**	**NOX**
ALL	Marine Distillate (0.1% S)	**13.74815306**
Medium	Marine Distillate (0.1% S)	**13.2**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**NOX**
ALL	Marine Distillate (0.1% S)	**13.74815306**
Medium	Marine Distillate (0.1% S)	**13.2**

	A	B	C	D	E	F	G	H	I
32		**Outbound speed**	7	8.06	3.60				**g/kW-HR**
33									
34		**Main Power**	7803	kilowatts			**Auxiliary Engine**		
35		**Auxiliary power**	2459	kilowatts			**Engine Speed**	**Fuel**	
36		**Boiler Power**	109	kilowatts					**NOX**
37		**Tug Power**	1620	kilowatts	(2172 hp - Average)		**Medium**	Marine Distillate (0.1% S)	**10.53415983**
38		**Tug (auiliary)**	95	kilowatts					**g/kW-HR**
39									
40		**Load Factor**							
41		**Main Engine**	82.5%	at cruise speed			**Boiler**		
42		**Maximum Handymax speed**	15.00	knots				**NOX**	
43		**Main Engine Speed (> 3km)**	51.2%	RSZ (12 knots)	(average speed)		Marine Distillate (0.1% S)	**2.00**	
44		**Main Engine (3km from port)**	10.2%	Slow-down approaching port				g/kW-HR	
45		**Main Engine**	3.7%	Maneuvering (5 knots)	inwards				
46		**Main Engine**	10.2%	Maneuvering (7 knots)	outwards				
47		**Low Adjustment Factor (5 knots)**	2.42	NOX at 3.7%	(USEPA (2009))		**Tug**		
48		**Low Adjustment Factor (7 knots)**	1.21	NOX at 10.2%	(USEPA (2009))			**NOX**	
49		**Load Factor**					Marine Distillate (0.1% S)	**See below**	
50		**Tug Main Engine**	0.31	CARB (POO EI)				g/kW-HR	
51		**Tug Auxillary Engine**	0.43	CARB (POO EI)					
52									
53		**Auxilliary Engine**							
54		**Hoteling**	0.061	POLA (2012)					
55		**Maneuvering**	0.275	POLA (2012)					
56		**Transit**	0.104	POLA (2012)					

		Emission Factors (g/kW-hr)								
Year	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	0.195542	0.001767
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	0.195032	0.001765
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category

With fuel regulations and MARPOL standards

Golden Gate	Dock		23.13	nm	23.13		AWN	73673	
Sea Buoy	GG		8.72		8.91			1700	
At Buoy			1.5		1.5			1300	
North	Sea Buoy		7.4		6.1	Link not included			
			40.75	nm	39.64			76673	meters
		1.1508	46.8951					41.43703	nm
			75454.22						
			72454.22						
	Out to Sea Buoy		33.35		33.54	nm			
				1.1508	38.59783	statute miles			
					62103.91	meters			
					59103.91	meters - 3000 meters for maneuvering			

			g/hp-hr					
Calendar Year	Area	Engine	NOx	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172

Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
http://www.arb.ca.gov/msei/categories.htm#chc_category

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Barge Emission Factor

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Distance assessed	6300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	NOX		Time (hrs)		inward	outward	Barge Emission Rate
Main	9499	g/hr	0.486		2.57	3.60	2.752
					m/s	m/s	
Auxiliary	410.3	g/hr	0.486		2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

· 3000 hp was assumed as the rated horsepower of the main engine(s).

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	NOX	
Forklift	0.20	100	2.27	diesel
		hp	g/(hp-hr)	
Deterioration Rate	2.96E-05	g/(hr-hr2)		
Age	6.7	years	(2013 Model)	
Activity	1800	hours/year	(capped at 12,000 hrs)	
Fuel Correction Factor	0.948			
Emission Rate	49.81	g/hr		
Activity Factor	0.50	Fractional usage per hour		

NOX	Maximum Day	
Emission Rate	24.90	g/hr
Emission Rate	0.0069	g/sec
Sources	1	
Emissions per sec S1/source	0.0069	g/sec
	NOX	
Emissions per sec S1/source	0.0069	g/sec

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

OFFROAD2011	Load Factor	HP	NOX (Diesel Engine)*
Front Loader	0.3618	369	0.27
			g/(hp-hr)
Deterioration Rate	3.75E-06	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	38.44	g/hr	

*It was assumed that the front loader is diesel powered instead of CNG. Currently, there are no CNG 369 hp offroad engines being sold and diesel engines have the necessary torque to perform the work

Activity Factor	90%	Fractional usage per hour

Emission Rate / Front Loader	0.0096	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

				Hours Of Operation
Emission Rate / Front Loader / Truck Loading	0.00192	0.00961	g/s	5760
Emission Rate / Front Loader / TransLoading	0.00240	0.00961	g/s	1392
Emission Rate / Front Loader / Rail Loading	0.00192	0.00961	g/s	2038
Emission Rate / Front Loader / Barge Loading	0.00192	0.00961	g/s	237.6
				Sum

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	NOX_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	14.90	Annual		14.898
						17.11	Summer		
						18.07	Winter		

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NOX (g/hr-veh)	
2020	HHDT	D	SF	A		
					25.48	annual
	Speed	5	miles/hr		61.99	summer
		8.046	km/hr		57.39	winter

HHDT Emission Factor					
		NOX_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	10.63	17.11	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	11.23	18.07	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	9.26	14.90	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (Win)	g/vkt	7.13	11.48	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	3.17	5.10	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	10.41	16.76	Sum	
Composite Emission Factor (Win)	g/vkt	10.92	17.58	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	8.80	14.16	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.088	1.084	0.088
2020	Annual	LDA	DSL	Aggregated	10	0.171	0.000	0.171
2020	Summer	LDA	GAS	Aggregated	10	0.145	0.965	0.145
2020	Summer	LDA	DSL	Aggregated	10	0.662	0.000	0.662
2020	Winter	LDA	GAS	Aggregated	10	0.178	1.196	0.178
2020	Winter	LDA	DSL	Aggregated	10	0.702	0.000	0.702

LDA Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		NOX_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.102	0.205	0.166

	8.046	km/hr	DSL	Aggregated	Aggregated	0.191	0.765	0.722

		NOX_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.055	0.088	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.106	0.171	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	1.760	2.832	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (winter)	g/vkt	0.436	0.702	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.316	0.509	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.593	0.954	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	0.205	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	0.765	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.074	0.120	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.143	0.230	sum	
Composite Emission Factor Gas (winter)	g/vkt	1.638	2.635	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.439	0.707	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.075	0.120	sum	Based on 0.38% Diesel
Composite Emission Factor (winter)	g/vkt	1.633	2.628	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	NOX		NOX	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	7.918	g/hr	1.184	based on winter
Emission Factor/vehicle	0.0021994	g/sec	0.006577	includes all trips/day
Emissions /vehicle/AERMOD Source	2.75E-05	g/sec	8.22E-05	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	NOX Emissions (g/s)	NOX Vehicles Per Hour	NOX Emissions (g/s)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	2.75E-05	0	0.00E+00	8.22E-05	0	0.00E+00	8.22E-05
2	2.75E-05	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	2.75E-05	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	2.75E-05	3	8.25E-05	8.25E-05	2	4.56E-05	4.56E-05
5	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
6	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
7	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
8	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
9	2.75E-05	4	1.10E-04	2.74E-04	2	6.07E-05	2.25E-04
10	2.75E-05	6	1.65E-04	1.65E-04	3	9.11E-05	9.11E-05
11	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
12	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
13	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
14	2.75E-05	6	1.65E-04	1.65E-04	3	9.11E-05	9.11E-05

15	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
16	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
17	2.75E-05	4	1.10E-04	1.92E-04	2	6.07E-05	1.43E-04
18	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
19	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
20	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
21	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
22	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
23	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05
24	2.75E-05	4	1.10E-04	1.10E-04	2	6.07E-05	6.07E-05

Total HHDT/Day	87.0		48.1	Annualised Emission Rate
	including deliveries (2 per day, 10am, 2pm)			6.88E-05
Annual HHDT Based On Max Day	31755			
Actual HHDT Based On Tonnage	17542			
Ratio	0.5524			

Annual					Maximum Day	Annual Mean				
HHDT Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480,000	480000	26445	0.725	7.918	6.381	1.519	0.1687	0.1860	371.99
Phase 1 Trucks & Rail	720,000	240000	13846	0.725	7.918	6.381	1.519	0.0883	0.0974	194.77
Phase 1 Alternative	1,350,000	480000	26445	0.725	7.918	6.381	1.519	0.1687	0.1860	371.99
Phase 2	1,160,000	214400	12503	0.725	7.918	6.381	1.519	0.0798	0.0879	175.87
Phase 2 Alternative	1,160,000	310400	17542	0.725	7.918	6.381	1.519	0.1119	0.1234	246.76
LDA Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	1.1839	0.0541	0.063	0.000203	0.000223	0.45
Phase 1 Trucks & Rail	720000	24	4992	0.725	1.1839	0.0541	0.063	0.000270	0.000298	0.60
Phase 1 Alternative	1350000	40	10400	0.725	1.1839	0.0541	0.104	0.000563	0.000620	1.24
Phase 2	1,160,000	80	20800	0.725	1.1839	0.0541	0.209	0.001125	0.001240	2.48
Phase 2 Alternative	1,160,000	80	20800	0.725	1.1839	0.0541	0.209	0.001125	0.001240	2.48
									tpa	
							NOX			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	1.5816	0.1689	0.1862	372.4
						Phase 1 Trucks & Rail	1.5816	0.0886	0.0977	195.4
						Phase 1 Alternative	1.6233	0.1693	0.1866	373.2
						Phase 2	1.7278	0.0809	0.0892	178.3
						Phase 2 Alternative	1.7278	0.1131	0.1246	249.2

NOX Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor NOX

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	NO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	7.02	Annual		7.022
						9.05	Summer		
						9.56	Winter		

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Cate	Fuel_Type	air_basin	season	NO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					25.48	annual
	Speed	5	miles/hr		61.99	summer
		8.046	km/hr		57.39	winter

HHDT Emission Factor

		NO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	4.36	7.02	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	5.63	9.05	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	5.94	9.56	EMFAC2011	
Idling T7 Single (ann)	g/vkt	3.17	5.10	EMFAC2011	
Idling T7 Single (summer)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (winter)	g/vkt	7.13	11.48	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	4.27	6.88	Sum	
Composite Emission Factor (summer)	g/vkt	5.78	9.30	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (winter)	g/vkt	6.03	9.70	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.069		0.069
2020	Annual	LDA	DSL	Aggregated	20	0.116		0.116
2020	Summer	LDA	GAS	Aggregated	20	0.115		0.115
2020	Summer	LDA	DSL	Aggregated	20	0.510		0.510
2020	Winter	LDA	GAS	Aggregated	20	0.147		0.147
2020	Winter	LDA	DSL	Aggregated	20	0.541		0.541

Idling Calculation								
2020	Annual	LDA	GAS	Aggregated	NOX			
					Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	0.1018	0.2054		0.1659
	8.046	km/hr	DSL	Aggregated	0.1908	0.7652		0.7218

		NOX	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.043	**0.069**	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	0.072	**0.116**	EMFAC2011	No start emissions - onsite only
Tailpipe Gas LDA (winter)	g/vkt	0.092	**0.147**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.336	**0.541**	EMFAC2011	

Idling Gas LDA (ann)	g/vkt	0.063	**0.102**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.119	**0.191**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	**0.205**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	**0.765**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.045	**0.072**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.075	**0.121**	sum	
Composite Emission Factor Gas (winter)	g/vkt	0.094	**0.152**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.346	**0.557**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**0.045**	**0.072**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**0.095**	**0.153**	sum	

Paved road modelled as a series of volume sources

		HHDT		LDA	
		NOX		NOX	
Spacing of volume sources		**14**	**m**	**14**	2-way roadway
AERMOD volume Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**4.341**	**g/hr**	**0.069**	based on winter
Emission Factor/vehicle		**1.21E-03**	**g/sec**	**3.81E-04**	includes shift trips/day
Emissions /vehicle/AERMOD Source		**2.36E-05**	g/sec	**7.47E-06**	

Staff Numbers			**Trips**
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative

Weekday Hours	NOX Emissions (g/s)	phase 2 alternative Vehicles Per Hour	NOX Emissions (g/s)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	2.36E-05	0	0.00E+00	7.47E-06	0	0.00E+00	7.47E-06
2	2.36E-05	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	2.36E-05	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	2.36E-05	3	1.42E-04	1.42E-04	2	7.84E-05	7.84E-05
5	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
6	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
7	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
8	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
9	2.36E-05	4	1.89E-04	2.04E-04	2	1.04E-04	1.19E-04
10	2.36E-05	6	2.84E-04	2.84E-04	3	1.57E-04	1.57E-04
11	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
12	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
13	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
14	2.36E-05	6	2.84E-04	2.84E-04	3	1.57E-04	1.57E-04
15	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
16	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
17	2.36E-05	4	1.89E-04	1.97E-04	2	1.04E-04	1.12E-04
18	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
19	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
20	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
21	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
22	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
23	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
24	2.36E-05	4	1.89E-04	1.89E-04	2	1.04E-04	1.04E-04
		87.0			**48.1**		**Annualised Emission Rate**
		including deliveries (2 per day, 10am, 2pm)			**including deliveries (2 per day, 10am, 2pm)**		**9.59E-05**

NOX Public Paved Road (Exhaust Emissions)		**HHDT**	**LDA**	
Emission factor, E	**g/VKT**	**6.030**	**0.0953**	**Lemon**
Emission factor, E (winter)	**g/VKT**	**6.0297**	**0.0781**	**Sonoma Blvd**
Emission factor, E (annual)	**g/VKT**	**4.2740**	**0.0700**	**Sonoma Blvd**

		Length	**Width**
SONOM_S	**Sonoma South of Lemon**	735	24
SONOM_N	**Sonoma North of Lemon**	525	24
LEMON_E	**Lemon East of Sonoma**	820	16
SONOM_S2	**Sonoma South of Magazine**	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		NOX		NOX	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		3.166	g/hr	0.041	based on winter
Emission Factor/vehicle		0.00087934	g/sec	0.00022780	includes shift trips/day
Emission factor, E (winter)		4.00E-05	g/sec	1.04E-05	

Sonoma North of Lemon				0.525
Split	0.05			km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	4.00E-05	0.00	0.00E+00	5.18E-07	0	0.00E+00	5.18E-07
2	4.00E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	4.00E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	4.00E-05	0.15	1.20E-05	1.20E-05	0	6.62E-06	6.62E-06
5	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
6	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
7	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
8	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
9	4.00E-05	0.20	1.60E-05	1.70E-05	0	8.83E-06	9.87E-06
10	4.00E-05	0.30	2.40E-05	2.40E-05	0	1.32E-05	1.32E-05
11	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
12	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
13	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
14	4.00E-05	0.30	2.40E-05	2.40E-05	0	1.32E-05	1.32E-05
15	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
16	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
17	4.00E-05	0.20	1.60E-05	1.65E-05	0	8.83E-06	9.35E-06
18	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
19	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
20	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
21	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
22	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
23	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
24	4.00E-05	0.20	1.60E-05	1.60E-05	0	8.83E-06	8.83E-06
				g/sec			
		4.4			2.4		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		8.09E-06

Sonoma South of Lemon

Paved road modelled as a series of volume sources

		HHDT		LDA	
		NOX		NOX	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	to junction Sonoma Blvd
Emission Factor/vehicle		4.432	g/hr	0.057	based on winter
Emission Factor/vehicle		0.001231	g/sec	0.000319	includes shift trips/day
Emission factor, E (winter)		3.97E-05	g/sec	1.03E-05	

Sonoma South of Lemon		0.735
Split	0.39	km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	3.97E-05	0.00	0.00E+00	4.01E-06	0.00	0.00E+00	4.01E-06
2	3.97E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	3.97E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	3.97E-05	1.17	9.29E-05	9.29E-05	0.65	5.13E-05	5.13E-05
5	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
6	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
7	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
8	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
9	3.97E-05	1.56	1.24E-04	1.32E-04	0.86	6.84E-05	7.65E-05
10	3.97E-05	2.34	1.86E-04	1.86E-04	1.29	1.03E-04	1.03E-04
11	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
12	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
13	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
14	3.97E-05	2.34	1.86E-04	1.86E-04	1.29	1.03E-04	1.03E-04
15	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
16	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
17	3.97E-05	1.56	1.24E-04	1.28E-04	0.86	6.84E-05	7.25E-05
18	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
19	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
20	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
21	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
22	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
23	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
24	3.97E-05	1.56	1.24E-04	1.24E-04	0.86	6.84E-05	6.84E-05
				g/hr			
		33.9			18.7		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		6.27E-05

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of volume sources	16	m	16	2-way roadway
AERMOD volume Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle	4.944	g/hr	0.078	based on winter
Emission Factor/vehicle	0.00137	g/sec	0.0004340	includes shift trips/day
Emission factor, E (winter)	2.69E-05	g/sec	8.51E-06	

Lemon St East Of Sonoma		0.82
Split	0.56	km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	2.69E-05	0	0.00E+00	4.77E-06	0.00	0.00E+00	4.77E-06
2	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	2.69E-05	2	9.05E-05	9.05E-05	0.93	5.00E-05	5.00E-05
5	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
6	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
7	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
8	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
9	2.69E-05	2	1.21E-04	1.30E-04	1.24	6.66E-05	7.62E-05
10	2.69E-05	3	1.81E-04	1.81E-04	1.86	1.00E-04	1.00E-04
11	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
12	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
13	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
14	2.69E-05	3	1.81E-04	1.81E-04	1.86	1.00E-04	1.00E-04
15	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
16	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
17	2.69E-05	2	1.21E-04	1.25E-04	1.24	6.66E-05	7.14E-05
18	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
19	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
20	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
21	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
22	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
23	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
24	2.69E-05	2	1.21E-04	1.21E-04	1.24	6.66E-05	6.66E-05
				g/hr			
		48.7			26.9		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		6.12E-05

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of volume sources	24	m	24	2-way roadway
AERMOD volume Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	to junction Sonoma Blvd
Emission Factor/vehicle	4.209	g/hr	0.055	based on winter
Emission Factor/vehicle	0.0011691	g/sec	0.0003029	includes shift trips/day
Emission factor, E (winter)	4.03E-05	g/sec	1.04E-05	

Sonoma South of Magazine			0.698
Split	0.39		km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	NOX Including LDA
1	4.03E-05	0	0.00E+00	4.07E-06	0.00	0.00E+00	4.07E-06
2	4.03E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	4.03E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	4.03E-05	1	9.43E-05	9.43E-05	0.65	5.21E-05	5.21E-05
5	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
6	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
7	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
8	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
9	4.03E-05	2	1.26E-04	1.34E-04	0.86	6.95E-05	7.76E-05
10	4.03E-05	2	1.89E-04	1.89E-04	1.29	1.04E-04	1.04E-04
11	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
12	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
13	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
14	4.03E-05	2	1.89E-04	1.89E-04	1.29	1.04E-04	1.04E-04
15	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
16	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
17	4.03E-05	2	1.26E-04	1.30E-04	0.86	6.95E-05	7.36E-05
18	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
19	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
20	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
21	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
22	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
23	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
24	4.03E-05	2	1.26E-04	1.26E-04	0.86	6.95E-05	6.95E-05
				g/s			
		33.9			18.7		Annualised Emission Rate

including deliveries (2 per day, 10am, 2pm)	including deliveries (2 per day, 10am, 2pm)	6.36E-05	

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	trucks tonnage per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480,000	26,445	80.467	485.20	343.91	93.077	9.0948	10.0252	20050.30
Phase 1 Trucks & Rail	720000	240,000	13,846	80.467	485.20	343.91	93.077	4.7620	5.2491	10498.26
Phase 1 Alternative	1350000	480,000	26,445	80.467	485.20	343.91	93.077	9.0948	10.0252	20050.30
Phase 2	1,160,000	214,400	12,503	80.467	485.20	343.91	93.077	4.2998	4.7397	9479.38
Phase 2 Alternative	1,160,000	310,400	17,542	80.467	485.20	343.91	93.077	6.0329	6.6501	13300.19
LDA Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	3.12	2.80	0.148	0.010465	0.011535	23.07
Phase 1 Trucks & Rail	720000	24	4992	39.910	3.12	2.80	0.148	0.013953	0.015380	30.76
Phase 1 Alternative	1350000	40	10400	39.910	3.12	2.80	0.247	0.029069	0.032042	64.08
Phase 2	1160000	80	20800	39.910	3.12	2.80	0.493	0.058137	0.064085	128.17
Phase 2 Alternative	1160000	80	20800	39.910	3.12	2.80	0.493	0.058137	0.064085	128.17
									tpa	
							NOX			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	93.225	9.1052	10.0367	20073
						Phase 1 Trucks & Rail	93.225	4.7759	5.2645	10529
						Phase 1 Alternative	93.324	9.1238	10.0572	20114
						Phase 2	93.571	4.3580	4.8038	9608
						Phase 2 Alternative	93.571	6.0911	6.7142	13428

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	NOX (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	8.45
1	4.76%	33.32	5.00%	1.67	5.61
2	14.18%	99.26	25.00%	24.82	83.63
3	27.80%	194.6	2.30%	4.48	15.08
4	42.07%	294.49	21.50%	63.32	213.37
5	57.30%	401.1	1.50%	6.02	20.28
6	72.51%	507.57	1.60%	8.12	27.37
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.94**				

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SF)								
Calendar Year:	2018								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	NOX_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2018	Annual	T7 Single	DSL	Aggregated	14.30	Annual		14.303
						17.11	Summer		
						18.07	Winter		

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NOX (g/hr-veh)	
2016	HHDT	D	SF	A		
					27.14	annual
	Speed	5	miles/hr		61.99	summer
		8.046	km/hr		57.39	winter

HHDT Emission Factor					
		NOX_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	10.63	17.11	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	11.23	18.07	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	8.89	14.30	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (Win)	g/vkt	7.13	11.48	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	3.37	5.43	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	10.41	16.76	Sum	
Composite Emission Factor (Win)	g/vkt	10.92	17.58	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	8.47	13.64	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX	PM10_STREX	PM10_Combined
									(gms/vehicle/day)	0
									0.01929	0.000
									0.00000	0.000
									0.01929	0.000
									0.00000	#VALUE!
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	0.01929	#VALUE!
2016	Annual	LDA	GAS	Aggregated	10	0.159	1.084	0.159	0.00000	1.402
2016	Annual	LDA	DSL	Aggregated	10	0.692	0.000	0.692		
2016	Summer	LDA	GAS	Aggregated	10	0.145	0.965	0.145		
2016	Summer	LDA	DSL	Aggregated	10	0.662	0.000	0.662		
2016	Winter	LDA	GAS	Aggregated	10	0.178	1.196	0.178		
2016	Winter	LDA	DSL	Aggregated	10	0.702	0.000	0.702		

LDA Idling Calculation								
2016	Annual	LDA	GAS	Aggregated		NOX_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.183	0.205	0.166

	8.046	km/hr	DSL	Aggregated	Aggregated	0.755	0.765	0.722

		NOX_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	1.594	2.565	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.430	0.692	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	1.760	2.832	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (winter)	g/vkt	0.436	0.702	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.114	0.183	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.469	0.755	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	0.205	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	0.765	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	1.483	2.386	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.433	0.697	sum	
Composite Emission Factor Gas (winter)	g/vkt	1.638	2.635	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.439	0.707	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	1.479	2.380	sum	Based on 0.38% Diesel
Composite Emission Factor (winter)	g/vkt	1.633	2.628	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

	HHDT		LDA	
	NOX		NOX	
Spacing of volume sources	9	m	9	
AERMOD volume Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	7.918	g/hr	1.072	based on winter
Emission Factor/vehicle	0.0021994	g/sec	0.005957	includes all trips/day
Emissions /vehicle/AERMOD Source	2.75E-05	g/sec	7.45E-05	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	NOX Emissions (g/s)	NOX Vehicles Per Hour	NOX Emissions (g/s)	NOX Including LDA
1	2.75E-05	0	0.00E+00	7.45E-05
2	2.75E-05	0	0.00E+00	0.00E+00
3	2.75E-05	0	0.00E+00	0.00E+00
4	2.75E-05	0	0.00E+00	0.00E+00
5	2.75E-05	0	0.00E+00	0.00E+00
6	2.75E-05	0	0.00E+00	0.00E+00
7	2.75E-05	0	0.00E+00	0.00E+00
8	2.75E-05	0	0.00E+00	0.00E+00
9	2.75E-05	0	0.00E+00	1.49E-04
10	2.75E-05	2	5.50E-05	5.50E-05
11	2.75E-05	0	0.00E+00	0.00E+00
12	2.75E-05	0	0.00E+00	0.00E+00
13	2.75E-05	0	0.00E+00	0.00E+00
14	2.75E-05	2	5.50E-05	5.50E-05

15	2.75E-05	0	0.00E+00	0.00E+00
16	2.75E-05	0	0.00E+00	0.00E+00
17	2.75E-05	0	0.00E+00	7.45E-05
18	2.75E-05	0	0.00E+00	0.00E+00
19	2.75E-05	0	0.00E+00	0.00E+00
20	2.75E-05	0	0.00E+00	0.00E+00
21	2.75E-05	0	0.00E+00	0.00E+00
22	2.75E-05	0	0.00E+00	0.00E+00
23	2.75E-05	0	0.00E+00	0.00E+00
24	2.75E-05	0	0.00E+00	0.00E+00

Total HHDT/Day	4.0
	including deliveries (2 per day, 10am, 2pm)
Annual HHDT Based On Max Day	1460
Actual HHDT Based On Tonnage	17631
Ratio	0.5524

Annual					Maximum Day	Annual Mean				
HGV Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480,000	480000	25717	0.725	5.585	6.444	0.049	0.1657	0.1827	365.33
Phase 1 Trucks & Rail	720,000	240000	13750	0.725	5.585	6.444	0.049	0.0886	0.0977	195.34
Phase 1 Alternative	1,350,000	480000	25717	0.725	5.585	6.444	0.049	0.1657	0.1827	365.33
Phase 2	1,160,000	214400	12339	0.725	5.585	6.444	0.049	0.0795	0.0876	175.29
Phase 2 Alternative	1,160,000	310400	17631	0.725	5.585	6.444	0.049	0.1136	0.1252	250.47
LDA Traffic					NOX	NOX	NOX	NOX	NOX	NOX
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.34475	0.09252	0.018	0.000346	0.000382	0.76
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.34475	0.09252	0.018	0.000462	0.000509	1.02
Phase 1 Alternative	1350000	40	10400	0.725	0.34475	0.09252	0.030	0.000962	0.001061	2.12
Phase 2	1,160,000	80	20800	0.725	0.34475	0.09252	0.061	0.001924	0.002121	4.24
Phase 2 Alternative	1,160,000	80	20800	0.725	0.34475	0.09252	0.061	0.001924	0.002121	4.24
									tpa	
							NOX			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.0675	0.1661	0.1830	366.1
						Phase 1 Trucks & Rail	0.0675	0.0891	0.0982	196.4
						Phase 1 Alternative	0.0797	0.1667	0.1837	367.4
						Phase 2	0.1101	0.0814	0.0898	179.5
						Phase 2 Alternative	0.1101	0.1155	0.1274	254.7

NOX Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor NOX

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SF)								
Calendar Year:	2018								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	NO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2018	Annual	T7 Single	DSL	Aggregated	7.09	Annual		7.086
						9.05	Summer		
						9.56	Winter		

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Cate	Fuel_Type	air_basin	season	NO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					27.14	annual
	Speed	5	miles/hr		61.99	summer
		8.046	km/hr		57.39	winter

HHDT Emission Factor					
		NO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	4.40	7.09	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	5.63	9.05	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	5.94	9.56	EMFAC2011	
Idling T7 Single (ann)	g/vkt	3.37	5.43	EMFAC2011	
Idling T7 Single (summer)	g/vkt	7.70	12.40	EMFAC2011	
Idling T7 Single (winter)	g/vkt	7.13	11.48	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	4.33	6.96	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (summer)	g/vkt	5.78	9.30	Sum	
Composite Emission Factor (winter)	g/vkt	6.03	9.70	Sum	

PM10_STREX	PM10_Combined
(gms/vehicle/day)	0
	0.000
	0.000
	0.000
	#VALUE!
	#VALUE!
	0.261

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	NOX_RUNEX	NOX_STREX	NOX_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	20	0.131		0.131
2016	Annual	LDA	DSL	Aggregated	20	0.532		0.532
2016	Summer	LDA	GAS	Aggregated	20	0.115		0.115
2016	Summer	LDA	DSL	Aggregated	20	0.510		0.510
2016	Winter	LDA	GAS	Aggregated	20	0.147		0.147
2016	Winter	LDA	DSL	Aggregated	20	0.541		0.541

Idling Calculation								
2016	Annual	LDA	GAS	Aggregated	NOX			
					Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	0.1833	0.2054		0.1659
	8.046	km/hr	DSL	Aggregated	0.7546	0.7652		0.7218

		NOX	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.081	0.131	EMFAC2011	No start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.331	0.532	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	0.092	0.147	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.336	0.541	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.114	0.183	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.469	0.755	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.128	0.205	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.476	0.765	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.084	0.135	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.341	0.549	sum	
Composite Emission Factor Gas (winter)	g/vkt	0.094	0.152	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.346	0.557	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.085	0.136	sum	Based on 0.38% Diesel
Composite Emission Factor (winter)	g/vkt	0.095	0.153	sum	

Paved road modelled as a series of volume sources

		HHDT NOX		LDA NOX	
Spacing of volume sources		14	m	14	2-way roadway
AERMOD volume Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		4.341	g/hr	0.069	based on winter
Emission Factor/vehicle		1.21E-03	g/sec	3.81E-04	includes shift trips/day
Emissions /vehicle/AERMOD Source		2.36E-05	g/sec	7.47E-06	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative

Weekday Hours	NOX Emissions (g/s)	phase 2 alternative Vehicles Per Hour	NOX Emissions (g/s)	NOX Including LDA
1	2.36E-05	0	0.00E+00	7.47E-06
2	2.36E-05	0	0.00E+00	0.00E+00
3	2.36E-05	0	0.00E+00	0.00E+00
4	2.36E-05	0	0.00E+00	0.00E+00
5	2.36E-05	0	0.00E+00	0.00E+00
6	2.36E-05	0	0.00E+00	0.00E+00
7	2.36E-05	0	0.00E+00	0.00E+00
8	2.36E-05	0	0.00E+00	0.00E+00
9	2.36E-05	0	0.00E+00	1.49E-05
10	2.36E-05	2	9.46E-05	9.46E-05
11	2.36E-05	0	0.00E+00	0.00E+00
12	2.36E-05	0	0.00E+00	0.00E+00
13	2.36E-05	0	0.00E+00	0.00E+00
14	2.36E-05	2	9.46E-05	9.46E-05
15	2.36E-05	0	0.00E+00	0.00E+00
16	2.36E-05	0	0.00E+00	0.00E+00
17	2.36E-05	0	0.00E+00	7.47E-06
18	2.36E-05	0	0.00E+00	0.00E+00
19	2.36E-05	0	0.00E+00	0.00E+00
20	2.36E-05	0	0.00E+00	0.00E+00
21	2.36E-05	0	0.00E+00	0.00E+00
22	2.36E-05	0	0.00E+00	0.00E+00
23	2.36E-05	0	0.00E+00	0.00E+00
24	2.36E-05	0	0.00E+00	0.00E+00

4.0

including deliveries (2 per day, 10am, 2pm)

NOX Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	6.030	0.0953	Lemon
Controlled Emission factor, E	g/VKT	5.0614	0.0781	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of volume sources

		HHDT NOX		LDA NOX	
Spacing of volume sources		24	m	24	2-way roadway
AERMOD volume Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		2.657	g/hr	0.041	based on winter
Emission Factor/vehicle		0.00073813	g/sec	0.00022780	includes shift trips/day
Controlled Emission factor, E		3.36E-05	g/sec	1.04E-05	

Sonoma North of Lemon			0.525
Split	0.05		km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	PM10 Including LDA
1	3.36E-05	0.00	0.00E+00	5.18E-07	0	0.00E+00	5.18E-07
2	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
5	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
6	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
7	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
8	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
9	3.36E-05	0.00	0.00E+00	1.04E-06	0	0.00E+00	1.04E-06
10	3.36E-05	0.10	6.71E-06	6.71E-06	0	3.71E-06	3.71E-06
11	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
12	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
13	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
14	3.36E-05	0.10	6.71E-06	6.71E-06	0	3.71E-06	3.71E-06
15	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
16	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
17	3.36E-05	0.00	0.00E+00	5.18E-07	0	0.00E+00	5.18E-07

18	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
19	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
20	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
21	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
22	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
23	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
24	3.36E-05	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
				g/sec			
		0.2			0.1		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		3.95E-07

Sonoma South of Lemon

Paved road modelled as a series of volume sources

	HHDT		LDA		
	NOX		NOX		
Spacing of volume sources	24	m	24	2-way roadway	
AERMOD volume Sources	31		31		
Distance Travelled (Lemon Street)	0.735	km	0.735	to junction Sonoma Blvd	
Emission Factor/vehicle	3.720	g/hr	0.057	based on winter	
Emission Factor/vehicle	0.00103338	g/sec	0.00031892	includes shift trips/day	
Controlled Emission factor, E	3.33E-05	g/sec	1.03E-05		

Sonoma South of Lemon		0.735
Split	0.39	km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	PM10 Including LDA
1	3.33E-05	0.00	0.00E+00	4.01E-06	0.00	0.00E+00	4.01E-06
2	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
5	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
6	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
7	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
8	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
9	3.33E-05	0.00	0.00E+00	8.02E-06	0.00	0.00E+00	8.02E-06
10	3.33E-05	0.78	5.20E-05	5.20E-05	0.43	2.87E-05	2.87E-05
11	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
12	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
13	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
14	3.33E-05	0.78	5.20E-05	5.20E-05	0.43	2.87E-05	2.87E-05
15	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
16	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
17	3.33E-05	0.00	0.00E+00	4.01E-06	0.00	0.00E+00	4.01E-06
18	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
19	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
20	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
21	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
22	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
23	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
24	3.33E-05	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
				g/hr			
		1.6			0.9		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		3.06E-06

Lemon St East Of Sonoma

Paved road modelled as a series of volume sources

#DIV/0!

	HHDT		LDA		
	HHDT		HHDT		
Spacing of volume sources	16	m	16	2-way roadway	
AERMOD volume Sources	51		51		
Distance Travelled (Lemon Street)	0.820	km	0.820	to junction Sonoma Blvd	
Emission Factor/vehicle	4.944	g/hr	0.078	based on winter	
Emission Factor/vehicle	0.0013734	g/sec	0.0004340	includes shift trips/day	
Controlled Emission factor, E	2.69E-05	g/sec	8.51E-06		

Lemon St East Of Sonoma		0.82
Split	0.56	km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	PM10 Including LDA
1	2.69E-05	0	0.00E+00	4.77E-06	0.00	0.00E+00	4.77E-06
2	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
5	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
6	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
7	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
8	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
9	2.69E-05	0	0.00E+00	9.53E-06	0.00	0.00E+00	9.53E-06
10	2.69E-05	1	6.03E-05	6.03E-05	0.62	3.33E-05	3.33E-05
11	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
12	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
13	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
14	2.69E-05	1	6.03E-05	6.03E-05	0.62	3.33E-05	3.33E-05
15	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
16	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
17	2.69E-05	0	0.00E+00	4.77E-06	0.00	0.00E+00	4.77E-06
18	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
19	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
20	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
21	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
22	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
23	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
24	2.69E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
				g/hr			
		2.2			1.2		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		3.57E-06

Sonoma South of Magazine

Paved road modelled as a series of volume sources

	HHDT		LDA		
	HHDT		HHDT		
Spacing of volume sources	24	m	24	2-way roadway	
AERMOD volume Sources	29		29		
Distance Travelled (Lemon Street)	0.698	km	0.698	to junction Sonoma Blvd	
Emission Factor/vehicle	3.533	g/hr	0.055	based on winter	
Emission Factor/vehicle	0.0009814	g/sec	0.0003029	includes shift trips/day	
#REF!	3.38E-05	g/sec	1.04E-05		

Sonoma South of Magazine		0.698
Split	0.39	km

phase 2 alternative

Weekday Hours	NOX Emissions (g/sec)	NOX Vehicles Per Hour	NOX Emissions (g/sec)	NOX Including LDA	NOX Vehicles Per Hour	NOX Including LDA	PM10 Including LDA
1	3.38E-05	0	0.00E+00	4.07E-06	0.00	0.00E+00	4.07E-06

2	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
5	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
6	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
7	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
8	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
9	3.38E-05	0	0.00E+00	8.15E-06	0.00	0.00E+00	8.15E-06
10	3.38E-05	1	5.28E-05	5.28E-05	0.43	2.92E-05	2.92E-05
11	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
12	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
13	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
14	3.38E-05	1	5.28E-05	5.28E-05	0.43	2.92E-05	2.92E-05
15	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
16	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
17	3.38E-05	0	0.00E+00	4.07E-06	0.00	0.00E+00	4.07E-06
18	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
19	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
20	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
21	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
22	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
23	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
24	3.38E-05	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
				g/s			
		1.6			0.9		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		3.11E-06

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day		
HGV Traffic					NOX		NOX
	tonnage	trucks tonnage per year	trucks per year	distance travelled (km)	g/trip		lbs/day
Phase 1 Trucks Only	480000	480,000	26,445	80.467	485.20		4.279
Phase 1 Trucks & Rail	720000	240,000	13,846	80.467	485.20		4.279
Phase 1 Alternative	1350000	480,000	26,445	80.467	485.20		4.279
Phase 2	1,160,000	214,400	12,503	80.467	485.20		4.279
Phase 2 Alternative	1,160,000	310,400	17,542	80.467	485.20		4.279
LDA Traffic					NOX		NOX
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip		lbs/day
Phase 1 Trucks Only	480000	24	3744	39.910	3.12		0.165
Phase 1 Trucks & Rail	720000	24	4992	39.910	3.12		0.165
Phase 1 Alternative	1350000	40	10400	39.910	3.12		0.275
Phase 2	1160000	80	20800	39.910	3.12		0.550
Phase 2 Alternative	1160000	80	20800	39.910	3.12		0.550
							NOX
							lbs/day
				Combined		Phase 1 Trucks Only	4.444
						Phase 1 Trucks & Rail	4.444
						Phase 1 Alternative	4.554
						Phase 2	4.829
						Phase 2 Alternative	4.829

VMT, Phase 2 (Alternative)

Phase 2	1,160,000	tons per year of sand / aggregate imported
Hours Of Operation	5760	hrs
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,000	metric tonnes
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days
Duration of ship unloading	132	hrs (5.5 days)
Rail Loading	9072	mtonnes per day

Operations	Number Of Events / Year	Hours Of Operation (per year)	Mitigation Reduction (%)	Mitigation Required
Handymax Ship	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 36 = 72hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	29	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for Phase 2 Alternative manuverving = 2hrs x 36 = 72hrs.	**25%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Rail	Varies	Rail will replace trucks - as truck movements decrease rail movements increase under various scenarios	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in NOX compared to Tier II EPA emission rates.

VMT, Phase 2 (Alternative)

Phase 2	1,440,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
ROG **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 137 hrs of hotelling x 36 = 4932 hrs, manuverving & transit = 2hrs x 36 = 72hrs		lbs/day
	Barge	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs	7.719	lbs/day

VMT, Phase 2 (Alternative)

Phase 2	1,440,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
ROG **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 137 hrs of hotelling x 36 = 4932 hrs, manuverving & transit = 2hrs x 36 = 72hrs	24.7	lbs/day
	Barge	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs	7.719	lbs/day

VMT, Phase 2 (Alternative)

Phase 2	1,440,000 tons per year of sand / aggregate imported	
Hours Of Operation	5760	
Days Of Operation	240	days
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,0000 metric tonnes	
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days
Duration of ship unloading	132	hrs (5.5 days)

Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**ROG** Exhaust	Units
ROG **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 137 hrs of hotelling x 36 = 4932 hrs, manuverving & transit = 2hrs x 36 = 72hrs	1971.9	lbs/year
	Barge	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs	555.6	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**	
Visits Per Year	29	visits
Hours Per Visit	138	hrs
Ship Capacity	40000	metric tonne
Hotelling Time	132	hrs
Hotelling Time (Highest Day)	20.82	hrs
Transit & Maneuvering Time	6	hours (roundtrip)
Transit distance assessed (>3km)	59103.91169	metres
Transit Distance (within 3km)	1700	metres
Maneurvering Distance	1300	metres

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**ROG**
Slow	Marine Distillate (0.1% S)	**0.6867**
Medium	Marine Distillate (0.1% S)	**0.6867**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**ROG**
Slow	Marine Distillate (0.1% S)	**0.6867**
Medium	Marine Distillate (0.1% S)	**0.6867**

	A	B	C	D	E	F	G	H	I
32		**Outbound speed**	7	8.06	3.60				**g/kW-HR**
33									
34		**Main Power**	7803	kilowatts			**Auxiliary Engine**		
35		**Auxiliary power**	2459	kilowatts			**Engine Speed**	**Fuel**	
36		**Boiler Power**	109	kilowatts					**ROG**
37		**Tug Power**	1620	kilowatts	(2172 hp - Average)		**Medium**	Marine Distillate (0.1% S)	**0.5200**
38		**Tug (auiliary)**	95	kilowatts					**g/kW-HR**
39									
40		**Load Factor**							
41		**Main Engine**	82.5%	at cruise speed			**Boiler**		
42		**Maximum Handymax speed**	15.00	knots				**ROG**	
43		**Main Engine Speed (> 3km)**	51.2%	RSZ (12 knots)	(average speed)		Marine Distillate (0.1% S)	**0.11**	
44		**Main Engine (3km from port)**	10.2%	Slow-down approaching port				g/kW-HR	
45		**Main Engine**	3.7%	Maneuvering (5 knots)	inwards				
46		**Main Engine**	10.2%	Maneuvering (7 knots)	outwards				
47		**Low Adjustment Factor (5 knots)**	8.90	NOX at 3.7%	(USEPA (2009))		**Tug**		
48		**Low Adjustment Factor (7 knots)**	2.15	NOX at 10.2%	(USEPA (2009))			**ROG**	
49		**Load Factor**					Marine Distillate (0.1% S)	**See below**	
50		**Tug Main Engine**	0.31	CARB (POO EI)				g/kW-HR	
51		**Tug Auxillary Engine**	0.43	CARB (POO EI)					
52									
53		**Auxilliary Engine**							
54		**Hoteling**	0.061	POLA (2012)					
55		**Maneuvering**	0.275	POLA (2012)					
56		**Transit**	0.104	POLA (2012)					

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Barge Emission Factor

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	ROG		Time (hrs)	inward	outward	Barge Emission Rate
Main	1158	g/hr	0.540	2.57	3.60	0.340
				m/s	m/s	
Auxiliary	67.1	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine(s).

Emission Factors (g/kW-hr)

Year	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	0.195542	0.001767
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	0.195032	0.001765
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	0.195032	0.001764
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	0.228476	0.008527
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	0.305131	0.001274

Average from ARB Database http://www.arb.ca.gov/msei/categories.htm#ogv_category
With fuel regulations and MARPOL standards

Golden Gate	Dock		23.13	nm	23.13		AWN	73673	
Sea Buoy	GG		8.72		8.91			1700	
At Buoy			1.5		1.5			1300	
North	Sea Buoy		7.4		6.1	Link not included			
			40.75	nm	39.64			76673	meters
		1.1508	46.8951					41.43703	nm
			75454.22						
			72454.22						
	Out to Sea Buoy		33.35		33.54	nm			
				1.1508	38.59783	statute miles			
					62103.91	meters			
					59103.91	meters - 3000 meters for maneuvering			

Calendar Year	Area	Engine	NOx (g/hp-hr)	PM	ROG	CO	SOx	CO2
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172

Average Emission Rates from the Harbor Craft Database emission inventory database tool for the Bay Area operations.
http://www.arb.ca.gov/msei/categories.htm#chc_category

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	ROG
Forklift	0.20	100	0.10
		hp	g/(hp-hr)
Deterioration Rate	4.00E-05	g/(hr-hr^2)	
Age	7	years	(2013 Model)
Activity	1800	hours/year	(capped at 12,000 hrs)
Fuel Correction Factor	1		
Emission Rate	10.95	g/hr	
Activity Factor	0.50	Fractional usage per hour	

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

OFFROAD2011	Load Factor	HP	ROG (diesel)
Front Loader	0.36	369	0.04
			g/(hp-hr)
Deterioration Rate	1.23E-05	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Historical Activity	957	hours/year	5 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1.00		
Emission Rate	12.90	g/hr	

Activity Factor	90%	Fractional usage per hour

Emission Rate / Front Loader	0.0032	g/s

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SF)							
Calendar Year:	Solano (SV)							
Season:	2020							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	ROG_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.81	Annual	
						1.20	Summer	
						1.20	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	ROG (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.92	annual
	Speed	5	miles/hr		2.80	summer
		8.05	km/hr		3.19	winter

HHDT Emission Factor					
		ROG_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	0.75	1.20	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	0.75	1.20	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	0.50	0.81	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	0.35	0.56	EMFAC2011	
Idling T7 Single (Win)	g/vkt	0.40	0.64	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.11	0.18	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	0.72	1.16	Sum	
Composite Emission Factor (Win)	g/vkt	0.72	1.16	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	0.47	0.76	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	ROG_RUNEX	ROG_STREX	ROG_RUNEX	ROG_DIURN	ROG_HTSK	ROG_RUNLS	ROG_RESTL
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	(gms/vehicle/day)	(gms/vehicle/day)	(gms/mile)	(gms/vehicle/day)
2020	Annual	LDA	GAS	Aggregated	10	0.0495	0.01712	0.050	0.31429	0.85998	0.05164	0.22982
2020	Annual	LDA	DSL	Aggregated	10	0.1709	0.00000	0.171	0.00000	0.00000	0.00000	0.00000
2020	Summer	LDA	GAS	Aggregated	10	0.1178	0.99929	0.118	0.75147	0.98493	0.04920	0.56017
2020	Summer	LDA	DSL	Aggregated	10	0.0880	0.00000	0.088	0.00000	0.00000	0.00000	0.00000
2020	Winter	LDA	GAS	Aggregated	10	0.1080	1.64344	0.108	0.07395	0.89772	0.05961	0.06717
2020	Winter	LDA	DSL	Aggregated	10	0.0880	0.00000	0.088	0.00000	0.00000	0.00000	0.00000

LDA Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		ROG_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.0779	0.1644	0.1786
	8.046	km/hr	DSL	Aggregated	Aggregated	0.2316	0.1000	0.1000

		ROG_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.054	**0.087**	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.106	**0.171**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	2.334	**3.756**	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	0.086	**0.139**	EMFAC2011	including evaporative running losses
Tailpipe DSL LDA (ann)	g/vkt	0.106	**0.171**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	2.371	**3.816**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	1.273	**2.048**	EMFAC2011	including hot soak emissions
Tailpipe DSL LDA (ann)	g/vkt	0.106	**0.171**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	3.609	**5.808**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	1.329	**2.139**	EMFAC2011	including diurnal & resting losses
Tailpipe DSL LDA (ann)	g/vkt	0.106	**0.171**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	3.624	**5.832**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.048	**0.078**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.144	**0.232**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.102	**0.164**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.062	**0.100**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	1.233	**1.984**	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.109	**0.175**	sum	
Composite Emission Factor Gas (winter)	g/vkt	3.360	**5.407**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.055	**0.089**	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	**1.229**	**1.977**	sum	Based on 0.38% Diesel
Composite Emission Factor (winter)	g/vkt	**3.347**	**5.386**	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		LDA	
	ROG		ROG	
Spacing of point sources	9	m	9	
AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	**mile**	**0.451**	
Emission Factor/vehicle	0.524	g/hr	2.427	based on winter
Emission Factor/vehicle	0.343	g/hr	0.891	based on annual
Emission Factor/vehicle	0.00015	g/sec	0.01348	includes all trips/day
Emission Factor/vehicle	0.00010	g/sec	0.00495	
Emission Factor/vehicle/AERMOD Source	**1.82E-06**	g/sec	**1.69E-04**	based on winter
Emission Factor/vehicle/AERMOD Source	**1.19E-06**	g/sec	**6.19E-05**	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

			based on winter	Maximum Day
	ROG	ROG	ROG	ROG

Weekday Hours	Emission Factor	VMT	Emission Factor	Including LDA
1	1.82E-06	0	0.00E+00	1.685E-04
2	1.82E-06	0	0.00E+00	0.000E+00
3	1.82E-06	0	0.00E+00	0.000E+00
4	1.82E-06	3	5.45E-06	5.455E-06
5	1.82E-06	4	7.27E-06	7.273E-06
6	1.82E-06	4	7.27E-06	7.273E-06
7	1.82E-06	4	7.27E-06	7.273E-06
8	1.82E-06	6	1.09E-05	1.091E-05
9	1.82E-06	4	7.27E-06	3.443E-04
10	1.82E-06	4	7.27E-06	7.273E-06
11	1.82E-06	4	7.27E-06	7.273E-06
12	1.82E-06	6	1.09E-05	1.091E-05
13	1.82E-06	4	7.27E-06	7.273E-06
14	1.82E-06	4	7.27E-06	7.273E-06
15	1.82E-06	4	7.27E-06	7.273E-06
16	1.82E-06	4	7.27E-06	7.273E-06
17	1.82E-06	4	7.27E-06	1.758E-04
18	1.82E-06	4	7.27E-06	7.273E-06
19	1.82E-06	4	7.27E-06	7.273E-06
20	1.82E-06	4	7.27E-06	7.273E-06
21	1.82E-06	4	7.27E-06	7.273E-06
22	1.82E-06	4	7.27E-06	7.273E-06
23	1.82E-06	4	7.27E-06	7.273E-06
24	1.82E-06	4	7.27E-06	7.273E-06

Total HHDT/Day	87.0
	including deliveries (2 per day, 10am, 2pm)

Annual					Maximum Day	Annual Mean				
HGV Traffic			Based on 21 US ton trucks		ROG	ROG	ROG	ROG	ROG	ROG
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.725	0.524	0.343	0.10	0.01	0.01	19.98
Phase 1 Trucks & Rail	720000	240000	13846	0.725	0.524	0.343	0.10	0.00	0.01	10.46
Phase 1 Alternative	1350000	480000	26445	0.725	0.524	0.343	0.10	0.01	0.01	19.98
Phase 2	1160000	214400	12503	0.725	0.524	0.343	0.10	0.00	0.00	9.45
Phase 2 Alternative	1160000	310400	17542	0.725	0.524	0.343	0.10	0.01	0.01	13.25
LDA Traffic					ROG	ROG	ROG	ROG	ROG	ROG
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	2.427	0.891	0.1284	0.0033	0.0037	7.35
Phase 1 Trucks & Rail	720000	24	4992	0.725	2.427	0.891	0.1284	0.0044	0.0049	9.80
Phase 1 Alternative	1350000	40	10400	0.725	2.427	0.891	0.2140	0.0093	0.0102	20.42
Phase 2	1160000	80	20800	0.725	2.427	0.891	0.4281	0.0185	0.0204	40.85
Phase 2 Alternative	1160000	80	20800	0.725	2.427	0.891	0.4281	0.0185	0.0204	40.85
									tpa	
							ROG			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.229	0.012	0.014	27.3
						Phase 1 Trucks & Rail	0.229	0.009	0.010	20.3
						Phase 1 Alternative	0.314	0.018	0.020	40.4
						Phase 2	0.529	0.023	0.025	50.3

Phase 2 Alternative	**0.529**	**0.025**	**0.027**	**54.1**	

Phase	Annual Tonnage	Annual Ships	Annual Tonnage Truck	Rail	Barge	Trucks Daily	Trucks Hourly	Rail Number/Annum	Barge Number/Annum	Rail Hrs/Annum	Barge Hrs/Annum
Phase 1 Trucks Only	480000	12	480000	0	0	1667	83	0	0	0	0
Phase 1 Trucks & Rail	720000	18	240000	480000	0	833	42	52.9	0	1269.8	0
Phase 1 Alternative	1350000	34	480000	870000	0	1667	83	95.9	0	2301.6	0
Phase 2	1160000	29	360000	360000	720000	1250	63	39.7	51.4	952.4	1234.3
Phase 2 Alternative	**1160000**	**29**	**480000**	**864000**	**96000**	**1667**	**83**	**95.2**	**1.0**	**2285.7**	**24.0**

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor ROG

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	ROG_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.409	Annual	
						0.256	Summer	
						0.256	Winter	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	ROG (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.92	annual
	Speed	5	miles/hr		2.80	summer
		8.046	km/hr		3.19	winter

HHDT Emission Factor

		ROG_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.25	0.41	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.16	0.26	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.16	0.26	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.11	0.18	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.35	0.56	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.40	0.64	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.244	0.392	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (summer)	g/vkt	0.17	0.28	Sum	
Composite Emission Factor (winter)	g/vkt	0.177	0.285	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	ROG_RUNEX	ROG_STREX	ROG_RUNEX	ROG_RUNLS
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.0235		0.0235	0.05164
2020	Annual	LDA	DSL	Aggregated	20	0.0446		0.0446	0.00000
2020	Summer	LDA	GAS	Aggregated	20	0.0568		0.0568	0.04920
2020	Summer	LDA	DSL	Aggregated	20	0.0562		0.0562	0.00000
2020	Winter	LDA	GAS	Aggregated	20	0.0554		0.0554	0.05961
2020	Winter	LDA	DSL	Aggregated	20	0.0562		0.0562	0.00000

Idling Calculation							
2020	Annual	LDA	GAS	Aggregated	(gms/mile)		
					Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	0.0779	0.1644	0.1786
	8.046	km/hr	DSL	Aggregated	0.2316	0.1000	0.1000

		ROG	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	0.047	0.075	EMFAC2011	No starting emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.028	0.045	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	0.071	0.115	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.035	0.056	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.048	0.078	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.144	0.232	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.102	0.164	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.062	0.100	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.047	0.075	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.036	0.059	sum	
Composite Emission Factor Gas (winter)	g/vkt	0.074	0.119	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.037	0.060	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.047	0.075	sum	Based on 0.38% Diesel
Composite Emission Factor (winter)	g/vkt	0.074	0.118	sum	

AERMOD Model Inputs
Paved road modelled as a series of point sources

		HHDT		LDA	
		ROG		ROG	
Spacing of point sources		14	m	14	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.725	km	0.725	to junction Sonoma Blvd
Emission Factor/vehicle		0.128	g/hr	0.053	based on Winter
Emission Factor/vehicle		0.177	g/hr	0.034	based on Annual
Emission Factor/vehicle		0.00004	g/sec	0.000296	includes shift trips/day
Emission Factor/vehicle		0.00005	g/sec	0.000188	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		6.99E-07	g/sec	5.81E-06	based on winter
Emission Factor/vehicle/AERMOD Source		9.62E-07	g/sec	3.69E-06	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative — based on winter

Weekday Hours	ROG Emission Factor	Milestone5 VMT	ROG Emission Factor	ROG Including LDA
1	6.99E-07	0	0.00E+00	5.81E-06
2	6.99E-07	0	0.00E+00	0.00E+00
3	6.99E-07	0	0.00E+00	0.00E+00
4	6.99E-07	3	4.20E-06	4.20E-06
5	6.99E-07	4	5.60E-06	5.60E-06
6	6.99E-07	4	5.60E-06	5.60E-06
7	6.99E-07	4	5.60E-06	5.60E-06
8	6.99E-07	6	8.39E-06	8.39E-06
9	6.99E-07	4	5.60E-06	1.72E-05
10	6.99E-07	4	5.60E-06	5.60E-06
11	6.99E-07	4	5.60E-06	5.60E-06
12	6.99E-07	6	8.39E-06	8.39E-06
13	6.99E-07	4	5.60E-06	5.60E-06
14	6.99E-07	4	5.60E-06	5.60E-06
15	6.99E-07	4	5.60E-06	5.60E-06
16	6.99E-07	4	5.60E-06	5.60E-06
17	6.99E-07	4	5.60E-06	1.14E-05
18	6.99E-07	4	5.60E-06	5.60E-06
19	6.99E-07	4	5.60E-06	5.60E-06
20	6.99E-07	4	5.60E-06	5.60E-06
21	6.99E-07	4	5.60E-06	5.60E-06
22	6.99E-07	4	5.60E-06	5.60E-06
23	6.99E-07	4	5.60E-06	5.60E-06
24	6.99E-07	4	5.60E-06	5.60E-06

87.0
including deliveries (2 per day, 10am, 2pm)

	To junct of Sonoma Blvd	Deliveries	Staff
Distance Travelled	0.725	80.47	39.91
Units	km	km	km
Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual HGV Traffic	tonnage	truck tonnage	trucks per year	distance travelled (km)	Maximum Day ROG g/trip	Annual Mean ROG g/trip	ROG lbs/day	ROG MTPA	ROG tpa	ROG lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.47	12.30	6.26	2.360	0.2	0.2	364.8
Phase 1 Trucks & Rail	720000	239999.9976	13846	80.47	12.30	6.26	2.360	0.1	0.1	191.0
Phase 1 Alternative	1350000	480000	26445	80.47	12.30	6.26	2.360	0.2	0.2	364.8
Phase 2	1160000	214400	12503	80.47	12.30	6.26	2.360	0.1	0.1	172.5
Phase 2 Alternative	1160000	310400	17542	80.47	12.30	6.26	2.360	0.1	0.1	242.0
LDA Traffic					ROG	ROG	ROG	ROG	ROG	ROG
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only		24	3744	39.91	2.60	1.69	0.089	0.006	0.007	13.9
Phase 1 Trucks & Rail		24	4992	39.91	2.60	1.69	0.089	0.008	0.009	18.6
Phase 1 Alternative		40	10400	39.91	2.60	1.69	0.149	0.018	0.019	38.7
Phase 2		80	20800	39.91	2.60	1.69	0.298	0.035	0.039	77.4
Phase 2 Alternative		80	20800	39.91	2.60	1.69	0.298	0.035	0.039	77.4
									tpa	
							ROG			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	2.4	0.2	0.2	379

Phase 1 Trucks & Rail	2.4	0.1	0.1	210
Phase 1 Alternative	2.5	0.2	0.2	404
Phase 2	2.7	0.1	0.1	250
Phase 2 Alternative	2.7	0.1	0.2	319

2020		HHDT	LDA	
Controlled Emission factor, E (winter)	g/VKT	0.153	0.065	Sonoma Blvd
Controlled Emission factor, E (annual)	g/VKT	0.078	0.042	Sonoma Blvd
Controlled Emission factor, E	g/VKT	0.177	0.074	Lemon

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor ROG

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	**Solano (SV)**							
Calendar Year:	**2020**							
Season:	Annual							
Speed:	40	miles/hr						
Vehicle Classification:	**EMFAC2007 Categories**					Annual		
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**ROG_run**		
						(gms/mile)		
Solano (SF)	2018	Annual	HHDT	DSL	Aggregated	**0.1205**	Annual	
						0.2062	Summer	
						0.2062	Winter	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	ROG (g/hr-veh)	
2015	HHDT	D	SV	A		
					0.92	annual
	Speed	5	miles/hr		3.25	summer
		8.046	km/hr		3.68	winter

HHDT Emission Factor

		ROG_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.07	0.12	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.13	0.21	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.13	0.21	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.11	0.18	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.40	0.65	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.46	0.74	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**0.08**	**0.13**	Sum	
Composite Emission Factor (summer)	g/vkt	0.15	0.24	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (winter)	g/vkt	**0.15**	**0.25**	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	ROG_RUNEX	ROG_STREX	ROG_RUNEX	ROG_RUNLS
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	**(gms/mile)**
2020	Annual	LDA	GAS	Aggregated	**40**	0.0098		0.010	**0.0575**
2020	Annual	LDA	DSL	Aggregated	**40**	0.0176		0.018	**0.0000**
2020	Summer	LDA	GAS	Aggregated	**40**	0.0311		0.031	**0.05483**
2020	Summer	LDA	DSL	Aggregated	**40**	0.0360		0.036	**0.00000**
2020	Winter	LDA	GAS	Aggregated	**40**	0.0313		0.031	**0.0664**
2020	Winter	LDA	DSL	Aggregated	**40**	0.0360		0.036	**0.0000**

Idling Calculation							
2015	**Annual**	**LDA**	**GAS**	**Aggregated**	**(gms/mile)**		
					Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	0.0779	0.19493	0.2085
	8.046	**km/hr**	DSL	Aggregated	0.2316	0.11628	0.1163

		ROG	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	0.042	**0.067**	EMFAC2011	**No starting emissions - onsite only**
Tailpipe DSL LDA (ann)	g/vkt	0.011	**0.018**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	0.061	**0.098**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.022	**0.036**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.048	**0.078**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.144	**0.232**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.121	**0.195**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.072	**0.116**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.042	**0.068**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.021	**0.034**	sum	
Composite Emission Factor Gas (winter)	g/vkt	0.065	**0.105**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.026	**0.042**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**0.042**	**0.068**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**0.065**	**0.105**	sum	

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	ROG (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.11
1	4.76%	33.32	5.00%	1.67	0.07
2	14.18%	99.26	25.00%	24.82	1.05
3	27.80%	194.6	2.30%	4.48	0.19
4	42.07%	294.49	21.50%	63.32	2.67
5	57.30%	401.1	1.50%	6.02	0.25
6	72.51%	507.57	1.60%	8.12	0.34
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**0.94**				

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SV)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	ROG_run		
						(gms/mile)		
Solano (SF)	2020	Annual	HHDT	DSL	Aggregated	0.81	Annual	
						1.20	Summer	
						1.20	Winter	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	ROG (g/hr-veh)	
2020	HHDT	D	SV	A		
					0.92	annual
	Speed	5	miles/hr		2.80	summer
		8.05	km/hr		3.19	winter

HHDT Emission Factor

		ROG_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	0.75	1.20	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	0.75	1.20	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	0.50	0.81	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	0.35	0.56	EMFAC2011	
Idling T7 Single (Win)	g/vkt	0.40	0.64	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.11	0.18	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	0.72	1.16	Sum	
Composite Emission Factor (Win)	g/vkt	0.72	1.16	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	0.47	0.76	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	ROG_RUNEX	ROG_STREX	ROG_RUNEX	ROG_DIURN	ROG_HTSK	ROG_RUNLS
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	(gms/vehicle/day)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.1065	1.30703	0.107	0.31429	0.85998	0.05164
2020	Annual	LDA	DSL	Aggregated	10	0.0880	0.00000	0.088	0.00000	0.00000	0.00000
2020	Summer	LDA	GAS	Aggregated	10	0.1178	0.99929	0.118	0.75147	0.98493	0.04920
2020	Summer	LDA	DSL	Aggregated	10	0.0880	0.00000	0.088	0.00000	0.00000	0.00000
2020	Winter	LDA	GAS	Aggregated	10	0.1080	1.64344	0.108	0.07395	0.89772	0.05961

2020	Winter	LDA	DSL	Aggregated	10	0.0880	0.00000	0.088	**0.00000**	**0.00000**	**0.00000**

LDA Idling Calculation								
2015	**Annual**	**LDA**	**GAS**	**Aggregated**		**ROG_RUNEX**		
						Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	Aggregated	0.1621	0.1644	0.1786
	8.046	**km/hr**	DSL	Aggregated	Aggregated	0.1000	0.1000	0.1000

		ROG_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	1.869	**3.008**	EMFAC2011	**start emissions - onsite only**
Tailpipe DSL LDA (ann)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	2.334	**3.756**	EMFAC2011	**start emissions - onsite only**
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	1.901	**3.059**	EMFAC2011	**including evaporative running losses**
Tailpipe DSL LDA (ann)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	2.371	**3.816**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	3.087	**4.968**	EMFAC2011	**including hot soak emissions**
Tailpipe DSL LDA (ann)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	3.609	**5.808**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (ann)	g/vkt	3.144	**5.059**	EMFAC2011	**including diurnal & resting losses**
Tailpipe DSL LDA (ann)	g/vkt	0.055	**0.088**	EMFAC2011	
Tailpipe Gas LDA (winter)	g/vkt	3.624	**5.832**	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.055	**0.088**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.101	**0.162**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.062	**0.100**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.102	**0.164**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.062	**0.100**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	2.915	**4.692**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.055	**0.089**	sum	
Composite Emission Factor Gas (winter)	g/vkt	3.360	**5.407**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.055	**0.089**	sum	
% Of Diesel LDA	0.38%				**Based on ratio of gas:diesel VMT**
Composite Emission Factor (Ann)	g/vkt	**2.905**	**4.674**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**3.347**	**5.386**	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		**LDA**	
	ROG		**ROG**	
Spacing of point sources	9	m	9	

Staff Numbers			**Trips**
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40

AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	**mile**	**0.451**	
Emission Factor/vehicle	0.524	g/hr	2.427	**based on winter**
Emission Factor/vehicle	0.343	g/hr	2.106	**based on annual**
Emission Factor/vehicle	0.00015	g/sec	0.01348	**includes all trips/day**
Emission Factor/vehicle	0.00010	g/sec	0.01170	
Emission Factor/vehicle/AERMOD Source	**1.82E-06**	g/sec	**1.69E-04**	**based on winter**
Emission Factor/vehicle/AERMOD Source	**1.19E-06**	g/sec	**1.46E-04**	**based on annual**

Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	ROG Emission Factor	ROG VMT	based on winter ROG Emission Factor	Maximum Day ROG Including LDA
1	**1.82E-06**	**0**	**0.00E+00**	**1.685E-04**
2	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
3	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
4	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
5	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
6	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
7	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
8	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
9	**1.82E-06**	**0**	**0.00E+00**	**3.370E-04**
10	**1.82E-06**	**2**	**3.64E-06**	**3.636E-06**
11	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
12	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
13	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
14	**1.82E-06**	**2**	**3.64E-06**	**3.636E-06**
15	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
16	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
17	**1.82E-06**	**0**	**0.00E+00**	**1.685E-04**
18	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
19	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
20	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
21	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
22	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
23	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**
24	**1.82E-06**	**0**	**0.00E+00**	**0.000E+00**

Total HHDT/Day	**4.0**
	including deliveries (2 per day, 10am, 2pm)

Annual HGV Traffic	tonnage	truck tonnage	trucks per year	distance travelled (km)	Maximum Day ROG g/trip	Annual Mean ROG g/trip	ROG lbs/day	ROG MTPA	ROG tpa	ROG lbs/year
Phase 1 Trucks Only	**480000**	**480000**	**26981**	**0.725**	**0.524**	**0.343**	**0.0046**	**0.01**	**0.01**	**20.38**

Phase 1 Trucks & Rail	720000	240000	13750	0.725	0.524	0.343	0.0046	0.00	0.01	10.39
Phase 1 Alternative	1350000	480000	26981	0.725	0.524	0.343	0.0046	0.01	0.01	20.38
Phase 2	1160000	214400	12339	0.725	0.524	0.343	0.0046	0.00	0.00	9.32
Phase 2 Alternative	1160000	310400	17631	0.725	0.524	0.343	0.0046	0.01	0.01	13.32

LDA Traffic					ROG	ROG	ROG	ROG	ROG	ROG
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	2.427	2.106	0.1284	0.0079	0.0087	17.38
Phase 1 Trucks & Rail	720000	24	4992	0.725	2.427	2.106	0.1284	0.0105	0.0116	23.17
Phase 1 Alternative	1350000	40	10400	0.725	2.427	2.106	0.2140	0.0219	0.0241	48.28
Phase 2	1160000	80	20800	0.725	2.427	2.106	0.4281	0.0438	0.0483	96.56
Phase 2 Alternative	1160000	80	20800	0.725	2.427	2.106	0.4281	0.0438	0.0483	96.56
									tpa	

		ROG			
		lbs/day	MTPA	tpa	lbs/year
Combined	Phase 1 Trucks Only	0.133	0.017	0.019	37.8
	Phase 1 Trucks & Rail	0.133	0.015	0.017	33.6
	Phase 1 Alternative	0.219	0.031	0.034	68.7
	Phase 2	0.433	0.048	0.053	105.9
	Phase 2 Alternative	0.433	0.050	0.055	109.9

			Annual Tonnage			Trucks	Trucks	Rail	Barge	Rail	Barge
Phase	Annual Tonnage	Annual Ships	Truck	Rail	Barge	Daily	Hourly	Number/Annum	Number/Annum	Hrs/Annum	Hrs/Annum
Phase 1 Trucks Only	480000	12	480000	0	0	1667	83	0	0	0	0
Phase 1 Trucks & Rail	720000	18	240000	480000	0	833	42	52.9	0	1269.8	0
Phase 1 Alternative	1350000	34	480000	870000	0	1667	83	95.9	0	2301.6	0
Phase 2	1160000	29	360000	360000	720000	1250	63	39.7	51.4	952.4	1234.3
Phase 2 Alternative	**1160000**	**29**	**480000**	**864000**	**96000**	**1667**	**83**	**95.2**	**1.0**	**2285.7**	**24.0**

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor ROG

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SV)							
Calendar Year:	2018							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2007 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	ROG_run		
						(gms/mile)		
Solano (SF)	2018	Annual	HHDT	DSL	Aggregated	0.409	Annual	
						0.256	Summer	
						0.256	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	ROG (g/hr-veh)	
2018	HHDT	D	SV	A		
					0.92	annual
	Speed	5	miles/hr		2.80	summer
		8.046	km/hr		3.19	winter

HHDT Emission Factor					
		ROG_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.25	0.41	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.16	0.26	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.16	0.26	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.11	0.18	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.35	0.56	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.40	0.64	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.244	0.392	Sum	
Composite Emission Factor (summer)	g/vkt	0.17	0.28	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (winter)	g/vkt	0.177	0.285	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	ROG_RUNEX	ROG_STREX	ROG_RUNEX	ROG_RUNLS
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)	(gms/mile)
2018	Annual	LDA	GAS	Aggregated	20	0.0537		0.0537	0.05164
2018	Annual	LDA	DSL	Aggregated	20	0.0562		0.0562	0.00000
2018	Summer	LDA	GAS	Aggregated	20	0.0568		0.0568	0.04920
2018	Summer	LDA	DSL	Aggregated	20	0.0562		0.0562	0.00000
2018	Winter	LDA	GAS	Aggregated	20	0.0554		0.0554	0.05961
2018	Winter	LDA	DSL	Aggregated	20	0.0562		0.0562	0.00000

Idling Calculation							
2018	Annual	LDA	GAS	Aggregated	(gms/mile)		
					Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	0.1621	0.1644	0.1786
	8.046	km/hr	DSL	Aggregated	0.1000	0.1000	0.1000

		ROG	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	0.065	0.105	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	0.035	0.056	EMFAC2011	No starting emissions - onsite only
Tailpipe Gas LDA (winter)	g/vkt	0.071	0.115	EMFAC2011	
Tailpipe DSL LDA (winter)	g/vkt	0.035	0.056	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.101	0.162	EMFAC2011	

Idling Diesel LDA (ann)	g/vkt	0.062	**0.100**	EMFAC2011	
Idling Gas LDA (winter)	g/vkt	0.102	**0.164**	EMFAC2011	
Idling Diesel LDA (winter)	g/vkt	0.062	**0.100**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.068	**0.110**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	0.037	**0.060**	sum	
Composite Emission Factor Gas (winter)	g/vkt	0.074	**0.119**	sum	
Composite Emission Factor DSL (winter)	g/vkt	0.037	**0.060**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**0.068**	**0.109**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (winter)	g/vkt	**0.074**	**0.118**	sum	

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT		**LDA**	
		ROG		**ROG**	
Spacing of point sources		**14**	**m**	**14**	2-way roadway
AERMOD Point Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.725**	**km**	**0.725**	to junction Sonoma Blvd
Emission Factor/vehicle		**0.128**	**g/hr**	**0.053**	based on Winter
Emission Factor/vehicle		**0.177**	**g/hr**	**0.049**	based on Annual
Emission Factor/vehicle		**0.00004**	**g/sec**	**0.000296**	includes shift trips/day
Emission Factor/vehicle		**0.00005**	**g/sec**	**0.000274**	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		**6.99E-07**	**g/sec**	**5.81E-06**	**based on winter**
Emission Factor/vehicle/AERMOD Source		**9.62E-07**	**g/sec**	**5.37E-06**	**based on annual**

Staff Numbers			**Trips**
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative **based on winter**

Weekday Hours	**ROG Emission Factor**	**Milestone5 VMT**	**ROG Emission Factor**	**ROG Including LDA**
1	**6.99E-07**	**0**	**0.00E+00**	**5.81E-06**
2	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
3	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
4	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
5	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
6	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
7	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
8	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
9	**6.99E-07**	**0**	**0.00E+00**	**1.16E-05**
10	**6.99E-07**	**2**	**2.80E-06**	**2.80E-06**
11	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
12	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
13	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
14	**6.99E-07**	**2**	**2.80E-06**	**2.80E-06**
15	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
16	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
17	**6.99E-07**	**0**	**0.00E+00**	**5.81E-06**
18	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
19	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
20	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
21	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
22	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
23	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**
24	**6.99E-07**	**0**	**0.00E+00**	**0.00E+00**

4.0
including deliveries (2 per day, 10am, 2pm)

	To junct of Sonoma Blvd	**Deliveries**	**Staff**
Distance Travelled	**0.725**	**80.47**	**39.91**
Units	**km**	**km**	**km**

Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual HGV Traffic					Maximum Day	Annual Mean				
					ROG	ROG	ROG	ROG	ROG	ROG
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	80.47	12.30	6.26	0.108	0.2	0.2	364.8
Phase 1 Trucks & Rail	720000	239999.9976	13846	80.47	12.30	6.26	0.108	0.1	0.1	191.0
Phase 1 Alternative	1350000	480000	26445	80.47	12.30	6.26	0.108	0.2	0.2	364.8
Phase 2	1160000	214400	12503	80.47	12.30	6.26	0.108	0.1	0.1	172.5
Phase 2 Alternative	1160000	310400	17542	80.47	12.30	6.26	0.108	0.1	0.1	242.0
LDA Traffic					ROG	ROG	ROG	ROG	ROG	ROG
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only		24	3744	39.91	2.60	1.69	0.089	0.006	0.007	13.9
Phase 1 Trucks & Rail		24	4992	39.91	2.60	1.69	0.089	0.008	0.009	18.6
Phase 1 Alternative		40	10400	39.91	2.60	1.69	0.149	0.018	0.019	38.7
Phase 2		80	20800	39.91	2.60	1.69	0.298	0.035	0.039	77.4
Phase 2 Alternative		80	20800	39.91	2.60	1.69	0.298	0.035	0.039	77.4
									tpa	
							ROG			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.198	0.2	0.2	379
						Phase 1 Trucks & Rail	0.198	0.1	0.1	210
						Phase 1 Alternative	0.257	0.2	0.2	404
						Phase 2	0.406	0.1	0.1	250
						Phase 2 Alternative	0.406	0.1	0.2	319

2018		HHDT	LDA	
Controlled Emission factor, E (winter)	g/VKT	0.153	0.065	Sonoma Blvd
Controlled Emission factor, E (annual)	g/VKT	0.078	0.042	Sonoma Blvd
Controlled Emission factor, E	g/VKT	0.177	0.074	Lemon

SO2 Orcem Assessment **(including background)**

(units μg/m^3)

Conoco Phililips Rodeo	Max 1-hr	Max 24-hr
2007 **2008** **2009** **2010** **2012**	6.2	0.6

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported	
Production Capacity	100 tonnes per hour	
Hours Of Operation	7600 hour per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)	
Shipment Load	40,0000 tonnes (19 times per year, every 2.7 weeks)	
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days
Duration of ship unloading	132	hrs (5.5 days)

Operations	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Mitigation Reduction (%)**	**Mitigation Required**
Handymax Ship	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	19	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for milestone 5 manuverving = 2hrs x 19 = 38hrs.	**30%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Excavator)	Ongoing	Based on hours of operation of 24 hrs per day Monday - Saturday (7600 hrs per year as a worst-case). Front loader tonnage will be 14.6 mtonnes per trip. Number of trips per hour = (100 tonnes per hour / 14.6 tonnes) = 6.8 trips per hour	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Stack	Ongoing	Based on hours of operation of 24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case).	**N/A**	No Mitigation Apart From 50m Stack Height
Rail	100	Rail will replace trucks - as truck movements decrease rail movements increase. Total tonnage unchanged at 760000 tonnes / year. Worst-case assumes no decrease in trucks.	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in PM10 compared to Tier II EPA emission rates.

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600	per year			
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**SO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	19.83	lbs/day

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	hrs (5.5 days)		**SO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	1600	lbs/year

	Emission Factors (g/kW-hr)						units?		units?		Raw (kg/kW-hr)		
Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20	CH4	CO2	N20	Sulfur Fuel
Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	590.5319	0.001767	0.000596	0.195542	0.001767	0.090%
Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	588.994	0.001765	0.000595	0.195032	0.001765	0.090%
Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
								corrected units			**mistake on units**		
											MMT x 907200 x 365 / MW-hrs		

http://www.arb.ca.gov/msei/categories.htm#ogv_category

Dock		23.13	nm		23.13		AWN	73673	
GG		8.72			8.91			1700	
		1.5			1.5			1300	
Sea Buoy		7.4			6.1	Link not included			
		40.75	nm		39.64			76673	meters
	1.1508	46.8951						41.43703	nm
		75454.22							
		72454.22							
Out to Sea Buoy		33.35			33.54	nm			
				1.1508	38.59783	statute miles			
					62103.91	meters			
					59103.91	meters - 3000 meters for maneuvering			

		g/hp-hr							Sulfur
Area	Engine	NOx	PM	ROG	CO	SOx	CO2	Fuel	PPM

Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172	184.1585	32.31492362
Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172	184.1585	32.31492362
Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172	184.1585	32.31492362
Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172	184.1585	32.31492362
Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172	184.1585	32.31492362
Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172	184.1585	32.31492362
Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172	184.1585	32.31492362
Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172	184.1585	32.31492362
Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172	184.1585	32.31492362
Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172	184.1585	32.31492362
Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172	184.1585	32.31492362
Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172	184.1585	32.31492362
Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172	184.1585	32.31492362
Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172	184.1585	32.31492362
Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172	184.1585	32.31492362
Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172	184.1585	32.31492362
Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172	184.1585	32.31492362
Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172	184.1585	32.31492362
Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172	184.1585	32.31492362
Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172	184.1585	32.31492362

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaken for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.18**	**SO2 at 3.7%**	**(USEPA (2009))**
Low Adjustment Factor (7 knots)	**1.25**	**SO2 at 10.2%**	**(USEPA (2009))**
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2012)	
Maneuvering	0.275	POLA (2012)	
Transit	0.104	POLA (2012)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**SO2**
Slow	Marine Distillate (0.1% S)	**0.351264163**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**SO2**
Slow	Marine Distillate (0.1% S)	**0.351264163**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**SO2**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Boiler

	SO2
Marine Distillate (0.1% S)	**1.50**
	g/kW-HR

Tug

	SO2
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

lbs to grams	453.59	0.002205
tonnes to tons	1.1023	

Mobile Hoppers / Conveyors

	Load Factor	hp	SO2
Hopper / Conveyor	0.40	201	0.0055 g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.852		
Emission Rate	0.378	g/hr	

Activity Factor	1	Fractional usage per hour

Emission Rate /Hopper / Conveyor PM10	0.000105	g/s
PM2.5/PM10 Ratio	0.92	
Emission Rate / Hopper / Conveyor PM2.5	0.000097	g/s

Sources	pm10 Emission Rate		Milestone 5 Annual Emission Rate
Diesel Hopper 1	0.000105	g/s	1.37E-05
Diesel Hopper 2	0.000105	g/s	1.37E-05
Diesel Conveyor 1	0.000105	g/s	1.37E-05
Diesel Conveyor 2	0.000105	g/s	1.37E-05
Diesel Conveyor 3	0.000105	g/s	1.37E-05
Diesel Conveyor 4	0.000105	g/s	1.37E-05
Diesel Conveyor 5	0.000105	g/s	1.37E-05
Diesel Conveyor 6	0.000105	g/s	1.37E-05
Diesel Conveyor 7	0.000105	g/s	1.37E-05

	tonnage	hours of operation	PM10 g/hr	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/yr	Annual Mean g/sec
milestone 1	120000	180	3.403	0.1801	0.0006	0.0007	1.350	1.9E-05
milestone 2	240000	360	3.403	0.1801	0.0012	0.0014	2.701	3.9E-05
milestone 3	360000	540	3.403	0.1801	0.0018	0.0020	4.051	5.8E-05
milestone 4	480000	720	3.403	0.1801	0.0025	0.0027	5.402	7.8E-05
milestone 5	760000	1140	3.403	0.1801	0.0039	0.0043	8.553	1.2E-04

Unpaved Road - Industrial (Excavator in stockpile)

OFFROAD2011	Load Factor	HP	SO2
Excavator	n/a	175	0.0008
			lb/hr
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	3	years	(2013 Model)
Activity	1396	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	1		
Emission Rate	0.358	g/hr	

Activity Factor	0.25	Fractional usage per hour
Emission Rate / Excavator	0.0000248	g/s

Unpaved Road - Industrial (Front Loader stockpile to hopper)

			SO2 (diesel)	
CAT 980K	=	(S content in X/1000000) X (2 SO2/g S) x BSFC (184 g/hp-hr)		
HP	=	369	hp	
BSFC	=	184	g/hp-hr	
S content in fuel	=	15	ppm	
Main Engine Emissions	=	0.00020 g/sec		
Activity Factor	0.75	Fractional usage per hour		
Emission Rate / Front Loader & Excavator	0.000178	g/s	Both excavator and front loader	

	24-HR Maximum	Annual
Sources (Slag Heap N)	12	26
Sources (Slag Heap S)	5	13

	24-HR Maximum	Annual	
Emission Rate / Front Loader & Excavator / Source (SHN)	0.0000149	0.0000069	g/s
Emission Rate / Front Loader & Excavator/ Source (SHS)	0.0000357	0.0000137	g/s

SO2 (diesel)	Front Loader - Gypsum Loading			
Emission Rate	0.74	g/hr		
	0.000205	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	0.05	g/km		Tonnage / front loader
Gypsum Storage Sources	12			Tons / front loader
Spacing storage	0.010	km		Gypsum Tonnage
				3,522
Distance Travelled S3	0.240	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.22	14,088
				22,306
Emissions per hour S3	0.011	g/hr	0.0024	
Emissions per sec S3	3.07E-06	g/sec	6.72E-07	
	SO2 Maximum Day		SO2 Annual	
Emissions per sec S3/source	2.56E-07	g/sec	5.60E-08	

SO2 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SF)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	SO2_run		
						(gms/mile)		
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	0.0260	Annual	
						0.0167	Summer	
						0.0167	Winter	

taken from Environ (2010)

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor					
		SO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	0.02	0.03	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Win)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.01	0.01	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	0.0103	0.0165	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Win)	g/vkt	0.0102	0.0164	Sum	
Composite Emission Factor (Ann)	g/vkt	0.0155	0.0249	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2015	Annual	LDA	GAS	Aggregated	10	0.00344	0.00495	0.00344
2015	Annual	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372
2015	Summer	LDA	GAS	Aggregated	10	0.00372	0.00485	0.00372
2015	Summer	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372
2015	Winter	LDA	GAS	Aggregated	10	0.00339	0.00504	0.00339
2015	Winter	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372

LDA Idling Calculation								
2015	Annual	LDA	GAS	Aggregated		SO2_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.00344	0.00339	0.00372
	8.046	km/hr	DSL	Aggregated	Aggregated	0.00372	0.00372	0.00372

		SO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.00869	0.01399	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Tailpipe Gas LDA (sum)	g/vkt	0.00874	0.01406	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00214	0.00344	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00820	0.01319	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor Gas (sum)	g/vkt	0.00826	0.01329	sum	
Composite Emission Factor DSL (sum)	g/vkt	0.00231	0.00372	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.00818	0.01316	sum	Based on 0.38% Diesel
Composite Emission Factor (sum)	g/vkt	0.00823	0.01325	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		9	m	9	
AERMOD Point Sources		83		83	
Distance Travelled Onsite		0.755	km	0.755	
		0.469		0.469	
Emission Factor/vehicle		0.0077	g/hr	0.0062	based on summer
Emission Factor/vehicle		0.0117	g/hr	0.0062	based on annual
Emission Factor/vehicle		2.15E-06	g/sec	2.76E-05	includes all trips/shift
Emission Factor/vehicle		3.25E-06	g/sec	2.74E-05	includes all trips/shift
Emission Factor/vehicle/AERMOD Source		2.59E-08	g/sec	3.33E-07	based on summer
Emission Factor/vehicle/AERMOD Source		3.91E-08	g/sec	3.31E-07	based on annual

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	SO2 Emission Factor	SO2 Vehicles / hr	SO2 Emission Factor	SO2 Including LDA
1	2.59E-08	5	1.26E-07	4.590E-07
2	2.59E-08	6	1.68E-07	1.682E-07
3	2.59E-08	10	2.52E-07	2.523E-07
4	2.59E-08	11	2.94E-07	2.943E-07
5	2.59E-08	13	3.36E-07	3.364E-07
6	2.59E-08	13	3.36E-07	3.364E-07
7	2.59E-08	13	3.36E-07	3.364E-07
8	2.59E-08	13	3.36E-07	3.364E-07
9	2.59E-08	13	3.36E-07	1.002E-06
10	2.59E-08	13	3.36E-07	3.364E-07
11	2.59E-08	15	3.88E-07	3.882E-07
12	2.59E-08	13	3.36E-07	3.364E-07
13	2.59E-08	11	2.94E-07	2.943E-07
14	2.59E-08	5	1.26E-07	1.261E-07
15	2.59E-08	7	1.78E-07	1.780E-07
16	2.59E-08	0	0.00E+00	0.000E+00
17	2.59E-08	0	0.00E+00	3.329E-07
18	2.59E-08	0	0.00E+00	0.000E+00
19	2.59E-08	0	0.00E+00	0.000E+00
20	2.59E-08	0	0.00E+00	0.000E+00
21	2.59E-08	0	0.00E+00	0.000E+00
22	2.59E-08	0	0.00E+00	0.000E+00
23	2.59E-08	2	4.20E-08	4.204E-08
24	2.59E-08	3	8.41E-08	8.409E-08

Total HHDT/Day	166.1
	including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

				24-Hour Maximum	24-Hour Maximum VMT	Cumulative
	SO2 Emission Factor	Milestone5 Vehicles / hr	SO2 Emission Factor	SO2 Including LDA	SO2 Including LDA	SO2 Including LDA
1	2.59E-08	5	1.26E-07	4.59E-07	4.27E-07	8.86E-07
2	2.59E-08	6	1.68E-07	1.68E-07	0.00E+00	1.68E-07
3	2.59E-08	10	2.52E-07	2.52E-07	0.00E+00	2.52E-07
4	2.59E-08	11	2.94E-07	2.94E-07	0.00E+00	2.94E-07
5	2.59E-08	13	3.36E-07	3.36E-07	0.00E+00	3.36E-07
6	2.59E-08	13	3.36E-07	3.36E-07	0.00E+00	3.36E-07
7	2.59E-08	13	3.36E-07	3.36E-07	0.00E+00	3.36E-07
8	2.59E-08	19	4.92E-07	4.92E-07	0.00E+00	4.92E-07
9	2.59E-08	19	4.92E-07	1.16E-06	8.54E-07	2.01E-06
10	2.59E-08	19	4.92E-07	4.92E-07	5.17E-08	5.44E-07
11	2.59E-08	21	5.44E-07	5.44E-07	0.00E+00	5.44E-07
12	2.59E-08	19	4.92E-07	4.92E-07	0.00E+00	4.92E-07
13	2.59E-08	17	4.50E-07	4.50E-07	0.00E+00	4.50E-07
14	2.59E-08	11	2.82E-07	2.82E-07	5.17E-08	3.33E-07
15	2.59E-08	13	3.34E-07	3.34E-07	0.00E+00	3.34E-07
16	2.59E-08	6	1.56E-07	1.56E-07	0.00E+00	1.56E-07
17	2.59E-08	6	1.56E-07	4.88E-07	4.27E-07	9.15E-07
18	2.59E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
19	2.59E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20	2.59E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
21	2.59E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
22	2.59E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
23	2.59E-08	2	4.20E-08	4.20E-08	0.00E+00	4.20E-08
24	2.59E-08	3	8.41E-08	8.41E-08	0.00E+00	8.41E-08

Total HHDT/Day	226.1
	including deliveries (2 per day, 10am, 2pm)

Annual					Maximum Day	Annual Mean				
HGV Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	0.0077	0.0117	0.0039	0.0001	0.0001	0.22
milestone 2	240000		14578	0.755	0.0077	0.0117	0.0039	0.0002	0.0002	0.38
milestone 3	360000		20676	0.755	0.0077	0.0117	0.0039	0.0002	0.0003	0.53
milestone 4	480000		22723	0.755	0.0077	0.0117	0.0039	0.0003	0.0003	0.59
milestone 5	760000		32534	0.755	0.0077	0.0117	0.0039	0.0004	0.0004	0.84
					Maximum Day	Annual Mean				
LDA Traffic					SO2	SO2	SO2	SO2	SO2	SO2
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1		14	2184	0.755	0.0062	0.0062	0.0002	0.0000	0.0000	0.0297
milestone 2		24	4992	0.755	0.0062	0.0062	0.0003	0.0000	0.0000	0.0679
milestone 3		24	6240	0.755	0.0062	0.0062	0.0003	0.0000	0.0000	0.0849
milestone 4		64	16640	0.755	0.0062	0.0062	0.0009	0.0001	0.0001	0.2265
milestone 5		64	19968	0.755	0.0062	0.0062	0.0009	0.0001	0.0001	0.2718
									tpa	
							SO2			
							lbs/day	MTPA	tpa	lbs/year
					Combined	milestone 1	0.0041	0.0001	0.00012	0.2483
						milestone 2	0.0042	0.0002	0.00022	0.4436
						milestone 3	0.0042	0.0003	0.00031	0.6177
						milestone 4	0.0047	0.0004	0.00041	0.8120
						milestone 5	0.0047	0.0005	0.00056	1.1101

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor SO2

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SF)							
Calendar Year:	2016							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**SO2_run**		
						(gms/mile)		
Solano (SF)	2016	Annual	T7 Single	DSL	Aggregated	0.0191	Annual	
						0.0167	Summer	
						0.0167	Winter	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor

		SO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.0119	0.0191	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.0104	0.0167	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.0104	0.0167	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0074	0.0119	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.0089	0.0142	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.0077	0.0123	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**0.0115**	**0.0186**	Sum	
Composite Emission Factor (summer)	g/vkt	**0.0103**	**0.0165**	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (winter)	g/vkt	**0.0102**	**0.0164**	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	20	0.00344		0.00344
2016	Annual	LDA	DSL	Aggregated	20	0.00372		0.00372
2016	Summer	LDA	GAS	Aggregated	20	0.00372		0.00372
2016	Summer	LDA	DSL	Aggregated	20	0.00372		0.00372
2016	Winter	LDA	GAS	Aggregated	20	0.00339		0.00339
2016	Winter	LDA	DSL	Aggregated	20	0.00372		0.00372

Idling Calculation							
2016	Annual	LDA	GAS	Aggregated	SO2		
					Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	0.00344	0.00339	0.00372
	8.046	km/hr	DSL	Aggregated	0.00372	0.00372	0.00372

		SO2	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.00214	**0.00344**	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	0.00231	**0.00372**	EMFAC2011	No start emissions - onsite only
Tailpipe Gas LDA (sum)	g/vkt	0.00231	**0.00372**	EMFAC2011	
Tailpipe DSL LDA (sum)	g/vkt	0.00231	**0.00372**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00214	**0.00344**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00231	**0.00372**	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	**0.00372**	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	**0.00372**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00214	**0.00344**	sum	

Composite Emission Factor DSL (ann)	g/vkt	0.00231	**0.00372**	sum	**Assumption - Based On Idling for 7.5% of time**	
Composite Emission Factor Gas (sum)	g/vkt	0.00231	**0.00372**	sum		
Composite Emission Factor DSL (sum)	g/vkt	0.00231	**0.00372**	sum		
% Of Diesel LDA	0.38%					
Composite Emission Factor (Ann)	g/vkt	**0.00214**	**0.00344**	sum	**Based on 0.38% Diesel**	
Composite Emission Factor (sum)	g/vkt	**0.00231**	**0.00372**	sum		

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT		**LDA**	
		SO2		**SO2**	
Spacing of point sources		**14**	**m**	**14**	2-way roadway
AERMOD Point Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**0.00739**	**g/hr**	**0.00166**	based on Summer
Emission Factor/vehicle		**0.00831**	**g/hr**	**0.00154**	based on Annual
Emission Factor/vehicle		**2.05E-06**	**g/sec**	**7.40E-06**	includes shift trips/day
Emission Factor/vehicle		**2.31E-06**	**g/sec**	**6.85E-06**	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		**4.02E-08**	**g/sec**	**1.45E-07**	**based on summer**
Emission Factor/vehicle/AERMOD Source		**4.53E-08**	**g/sec**	**1.34E-07**	**based on annual**

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

	Maximum Day	**Annual**			**Maximum Day**		**Annual Mean**	**Maximum 24-Hr VMT**	**Cumulative**	
Weekday Hours	**SO2 Emission Factor**	**Milestone5 VMT**	**Milestone5 Trucks**	**SO2 Emission Factor**	**SO2 Including LDA**	**Milestone5 VMT**	**Milestone5 Including LDA**	**so2 Including LDA**	**SO2 Including LDA**	**Annualised Emission Rate SO2 Including LDA**
1	**4.02E-08**	**4.53E-08**	**4.86**	**3.92E-07**	**5.37E-07**	**4.40E-07**	**5.75E-07**	**1.81E-07**	**7.18E-07**	**4.99E-07**
2	**4.02E-08**	**4.53E-08**	**6.49**	**5.22E-07**	**5.22E-07**	**5.87E-07**	**5.87E-07**	**0.00E+00**	**5.22E-07**	**5.09E-07**
3	**4.02E-08**	**4.53E-08**	**9.73**	**7.83E-07**	**7.83E-07**	**8.81E-07**	**8.81E-07**	**0.00E+00**	**7.83E-07**	**7.64E-07**
4	**4.02E-08**	**4.53E-08**	**11.35**	**9.14E-07**	**9.14E-07**	**1.03E-06**	**1.03E-06**	**0.00E+00**	**9.14E-07**	**8.92E-07**
5	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**0.00E+00**	**1.04E-06**	**1.02E-06**
6	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**0.00E+00**	**1.04E-06**	**1.02E-06**
7	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**0.00E+00**	**1.04E-06**	**1.02E-06**
8	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**0.00E+00**	**1.04E-06**	**1.02E-06**
9	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.33E-06**	**1.17E-06**	**1.44E-06**	**3.63E-07**	**1.70E-06**	**1.25E-06**
10	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**1.60E-07**	**1.20E-06**	**1.02E-06**
11	**4.02E-08**	**4.53E-08**	**14.97**	**1.21E-06**	**1.21E-06**	**1.36E-06**	**1.36E-06**	**0.00E+00**	**1.21E-06**	**1.18E-06**
12	**4.02E-08**	**4.53E-08**	**12.97**	**1.04E-06**	**1.04E-06**	**1.17E-06**	**1.17E-06**	**0.00E+00**	**1.04E-06**	**1.02E-06**
13	**4.02E-08**	**4.53E-08**	**11.35**	**9.14E-07**	**9.14E-07**	**1.03E-06**	**1.03E-06**	**0.00E+00**	**9.14E-07**	**8.92E-07**
14	**4.02E-08**	**4.53E-08**	**4.86**	**3.92E-07**	**3.92E-07**	**4.40E-07**	**4.40E-07**	**1.60E-07**	**5.51E-07**	**3.82E-07**
15	**4.02E-08**	**4.53E-08**	**6.86**	**5.53E-07**	**5.53E-07**	**6.22E-07**	**6.22E-07**	**0.00E+00**	**5.53E-07**	**5.39E-07**
16	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
17	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**1.45E-07**	**0.00E+00**	**1.34E-07**	**1.81E-07**	**3.26E-07**	**1.16E-07**
18	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
19	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
20	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
21	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
22	**4.02E-08**	**4.53E-08**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.00E+00**
23	**4.02E-08**	**4.53E-08**	**1.62**	**1.31E-07**	**1.31E-07**	**1.47E-07**	**1.47E-07**	**0.00E+00**	**1.31E-07**	**1.27E-07**
24	**4.02E-08**	**4.53E-08**	**3.24**	**2.61E-07**	**2.61E-07**	**2.94E-07**	**2.94E-07**	**0.00E+00**	**2.61E-07**	**2.55E-07**
		including deliveries (2 per day, 10am, 2pm)	**166.1**				6.49E-07	4.35E-08	6.25E-07	**Annualised 5.63E-07**

	Deliveries	**Staff**
Distance Travelled	**80.47**	**39.91**
Units	**km**	**km**
Estimated Average Mileage (2-way)	**(50 miles)**	**(24.8 miles)**

Annual HGV Traffic	**tonnage**		**trucks per year**	**distance travelled (km)**	**Maximum Day SO2 g/trip**	**Annual Mean SO2 g/trip**	**SO2 lbs/day**	**SO2 MTPA**	**SO2 tpa**	**SO2 lbs/year**
milestone 1	**120000**		**8481**	**80.47**	**0.83**	**0.93**	**3.03E-01**	**7.88E-03**	**8.69E-03**	**17.4**
milestone 2	**240000**		**14578**	**80.47**	**0.83**	**0.93**	**3.03E-01**	**1.35E-02**	**1.49E-02**	**29.9**
milestone 3	**360000**		**20676**	**80.47**	**0.83**	**0.93**	**3.03E-01**	**1.92E-02**	**2.12E-02**	**42.3**
milestone 4	**480000**		**22723**	**80.47**	**0.83**	**0.93**	**3.03E-01**	**2.11E-02**	**2.33E-02**	**46.5**
milestone 5	**760000**		**32534**	**80.47**	**0.83**	**0.93**	**3.03E-01**	**3.02E-02**	**3.33E-02**	**66.6**
LDA Traffic		**movements/day**	**movement per year**	**distance travelled (km)**	**SO2 g/trip**	**SO2 g/trip**	**SO2 lbs/day**	**SO2 MTPA**	**SO2 tpa**	**SO2 lbs/year**
milestone 1		**14**	**2184**	**39.91**	**0.09**	**0.09**	**2.64E-03**	**1.86E-04**	**2.06E-04**	**0.4**
milestone 2		**24**	**4992**	**39.91**	**0.09**	**0.09**	**4.52E-03**	**4.26E-04**	**4.70E-04**	**0.9**
milestone 3		**24**	**6240**	**39.91**	**0.09**	**0.09**	**4.52E-03**	**5.33E-04**	**5.87E-04**	**1.2**
milestone 4		**64**	**16640**	**39.91**	**0.09**	**0.09**	**1.20E-02**	**1.42E-03**	**1.57E-03**	**3.1**
milestone 5		**64**	**19968**	**39.91**	**0.09**	**0.09**	**1.20E-02**	**1.70E-03**	**1.88E-03**	**3.8**
									tpa	
							SO2 lbs/day	**MTPA**	**tpa**	**lbs/year**
				Combined		**milestone 1**	**0.305**	**8.07E-03**	**8.89E-03**	**17.8**
						milestone 2	**0.307**	**1.40E-02**	**1.54E-02**	**30.8**

milestone 3	0.307	1.97E-02	2.18E-02	43.5
milestone 4	0.315	2.25E-02	2.48E-02	49.7
milestone 5	0.315	3.19E-02	0.0352	70.4

		Length	Width	Area
SONOM_S	Sonoma South of Lemon	735	24	17640
SONOM_N	Sonoma North of Lemon	525	24	12600
LEMON_E	Lemon East of Sonoma	820	16	13120
SONOM_S2	Sonoma South of Magazine	698	24	16752

2016		HHDT	LDA	
Emission factor, E	g/VKT	0.0102	0.0023	Sonoma Blvd
Emission factor, E	g/VKT	0.0102	0.0023	Lemon

Sonoma North of Lemon

Paved road modelled as a series of point sources

	HHDT		LDA	
	SO2		SO2	
Spacing of point sources	24	m	24	2-way roadway
AERMOD Point Sources	22		22	
Distance Travelled (Sonoma North)	0.525	km	0.525	
Emission Factor/vehicle	0.005	g/hr	0.001	based on winter
Emission Factor/vehicle	0.000001	g/sec	0.000005	includes shift trips/day
Emission factor, E	6.74E-08	g/sec	2.45E-07	

Sonoma North of Lemon				0.525
Split	0.05			km

Milestone 5

Weekday Hours	SO2 Emission Factor	Milestone5 VMT	SO2 Emission Factor	SO2 Including LDA
1	6.74E-08	0.24	3.28E-08	4.51E-08
2	6.74E-08	0.32	4.37E-08	4.37E-08
3	6.74E-08	0.49	6.56E-08	6.56E-08
4	6.74E-08	0.57	7.65E-08	7.65E-08
5	6.74E-08	0.65	8.75E-08	8.75E-08
6	6.74E-08	0.65	8.75E-08	8.75E-08
7	6.74E-08	0.65	8.75E-08	8.75E-08
8	6.74E-08	0.65	8.75E-08	8.75E-08
9	6.74E-08	0.65	8.75E-08	1.12E-07
10	6.74E-08	0.65	8.75E-08	8.75E-08
11	6.74E-08	0.75	1.01E-07	1.01E-07
12	6.74E-08	0.65	8.75E-08	8.75E-08
13	6.74E-08	0.57	7.65E-08	7.65E-08
14	6.74E-08	0.24	3.28E-08	3.28E-08
15	6.74E-08	0.34	4.63E-08	4.63E-08
16	6.74E-08	0.00	0.00E+00	0.00E+00
17	6.74E-08	0.00	0.00E+00	1.23E-08
18	6.74E-08	0.00	0.00E+00	0.00E+00
19	6.74E-08	0.00	0.00E+00	0.00E+00
20	6.74E-08	0.00	0.00E+00	0.00E+00
21	6.74E-08	0.00	0.00E+00	0.00E+00
22	6.74E-08	0.00	0.00E+00	0.00E+00

Sonoma North of Lemon

Weekday Hours	Maximum 24-Hr VMT SO2 Including LDA	Maximum 24-Hr Cumulative SO2 Including LDA	Annualised Emission Rate SO2 Including LDA	Annualised Emission Rate VMT SO2 Including LDA	Annualised Emission Rate Cumulative SO2 Including LDA
1	1.53E-08	6.04E-08	4.51E-08	1.53E-08	6.04E-08
2	0.00E+00	4.37E-08	4.37E-08	0.00E+00	4.37E-08
3	0.00E+00	6.56E-08	6.56E-08	0.00E+00	6.56E-08
4	0.00E+00	7.65E-08	7.65E-08	1.13E-08	8.79E-08
5	0.00E+00	8.75E-08	8.75E-08	1.51E-08	1.03E-07
6	0.00E+00	8.75E-08	8.75E-08	1.51E-08	1.03E-07
7	0.00E+00	8.75E-08	8.75E-08	1.51E-08	1.03E-07
8	0.00E+00	8.75E-08	8.75E-08	1.51E-08	1.03E-07
9	3.06E-08	1.43E-07	1.12E-07	4.58E-08	1.58E-07
10	1.36E-08	1.01E-07	8.75E-08	2.27E-08	1.10E-07
11	0.00E+00	1.01E-07	1.01E-07	1.51E-08	1.16E-07
12	0.00E+00	8.75E-08	8.75E-08	1.51E-08	1.03E-07
13	0.00E+00	7.65E-08	7.65E-08	1.51E-08	9.17E-08
14	1.36E-08	4.64E-08	3.28E-08	2.27E-08	5.55E-08
15	0.00E+00	4.63E-08	4.63E-08	1.51E-08	6.14E-08
16	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08
17	1.53E-08	2.76E-08	1.23E-08	3.04E-08	4.27E-08
18	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08
19	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08
20	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08
21	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08
22	0.00E+00	0.00E+00	0.00E+00	1.51E-08	1.51E-08

23	6.74E-08	0.08	1.09E-08	1.09E-08	0.00E+00	1.09E-08	1.09E-08	1.51E-08	2.60E-08
24	6.74E-08	0.16	2.19E-08	2.19E-08	0.00E+00	2.19E-08	2.19E-08	1.51E-08	3.70E-08
				g/sec					

8.31
including deliveries (2 per day, 10am, 2pm)

Annualised		Annualised
4.87E-08	1.62E-08	6.50E-08

Sonoma South of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		31		31	
Distance Travelled (Sonoma South)		0.735	km	0.735	
Emission Factor/vehicle		0.0075	g/hr	0.0017	based on winter
Emission Factor/vehicle		2.08E-06	g/sec	7.55E-06	includes shift trips/day
Emission factor, E		6.70E-08	g/sec	2.44E-07	

Sonoma South of Lemon				0.735
Split	0.39			km

Milestone 5

					Maximum 24-Hr			Sonoma South of Lemon Annualised Emission Rate	
					VMT	Cumulative	Annualised Emission Rate	VMT	Cumulative
	SO2	Milestone5	SO2	SO2	SO2	SO2	SO2	SO2	SO2
Weekday Hours	Emission Factor	VMT	Emission Factor	Including LDA	Including LDA	Including LDA	Including LDA	Including LDA	Including LDA
1	6.70E-08	2	2.54E-07	3.49E-07	1.19E-07	4.68E-07	3.49E-07	1.19E-07	4.68E-07
2	6.70E-08	3	3.39E-07	3.39E-07	0.00E+00	3.39E-07	3.39E-07	0.00E+00	3.39E-07
3	6.70E-08	4	5.08E-07	5.08E-07	0.00E+00	5.08E-07	5.08E-07	0.00E+00	5.08E-07
4	6.70E-08	4	5.93E-07	5.93E-07	0.00E+00	5.93E-07	5.93E-07	8.78E-08	6.81E-07
5	6.70E-08	5	6.78E-07	6.78E-07	0.00E+00	6.78E-07	6.78E-07	1.17E-07	7.95E-07
6	6.70E-08	5	6.78E-07	6.78E-07	0.00E+00	6.78E-07	6.78E-07	1.17E-07	7.95E-07
7	6.70E-08	5	6.78E-07	6.78E-07	0.00E+00	6.78E-07	6.78E-07	1.17E-07	7.95E-07
8	6.70E-08	5	6.78E-07	6.78E-07	0.00E+00	6.78E-07	6.78E-07	1.17E-07	7.95E-07
9	6.70E-08	5	6.78E-07	8.68E-07	2.38E-07	1.11E-06	8.68E-07	3.55E-07	1.22E-06
10	6.70E-08	5	6.78E-07	6.78E-07	1.05E-07	7.83E-07	6.78E-07	1.76E-07	8.54E-07
11	6.70E-08	6	7.82E-07	7.82E-07	0.00E+00	7.82E-07	7.82E-07	1.17E-07	9.00E-07
12	6.70E-08	5	6.78E-07	6.78E-07	0.00E+00	6.78E-07	6.78E-07	1.17E-07	7.95E-07
13	6.70E-08	4	5.93E-07	5.93E-07	0.00E+00	5.93E-07	5.93E-07	1.17E-07	7.10E-07
14	6.70E-08	2	2.54E-07	2.54E-07	1.05E-07	3.60E-07	2.54E-07	1.76E-07	4.30E-07
15	6.70E-08	3	3.59E-07	3.59E-07	0.00E+00	3.59E-07	3.59E-07	1.17E-07	4.76E-07
16	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
17	6.70E-08	0	0.00E+00	9.50E-08	1.19E-07	2.14E-07	9.50E-08	2.36E-07	3.31E-07
18	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
19	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
20	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
21	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
22	6.70E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07
23	6.70E-08	1	8.47E-08	8.47E-08	0.00E+00	8.47E-08	8.47E-08	1.17E-07	2.02E-07
24	6.70E-08	1	1.69E-07	1.69E-07	0.00E+00	1.69E-07	1.69E-07	1.17E-07	2.87E-07
				g/hr					

64.8

including deliveries (2 per day, 10am, 2pm)

Annualised	Annualised		Annualised
4.06E-07	3.78E-07	1.26E-07	5.04E-07

Lemon St East Of Sonoma

Paved road modelled as a series of point sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of point sources	16	m	16	2-way roadway
AERMOD Point Sources	51		51	
Distance Travelled (Lemon Street East)	0.820	km	0.820	
Emission Factor/vehicle	0.008	g/hr	0.002	based on winter
Emission Factor/vehicle	2.32E-06	g/sec	8.43E-06	includes shift trips/day
Emission factor, E	4.54E-08	g/sec	1.65E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Milestone 5

Lemon St East Of Sonoma

Weekday Hours	SO2 Emission Factor	Milestone5 VMT	SO2 Emission Factor	SO2 Including LDA	Maximum 24-Hr VMT SO2 Including LDA	Maximum 24-Hr Cumulative SO2 Including LDA	Annualised Emission Rate SO2 Including LDA	Annualised Emission Rate VMT SO2 Including LDA	Annualised Emission Rate Cumulative SO2 Including LDA
1	4.54E-08	3	2.48E-07	3.40E-07	1.16E-07	4.56E-07	3.40E-07	1.16E-07	4.56E-07
2	4.54E-08	4	3.30E-07	3.30E-07	0.00E+00	3.30E-07	3.30E-07	0.00E+00	3.30E-07
3	4.54E-08	5	4.95E-07	4.95E-07	0.00E+00	4.95E-07	4.95E-07	0.00E+00	4.95E-07
4	4.54E-08	6	5.78E-07	5.78E-07	0.00E+00	5.78E-07	5.78E-07	8.55E-08	6.63E-07
5	4.54E-08	7	6.60E-07	6.60E-07	0.00E+00	6.60E-07	6.60E-07	1.14E-07	7.74E-07
6	4.54E-08	7	6.60E-07	6.60E-07	0.00E+00	6.60E-07	6.60E-07	1.14E-07	7.74E-07
7	4.54E-08	7	6.60E-07	6.60E-07	0.00E+00	6.60E-07	6.60E-07	1.14E-07	7.74E-07
8	4.54E-08	7	6.60E-07	6.60E-07	0.00E+00	6.60E-07	6.60E-07	1.14E-07	7.74E-07
9	4.54E-08	7	6.60E-07	8.45E-07	2.31E-07	1.08E-06	8.45E-07	3.45E-07	1.19E-06
10	4.54E-08	7	6.60E-07	6.60E-07	1.03E-07	7.63E-07	6.60E-07	1.71E-07	8.31E-07
11	4.54E-08	8	7.62E-07	7.62E-07	0.00E+00	7.62E-07	7.62E-07	1.14E-07	8.76E-07
12	4.54E-08	7	6.60E-07	6.60E-07	0.00E+00	6.60E-07	6.60E-07	1.14E-07	7.74E-07
13	4.54E-08	6	5.78E-07	5.78E-07	0.00E+00	5.78E-07	5.78E-07	1.14E-07	6.92E-07
14	4.54E-08	3	2.48E-07	2.48E-07	1.03E-07	3.50E-07	2.48E-07	1.71E-07	4.19E-07
15	4.54E-08	4	3.49E-07	3.49E-07	0.00E+00	3.49E-07	3.49E-07	1.14E-07	4.63E-07
16	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
17	4.54E-08	0	0.00E+00	9.25E-08	1.16E-07	2.08E-07	9.25E-08	2.30E-07	3.22E-07
18	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
19	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
20	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
21	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
22	4.54E-08	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07
23	4.54E-08	1	8.25E-08	8.25E-08	0.00E+00	8.25E-08	8.25E-08	1.14E-07	1.97E-07
24	4.54E-08	2	1.65E-07	1.65E-07	0.00E+00	1.65E-07	1.65E-07	1.14E-07	2.79E-07
				g/hr					

93.0

including deliveries (2 per day, 10am, 2pm)

Annualised		Annualised
3.68E-07	1.23E-07	4.90E-07

Sonoma South of Magazine

Paved road modelled as a series of point sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of point sources	24	m	24	2-way roadway
AERMOD Point Sources	29		29	
Distance Travelled (Sonoma South Magazine)	0.698	km	0.698	
Emission Factor/vehicle	0.007	g/hr	0.002	based on winter
Emission Factor/vehicle	1.97E-06	g/sec	7.17E-06	includes shift trips/day
Emission factor, E	6.80E-08	g/sec	2.47E-07	

Sonoma South of Magazine		0.698
Split	0.39	km

Milestone 5

Weekday Hours	SO2 Emission Factor	Milestone5 VMT	SO2 Emission Factor	SO2 Including LDA
1	6.80E-08	2	2.58E-07	3.55E-07
2	6.80E-08	3	3.44E-07	3.44E-07
3	6.80E-08	4	5.16E-07	5.16E-07
4	6.80E-08	4	6.02E-07	6.02E-07
5	6.80E-08	5	6.88E-07	6.88E-07
6	6.80E-08	5	6.88E-07	6.88E-07
7	6.80E-08	5	6.88E-07	6.88E-07
8	6.80E-08	5	6.88E-07	6.88E-07
9	6.80E-08	5	6.88E-07	8.81E-07
10	6.80E-08	5	6.88E-07	6.88E-07
11	6.80E-08	6	7.94E-07	7.94E-07
12	6.80E-08	5	6.88E-07	6.88E-07
13	6.80E-08	4	6.02E-07	6.02E-07
14	6.80E-08	2	2.58E-07	2.58E-07
15	6.80E-08	3	3.64E-07	3.64E-07
16	6.80E-08	0	0.00E+00	0.00E+00
17	6.80E-08	0	0.00E+00	9.64E-08
18	6.80E-08	0	0.00E+00	0.00E+00
19	6.80E-08	0	0.00E+00	0.00E+00
20	6.80E-08	0	0.00E+00	0.00E+00
21	6.80E-08	0	0.00E+00	0.00E+00
22	6.80E-08	0	0.00E+00	0.00E+00
23	6.80E-08	1	8.60E-08	8.60E-08
24	6.80E-08	1	1.72E-07	1.72E-07
				g/s

64.8	
including deliveries (2 per day, 10am, 2pm)	

Maximum 24-Hr

VMT SO2 Including LDA	Cumulative SO2 Including LDA
1.21E-07	4.75E-07
0.00E+00	3.44E-07
0.00E+00	5.16E-07
0.00E+00	6.02E-07
0.00E+00	6.88E-07
0.00E+00	6.88E-07
0.00E+00	6.88E-07
0.00E+00	6.88E-07
2.41E-07	1.12E-06
1.07E-07	7.95E-07
0.00E+00	7.94E-07
0.00E+00	6.88E-07
0.00E+00	6.02E-07
1.07E-07	3.65E-07
0.00E+00	3.64E-07
0.00E+00	0.00E+00
1.21E-07	2.17E-07
0.00E+00	0.00E+00
0.00E+00	0.00E+00
0.00E+00	0.00E+00
0.00E+00	0.00E+00
0.00E+00	0.00E+00
0.00E+00	8.60E-08
0.00E+00	1.72E-07
	Annualised 4.12E-07

Annualised Emission Rate SO2 Including LDA
3.55E-07
3.44E-07
5.16E-07
6.02E-07
6.88E-07
6.88E-07
6.88E-07
6.88E-07
8.81E-07
6.88E-07
7.94E-07
6.88E-07
6.02E-07
2.58E-07
3.64E-07
0.00E+00
9.64E-08
0.00E+00
0.00E+00
0.00E+00
0.00E+00
0.00E+00
8.60E-08
1.72E-07
Annualised 3.83E-07

Sonoma South of Magazine

Annualised Emission Rate

VMT SO2 Including LDA	Cumulative SO2 Including LDA
1.21E-07	4.75E-07
0.00E+00	3.44E-07
0.00E+00	5.16E-07
8.91E-08	6.91E-07
1.19E-07	8.07E-07
1.19E-07	8.07E-07
1.19E-07	8.07E-07
1.19E-07	8.07E-07
3.60E-07	1.24E-06
1.78E-07	8.66E-07
1.19E-07	9.13E-07
1.19E-07	8.07E-07
1.19E-07	7.21E-07
1.78E-07	4.36E-07
1.19E-07	4.83E-07
1.19E-07	1.19E-07
2.39E-07	3.36E-07
1.19E-07	1.19E-07
1.19E-07	1.19E-07
1.19E-07	1.19E-07
1.19E-07	1.19E-07
1.19E-07	1.19E-07
1.19E-07	2.05E-07
1.19E-07	2.91E-07
1.28E-07	Annualised 5.11E-07

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 7% O2, Dry	11,784	1.04	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**30**	ppm at 3% O2	0.140	ratio
NOX Emission Level	30.0	ppm at 7% O2		

convert from	converrt to	
	m3/hr	
cfm	1.699	
	cfm	
m3/hr	0.589	49370.569
		ACFM

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2)	**56.60**	2.00	3.142	381.05	1.33	1.04	11784	0.67	667	0.185	1.4705	35.29
SO2	1.82	2.00	3.142	381.05	1.33	1.04	11784	0	21	**0.0059**	0.0472	1.13
CO	118.51	2.00	3.142	381.05	1.33	1.04	11784	1.40	1396	0.388	3.0786	73.89
PM10	10.72	2.00	3.142	381.05	1.33	1.04	11784	0.13	126	0.035	0.2785	6.68
PM2.5	9.65	2.00	3.142	381.05	1.33	1.04	11784	0.11	114	0.032	0.2507	6.02
TOC	15.52	2.00	3.142	381.05	1.33	1.04	11784	0.18	183	0.051	0.4032	9.68
Actual	**(mg/Nm3)**	**Diameter (m)**	**(m2)**	**(K)**		**(m/s)**	**(m3/hr)**	**Rate (kg/hr)**	**g/hr**	**g/s**	**g/kWh**	
NOX (as NO2)	7.95	2.00	3.142	381.05		7.41	83821	0.67	666	0.185	0.0760	
SO2	0.26	2.00	3.142	381.05		7.41	83821	0	21	0.0059	0.0020	
CO	16.64	2.00	3.142	381.05		7.41	83821	1.40	1395	0.388	0.1253	
PM	1.51	2.00	3.142	381.05		7.41	83821	0.13	126	0.035	0.0113	
TOC	2.18	2.00	3.142	381.05		7.41	83821	0.18	183	0.051	0.0164	

PM10
PM2.5
NOX (as NO2)
SO2
CO
PM10
PM2.5

Background
NO2
SO2
CO
PM10
PM2.5

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	SO2 (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.011
1	4.76%	33.32	5.00%	1.67	0.007
2	14.18%	99.26	25.00%	24.82	0.110
3	27.80%	194.6	2.30%	4.48	0.020
4	42.07%	294.49	21.50%	63.32	0.281
5	57.30%	401.1	1.50%	6.02	0.027
6	72.51%	507.57	1.60%	8.12	0.036
7	89.76%	628.32	0.00%	0.00	0.000
8	105.31%	737.17	0.00%	0.00	0.000
Fuel Correction Factor	1.00				

Natural Gas Combustion (USEPA AP-42 1.4)

HGG	10.82	MW	
	36.92	MMBtu/hr	
Natural Gas Combustion	10.08	Nm3/Tonne	(assumed normalised)
Based on 100 tonnes/hr of raw material	1038.24	m3/hr	of natural gas
Convert to SCF	36649.872	scf/hr	of natural gas

USEPA Emission Factors									
Combustor Type									
<100 MMBtu/hr	**NOX**	**CO**	**PM**	**SO2**	**SO2**	**TOC**	**VOC**	**CO2**	**CH4**
lb/10E+6 SCF	**100**	**84**	**7.6**	**n/a**	**0.6**	**11**	**5.5**	**120,000**	**2.3**
Emissions (lbs/hr)	3.665	3.079	0.279	n/a	0.022	0.403	0.202	4398	0.0843
Emissions (g/hr)	1662	1396	126	21.4	10	183	91	1994926	38.2
Emissions (g/sec)	0.462	0.388	**0.035**	0.0059	0.0028	0.0508	0.0254	554.1	0.01062
Volume Flow (Nm3/hr)	11784	11784	11784	11784	11784	11784	11784	11784	11784
(assumed 0% H20, 7% O2,298K)									
Emission Concentration (mg/m3)	141.1	118.5	10.72	1.816	0.846	15.52	7.759	169298	3.24
Molecular Weight	46	28		64	64	12	12	44	16
Emission Concentration (ppm)	75.0	103.5	N/A	0.694	0.323	31.6	15.8	94075.7	5.0
(Referenced to 25C)				BAAQMD Maximum	USEPA Default	(as C)	(as C)		

1.881

ppm = (mg/m^3 value)(24.45)/(molecular weight)

mg/m^3 = (ppm value)(molecular weight)/24.45

24.45 is a conversion factor that represents the volume of one mole of gas.
Note: this calculation assumes a temperature of 25°C (77°F) and a pressure of 1 atmosphere (760 torr or 760 mm Hg).

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000	tons per year of sand / aggregate imported
Hours Of Operation	5760	hrs
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,000	metric tonnes
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days
Duration of ship unloading	132	hrs (5.5 days)
Rail Loading	9072	mtonnes per day

Operations	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Mitigation Reduction (%)**	**Mitigation Required**
Handymax Ship	29	Each shipmment in first hour has transit and manouvering emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouvering and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	29	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for Phase 2 Alternative manuverving = 2hrs x 29 = 58hrs.	**25%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Forklift)	Ongoing	Based on hours of operation of 20 hrs per day Monday - Saturday (5760 hrs per year as a worst-case).	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Rail	Varies	Rail will replace trucks - as truck movements decrease rail movements increase under various scenarios	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in NOX compared to Tier II EPA emission rates.

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
SO2 **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs		lbs/day
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	0.075	lbs/day

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)			
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
SO2 **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 137hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	19.79	lbs/day
	Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	0.075	lbs/day

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported			
Hours Of Operation	5760			
Operational Details	24 days per month, 2 10-hour shift			
Shipment Load	40,0000 metric tonnes			
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days		
Duration of ship unloading	132	hrs (5.5 days)	**NO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Exhaust**	**Units**
Phase 2 Alternative	**Shipping**	29	2440.2	lbs/year
	Barge	12	1.79	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**		
Visits Per Year	29	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	

Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.18**	**SO2 at 3.7%**	**(USEPA (2009))**
Low Adjustment Factor (7 knots)	**1.25**	**SO2 at 10.2%**	**(USEPA (2009))**

Load Factor		
Tug Main Engine	0.31	CARB (POO EI)
Tug Auxillary Engine	0.43	CARB (POO EI)

Auxilliary Engine		
Hoteling	0.061	POLA (2012)
Maneuvering	0.275	POLA (2012)
Transit	0.104	POLA (2012)

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**SO2**
Slow	Marine Distillate (0.1% S)	**0.351264163**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**SO2**
Slow	Marine Distillate (0.1% S)	**0.351264163**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**SO2**
Medium	Marine Distillate (0.1% S)	**0.40**
		g/kW-HR

Boiler

	SO2
Marine Distillate (0.1% S)	**1.50**
	g/kW-HR

Tug

	SO2
Marine Distillate (0.1% S)	**See below**
	g/kW-HR

		Emission Factors (g/kW-hr)						units?		units?					
												Raw (kg/kW-hr)			
	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20	CH4	CO2	N20		Sulfur Fuel
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	590.5319	0.001767	0.000596	0.195542	0.001767		0.090%
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527		0.087%
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274		0.246%
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	588.994	0.001765	0.000595	0.195032	0.001765		0.090%
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527		0.087%
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274		0.246%
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764		0.090%
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527		0.087%
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274		0.246%
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764		0.090%
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527		0.087%
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274		0.246%
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764		0.090%
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527		0.087%
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274		0.246%
									corrected units			**mistake on units**			
			http://www.arb.ca.gov/msei/categories.htm#ogv_category									**MMT x 907200 x 365 / MW-hrs**			

	Dock	23.13	nm	23.13	AWN	73673	
	GG	8.72		8.91		1700	
	At Buoy	1.5		1.5		1300	
	Sea Buoy	7.4		6.1	Link not included		
		40.75	nm	39.64		76673	meters
1.1508		46.8951				41.43703	nm
		75454.22					
		72454.22					

Out to Sea Bu	33.35		33.54	nm
		1.1508	38.59783	statute miles
			62103.91	meters
			59103.91	meters - 3000 meters for maneuvering

			g/hp-hr							Sulfur
	Area	Engine	NOx	PM	ROG	CO	SOx	CO2	Fuel	PPM
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172	184.1585	32.31492
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172	184.1585	32.31492
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172	184.1585	32.31492
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172	184.1585	32.31492
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172	184.1585	32.31492
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172	184.1585	32.31492
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172	184.1585	32.31492
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172	184.1585	32.31492
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172	184.1585	32.31492
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172	184.1585	32.31492
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172	184.1585	32.31492
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172	184.1585	32.31492
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172	184.1585	32.31492
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172	184.1585	32.31492
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172	184.1585	32.31492
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172	184.1585	32.31492
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172	184.1585	32.31492
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172	184.1585	32.31492
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172	184.1585	32.31492
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172	184.1585	32.31492

	A	B	C	D	E	F	G	H	I
2		**Barge (Exhaust Emissions) - 5km from facility & hotelling**							
5		**Assumptions**							
7		**Barge Emission Factor**							
9		**Assumption**	**Phase 2 Alternative**						
10		**Visits Per Year**	12	visits			**Phase**	**Annual Tonnage**	**Truck Tonnage**
11		**Hours Per Visit**	22.0	hrs			**Phase 1 Trucks Only**	480000	480000
12		**Barge Capacity**	14000	ton			**Phase 1 Trucks & Rail**	720000	240000
13		**Hotelling Time**	20	hrs			**Phase 1 Alternative**	1350000	480000
14		**Transit & Maneuvering Time**	2	hours (roundtrip)			**Phase 2**	1160000	214400
15		**Transit distance assessed**	3700	metres			**Phase 2 Alternative**	1160000	310400
16		**Maneurvering Distance**	1300	metres					
18		**Bulk Emission Details (CARB (2011) Appendix D)**		1.1508	0.5144				
19			**knots**	**miles/hr**	**m/s**				
21		**Maneuving speed**	5	5.75	2.57				
22		**Outbound speed**	7	8.06	3.60				
24		**Barge Main Engine**	0.68	CARB (POO EI)					
25		**Barge Auxillary Engine**	0.43	CARB (POO EI)					
27		**Bulk Emission Details (CARB (2011) Appendix D)**							
30					**Time**				**Barge Emission Rate**
31			**SO2**		**(hrs)**		**inward**	**outward**	
32		**Main**	11.2	g/hr	0.540		2.57	3.60	**0.00329**
33							m/s	m/s	
35		**Auxiliary**	0.7	g/hr	0.540		2.57	3.60	
37		**Barge - Main Engines**							
38		In relation to the main engines likely to be used for the barge into port, the following assumptions were made:							
40		· 3000 hp was assumed as the rated horsepower of the main engine(s).							

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	SO2	
Forklift	N/A	100	0.00024	taken from OFFROAD2007 0.4 lb/hp-hr
		hp	lb/hr	
Deterioration Rate	0.00E+00	g/(hr-hr^2)		
Age	3	years	(2013 Model)	
Activity	1800	hours/year	(capped at 12,000 hrs)	
Fuel Correction Factor	1			
Emission Rate	0.11	g/hr		
Activity Factor	0.50	Fractional usage per hour		

SO2	Maximum Day			
Emission Rate	0.05	g/hr		
Emission Rate	1.47E-05	g/sec		
Sources	1			
Emissions per sec S1/source	1.47E-05	g/sec		
	SO2			
Emissions per sec S1/source	0.0000	g/sec		

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

			SO2 (diesel)	
CAT 980K	=	(S content in X/1000000) X (2 SO2/g S) x BSFC (184 g/hp-hr)		
HP	=	369	hp	
BSFC	=	184	g/hp-hr	
S content in fuel	=	15	ppm	(Maximum value in natural gas)
Main Engine Emissions	=	0.00020 g/sec		
Fuel Correction Factor	1			
Emission Rate	0.74	g/hr		

Activity Factor	90%	Fractional usage per hour
Emission Rate / Front Loader	0.0002	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

	Maximum Day	Annual		Hours Of Operation
Emission Rate / Front Loader / Truck Loading	0.000037	0.000184	g/s	5760
Emission Rate / Front Loader / TransLoading	0.000046	0.000184	g/s	1392
Emission Rate / Front Loader / Rail Loading	0.000037	0.000184	g/s	2038
Emission Rate / Front Loader / Barge Loading	0.000037	0.000184	g/s	237.6
				Sum

SO2 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*	*0.6214*
Region Type:	GAI							*mile to km*	*mile to km*
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	SO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	0.0260	Annual		0.026
						0.0167	Summer		
						0.0167	Winter		

taken from Environ (2010)

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor					
		SO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	0.02	0.03	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Win)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.01	0.01	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	0.0103	0.0165	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Win)	g/vkt	0.0102	0.0164	Sum	
Composite Emission Factor (Ann)	g/vkt	0.0155	0.0249	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	0.00655	0.00012	0.00655
2020	Annual	LDA	DSL	Aggregated	10	0.00535	0.00000	0.00535
2020	Summer	LDA	GAS	Aggregated	10	0.00372	0.00000	0.00372
2020	Summer	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372
2020	Winter	LDA	GAS	Aggregated	10	0.00339	0.00000	0.00339
2020	Winter	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372

LDA Idling Calculation									
2015	Annual	LDA	GAS	Aggregated		SO2_RUNEX			
						Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.00883	0.00339		0.00372

	8.046	km/hr	DSL	Aggregated	Aggregated	0.00642	0.00372	0.00372

		SO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.00424	0.00683	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.00332	0.00535	EMFAC2011	
Tailpipe Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00549	0.00883	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00399	0.00642	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00434	0.00698	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00337	0.00543	sum	
Composite Emission Factor Gas (sum)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor DSL (sum)	g/vkt	0.00231	0.00372	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.00433	0.00697	sum	Based on 0.38% Diesel
Composite Emission Factor (sum)	g/vkt	0.00231	0.00372	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		LDA	
	SO2		SO2	
Spacing of point sources	9	m	9	
AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.007	g/hr	0.002	based on summer
Emission Factor/vehicle	0.0000021	g/sec	0.000009	includes all trips/day
Emissions /vehicle/AERMOD Source	2.58E-08	g/sec	1.16E-07	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	SO2 Emissions (g/s)	SO2 Vehicles Per Hour	SO2 Emissions (g/s)	SO2 Including LDA	SO2 Vehicles Per Hour	SO2 Including LDA	SO2 Including LDA
1	2.58E-08	0	0.00E+00	1.16E-07	0	0.00E+00	1.16E-07
2	2.58E-08	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	2.58E-08	0	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	2.58E-08	3	7.75E-08	7.75E-08	2	4.28E-08	4.28E-08
5	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
6	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
7	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
8	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
9	2.58E-08	4	1.03E-07	3.36E-07	2	5.71E-08	2.90E-07
10	2.58E-08	6	1.55E-07	1.55E-07	3	8.56E-08	8.56E-08
11	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
12	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
13	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
14	2.58E-08	6	1.55E-07	1.55E-07	3	8.56E-08	8.56E-08

15	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
16	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
17	2.58E-08	4	1.03E-07	2.20E-07	2	5.71E-08	1.73E-07
18	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
19	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
20	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
21	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
22	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
23	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08
24	2.58E-08	4	1.03E-07	1.03E-07	2	5.71E-08	5.71E-08

Total HHDT/Day	87.0	48.1	Annualised Emission Rate
	including deliveries (2 per day, 10am, 2pm)		7.11E-08
Annual HHDT Based On Max Day	31755		
Actual HHDT Based On Tonnage	17542		
Ratio	0.5524		

Annual					Maximum Day	Annual Mean				
HGV Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480,000	480000	26445	0.725	0.007	0.011	0.001	0.0003	0.0003	0.65
Phase 1 Trucks & Rail	720,000	240000	13846	0.725	0.007	0.011	0.001	0.0002	0.0002	0.34
Phase 1 Alternative	1,350,000	480000	26445	0.725	0.007	0.011	0.001	0.0003	0.0003	0.65
Phase 2	1,160,000	214400	12503	0.725	0.007	0.011	0.001	0.0001	0.0002	0.31
Phase 2 Alternative	1,160,000	310400	17542	0.725	0.007	0.011	0.001	0.0002	0.0002	0.43
LDA Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.00168	0.00314	0.000	0.000012	0.000013	0.03
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.00168	0.00314	0.000	0.000016	0.000017	0.03
Phase 1 Alternative	1350000	40	10400	0.725	0.00168	0.00314	0.000	0.000033	0.000036	0.07
Phase 2	1,160,000	80	20800	0.725	0.00168	0.00314	0.000	0.000065	0.000072	0.14
Phase 2 Alternative	1,160,000	80	20800	0.725	0.00168	0.00314	0.000	0.000065	0.000072	0.14
									tpa	
							SO2			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.0015	0.0003	0.0003	0.681
						Phase 1 Trucks & Rail	0.0015	0.0002	0.0002	0.377
						Phase 1 Alternative	0.0016	0.0003	0.0004	0.727
						Phase 2	0.0017	0.0002	0.0002	0.454
						Phase 2 Alternative	0.0017	0.0003	0.0003	0.578

SO2 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor SO2

EMFAC2011 Emission Rates								0.6214	0.6214
Region Type:	GAI							mile to km	mile to km
Region:	Solano (SF)								
Calendar Year:	2020								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	SO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	0.0191	Annual		0.019
						0.0167	Summer		
						0.0167	Winter		

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Cate	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor

		SO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.0119	0.0191	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.0104	0.0167	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.0104	0.0167	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0074	0.0119	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.0089	0.0142	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.0077	0.0123	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0115	0.0186	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (summer)	g/vkt	0.0103	0.0165	Sum	
Composite Emission Factor (winter)	g/vkt	0.0102	0.0164	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	0.00016		0.000
2020	Annual	LDA	DSL	Aggregated	20	0.00361		0.004
2020	Summer	LDA	GAS	Aggregated	20	0.00372		0.004
2020	Summer	LDA	DSL	Aggregated	20	0.00372		0.004
2020	Winter	LDA	GAS	Aggregated	20	0.00339		0.003
2020	Winter	LDA	DSL	Aggregated	20	0.00372		0.004
2020								
Idling Calculation								
2020	Annual	LDA	GAS	Aggregated	SO2			
					Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	0.00011	0.00339		0.00372
	8.046	km/hr	DSL	Aggregated	0.00642	0.00372		0.00372

		SO2	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.00010	0.00016	EMFAC2011	No start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.00224	0.00361	EMFAC2011	
Tailpipe Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Tailpipe DSL LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00007	0.00011	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00399	0.00642	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00010	0.00016	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00237	0.00382	sum	
Composite Emission Factor Gas (sum)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor DSL (sum)	g/vkt	0.00231	0.00372	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.00011	0.00017	sum	Based on 0.38% Diesel
Composite Emission Factor (sum)	g/vkt	0.00231	0.00372	sum	

AERMOD Model Inputs
Paved road modelled as a series of point sources

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

		HHDT SO2		LDA SO2	
Spacing of point sources		14	m	14	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.007	g/hr	0.002	based on Winter
Emission Factor/vehicle		0.008	g/hr	0.000	based on Annual
Emission Factor/vehicle		2.03E-06	g/sec	9.25E-06	includes shift trips/day
Emission Factor/vehicle		2.31E-06	g/sec	4.23E-07	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		3.99E-08	g/sec	1.81E-07	based on winter
Emission Factor/vehicle/AERMOD Source		4.53E-08	g/sec	8.30E-09	based on annual

Diurnal Emission Factors Based On Truck Movement Breakdown

Milestone 5	2 shift changes assumed for milestone 5 Maximum Day	Annual			Maximum Day		Annual Mean	
Weekday Hours	SO2 Emission Factor	Milestone5 VMT	Milestone5 Trucks	SO2 Emission Factor	SO2 Including LDA	SO2 Vehicles Per Hour	SO2 Including LDA	SO2 Including LDA
1	3.99E-08	4.53E-08	0.00	0.00E+00	1.81E-07	0	0.00E+00	8.30E-09
2	3.99E-08	4.53E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	3.99E-08	4.53E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	3.99E-08	4.53E-08	3.00	2.39E-07	2.39E-07	2	1.50E-07	1.50E-07
5	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
6	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
7	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
8	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
9	3.99E-08	4.53E-08	4.00	3.19E-07	6.82E-07	2	2.00E-07	2.17E-07
10	3.99E-08	4.53E-08	6.00	4.79E-07	4.79E-07	3	3.00E-07	3.00E-07
11	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
12	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
13	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
14	3.99E-08	4.53E-08	6.00	4.79E-07	4.79E-07	3	3.00E-07	3.00E-07
15	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
16	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
17	3.99E-08	4.53E-08	4.00	3.19E-07	5.01E-07	2	2.00E-07	2.08E-07
18	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
19	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
20	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
21	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
22	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
23	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
24	3.99E-08	4.53E-08	4.00	3.19E-07	3.19E-07	2	2.00E-07	2.00E-07
	including deliveries (2 per day, 10am, 2pm)		87.0			48.1		Annualised Emission Rate 1.83E-07

SO2 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	0.0103	0.0023	Lemon
Controlled Emission factor, E	g/VKT	0.0103	0.0023	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon
Paved road modelled as a series of point sources

		HHDT SO2		LDA SO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.005	g/hr	0.001	based on winter
Emission Factor/vehicle		0.00000150	g/sec	0.00000674	includes shift trips/day
Controlled Emission factor, E		6.80E-08	g/sec	3.06E-07	

Sonoma North of Lemon				0.525
Split	0.05			km

phase 2 alternative

Weekday Hours	SO2 Emissions (g/sec)	SO2 Vehicles Per Hour	SO2 Emissions (g/sec)	SO2 Including LDA	SO2 Vehicles Per Hour	SO2 Including LDA	SO2 Including LDA
1	6.80E-08	0.00	0.00E+00	1.53E-08	0	0.00E+00	1.53E-08
2	6.80E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
3	6.80E-08	0.00	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
4	6.80E-08	0.15	2.04E-08	2.04E-08	0	1.13E-08	1.13E-08
5	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
6	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
7	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
8	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
9	6.80E-08	0.20	2.72E-08	5.79E-08	0	1.50E-08	4.57E-08
10	6.80E-08	0.30	4.08E-08	4.08E-08	0	2.25E-08	2.25E-08
11	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
12	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
13	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
14	6.80E-08	0.30	4.08E-08	4.08E-08	0	2.25E-08	2.25E-08
15	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08

16	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
17	6.80E-08	0.20	2.72E-08	4.25E-08	0	1.50E-08	3.04E-08
18	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
19	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
20	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
21	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
22	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
23	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08
24	6.80E-08	0.20	2.72E-08	2.72E-08	0	1.50E-08	1.50E-08

g/sec

4.4		2.4	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)		including deliveries (2 per day, 10am, 2pm)	1.62E-08

Sonoma South of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	to junction Sonoma Blvd
Emission Factor/vehicle		0.008	g/hr	0.002	based on winter
Emission Factor/vehicle		2.10E-06	g/sec	9.44E-06	includes shift trips/day
Controlled Emission factor, E		6.76E-08	g/sec	3.05E-07	

Sonoma South of Lemon		0.735
Split	0.39	km

phase 2 alternative

Weekday Hours	SO2 Emissions (g/sec)	SO2 Vehicles Per Hour	SO2 Emissions (g/sec)	SO2 Including LDA	SO2 Vehicles Per Hour	SO2 Including LDA	PM10 Including LDA
1	6.76E-08	0.00	0.00E+00	1.19E-07	0.00	0.00E+00	1.19E-07
2	6.76E-08	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	6.76E-08	0.00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	6.76E-08	1.17	1.58E-07	1.58E-07	0.65	8.74E-08	8.74E-08
5	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
6	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
7	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
8	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
9	6.76E-08	1.56	2.11E-07	4.48E-07	0.86	1.16E-07	3.54E-07
10	6.76E-08	2.34	3.16E-07	3.16E-07	1.29	1.75E-07	1.75E-07
11	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
12	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
13	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
14	6.76E-08	2.34	3.16E-07	3.16E-07	1.29	1.75E-07	1.75E-07
15	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
16	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
17	6.76E-08	1.56	2.11E-07	3.30E-07	0.86	1.16E-07	2.35E-07
18	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
19	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
20	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
21	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
22	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
23	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07
24	6.76E-08	1.56	2.11E-07	2.11E-07	0.86	1.16E-07	1.16E-07

g/hr

33.9		18.7	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)		including deliveries (2 per day, 10am, 2pm)	1.25E-07

Lemon St East Of Sonoma

Paved road modelled as a series of point sources

#DIV/0!

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		16	m	16	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.008	g/hr	0.002	based on winter
Emission Factor/vehicle		0.0000023	g/sec	0.0000105	includes shift trips/day
Controlled Emission factor, E		4.58E-08	g/sec	2.07E-07	

Lemon St East Of Sonoma		0.82
Split	0.56	km

phase 2 alternative

Weekday Hours	SO2 Emissions (g/sec)	SO2 Vehicles Per Hour	SO2 Emissions (g/sec)	SO2 Including LDA	SO2 Vehicles Per Hour	SO2 Including LDA	SO2 Including LDA
1	4.58E-08	0	0.00E+00	1.16E-07	0.00	0.00E+00	1.16E-07
2	4.58E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	4.58E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	4.58E-08	2	1.54E-07	1.54E-07	0.93	8.51E-08	8.51E-08
5	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
6	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
7	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
8	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
9	4.58E-08	2	2.05E-07	4.37E-07	1.24	1.13E-07	3.45E-07
10	4.58E-08	3	3.08E-07	3.08E-07	1.86	1.70E-07	1.70E-07
11	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
12	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
13	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
14	4.58E-08	3	3.08E-07	3.08E-07	1.86	1.70E-07	1.70E-07
15	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
16	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
17	4.58E-08	2	2.05E-07	3.21E-07	1.24	1.13E-07	2.29E-07
18	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
19	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
20	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
21	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
22	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
23	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07
24	4.58E-08	2	2.05E-07	2.05E-07	1.24	1.13E-07	1.13E-07

g/hr

48.7		26.9	Annualised Emission Rate
including deliveries (2 per day, 10am, 2pm)		including deliveries (2 per day, 10am, 2pm)	1.22E-07

Sonoma South of Magazine

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	to junction Sonoma Blvd
Emission Factor/vehicle		0.007	g/hr	0.002	based on winter
Emission Factor/vehicle		0.0000020	g/sec	0.0000090	includes shift trips/day
#REF!		6.86E-08	g/sec	3.09E-07	

Sonoma South of Magazine		0.698
Split	0.39	km

phase 2 alternative

	SO2	SO2	SO2	SO2	SO2	SO2	SO2

Weekday Hours	Emissions (g/sec)	Vehicles Per Hour	Emissions (g/sec)	Including LDA	Vehicles Per Hour	Including LDA	Including LDA
1	6.86E-08	0	0.00E+00	1.21E-07	0.00	0.00E+00	1.21E-07
2	6.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
3	6.86E-08	0	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00
4	6.86E-08	1	1.61E-07	1.61E-07	0.65	8.87E-08	8.87E-08
5	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
6	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
7	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
8	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
9	6.86E-08	2	2.14E-07	4.55E-07	0.86	1.18E-07	3.59E-07
10	6.86E-08	2	3.21E-07	3.21E-07	1.29	1.77E-07	1.77E-07
11	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
12	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
13	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
14	6.86E-08	2	3.21E-07	3.21E-07	1.29	1.77E-07	1.77E-07
15	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
16	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
17	6.86E-08	2	2.14E-07	3.35E-07	0.86	1.18E-07	2.39E-07
18	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
19	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
20	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
21	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
22	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
23	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
24	6.86E-08	2	2.14E-07	2.14E-07	0.86	1.18E-07	1.18E-07
				g/s			
		33.9			18.7		Annualised Emission Rate
		including deliveries (2 per day, 10am, 2pm)			including deliveries (2 per day, 10am, 2pm)		1.27E-07

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					SO_2	SO_2	SO_2	SO_2	SO_2	SO_2
	tonnage	trucks tonnage per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480,000	26,445	80.467	0.83	0.93	0.158	0.0246	0.0271	54.16
Phase 1 Trucks & Rail	720000	240,000	13,846	80.467	0.83	0.93	0.158	0.0129	0.0142	28.36
Phase 1 Alternative	1350000	480,000	26,445	80.467	0.83	0.93	0.158	0.0246	0.0271	54.16
Phase 2	1160000	214,400	12,503	80.467	0.83	0.93	0.158	0.0116	0.0128	25.61
Phase 2 Alternative	1160000	310,400	17,542	80.467	0.83	0.93	0.158	0.0163	0.0180	35.93
LDA Traffic					SO_2	SO_2	SO_2	SO_2	SO_2	SO_2
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	0.09	0.00	0.005	0.000016	0.000017	0.03
Phase 1 Trucks & Rail	720000	24	4992	39.910	0.09	0.00	0.005	0.000021	0.000023	0.05
Phase 1 Alternative	1350000	40	10400	39.910	0.09	0.00	0.008	0.000044	0.000048	0.10
Phase 2	1160000	80	20800	39.910	0.09	0.00	0.016	0.000088	0.000097	0.19
Phase 2 Alternative	1160000	80	20800	39.910	0.09	0.00	0.016	0.000088	0.000097	0.19
									tpa	
							SO_2			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.163	0.0246	0.0271	54.2
						Phase 1 Trucks & Rail	0.163	0.0129	0.0142	28.4
						Phase 1 Alternative	0.167	0.0246	0.0271	54.3
						Phase 2	0.175	0.0117	0.0129	25.8
						Phase 2 Alternative	0.175	0.0164	0.0181	36.1

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	SO2 (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.01
1	4.76%	33.32	5.00%	1.67	0.01
2	14.18%	99.26	25.00%	24.82	0.11
3	27.80%	194.6	2.30%	4.48	0.02
4	42.07%	294.49	21.50%	63.32	0.28
5	57.30%	401.1	1.50%	6.02	0.03
6	72.51%	507.57	1.60%	8.12	0.04
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	1.00				

SO2 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*	*0.6214*
Region Type:	GAI							*mile to km*	*mile to km*
Region:	Solano (SF)								
Calendar Year:	2016								
Season:	Annual								
Speed:	10	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	SO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2016	Annual	T7 Single	DSL	Aggregated	0.0260	Annual		0.026
						0.0167	Summer		
						0.0167	Winter		

taken from Environ (2010)

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor					
		SO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	0.01	0.02	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	0.02	0.03	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Win)	g/vkt	0.01	0.01	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	0.01	0.01	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	0.0103	0.0165	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Win)	g/vkt	0.0102	0.0164	Sum	
Composite Emission Factor (Ann)	g/vkt	0.0155	0.0249	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2015	Annual	LDA	GAS	Aggregated	10	0.00344	0.00495	0.00344
2015	Annual	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372
2015	Summer	LDA	GAS	Aggregated	10	0.00372	0.00485	0.00372
2015	Summer	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372
2015	Winter	LDA	GAS	Aggregated	10	0.00339	0.00504	0.00339
2015	Winter	LDA	DSL	Aggregated	10	0.00372	0.00000	0.00372

LDA Idling Calculation									
2015	Annual	LDA	GAS	Aggregated		SO2_RUNEX			
						Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	Aggregated	0.00344	0.00339		0.00372

	8.046	km/hr	DSL	Aggregated	Aggregated	0.00372	0.00372	0.00372

		SO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	0.00896	0.01442	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Tailpipe Gas LDA (sum)	g/vkt	0.00900	0.01449	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00214	0.00344	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00845	0.01360	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor Gas (sum)	g/vkt	0.00850	0.01368	sum	
Composite Emission Factor DSL (sum)	g/vkt	0.00231	0.00372	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	0.00843	0.01356	sum	Based on 0.38% Diesel
Composite Emission Factor (sum)	g/vkt	0.00848	0.01365	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		LDA	
	SO2		SO2	
Spacing of point sources	9	m	9	
AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.725	km	0.725	
	0.451	mile	0.451	
Emission Factor/vehicle	0.007	g/hr	0.006	based on summer
Emission Factor/vehicle	0.0000021	g/sec	0.000034	includes all trips/day
Emissions /vehicle/AERMOD Source	2.58E-08	g/sec	4.27E-07	

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	SO2 Emissions (g/s)	SO2 Vehicles Per Hour	SO2 Emissions (g/s)	SO2 Including LDA
1	2.58E-08	0	0.00E+00	4.27E-07
2	2.58E-08	0	0.00E+00	0.00E+00
3	2.58E-08	0	0.00E+00	0.00E+00
4	2.58E-08	0	0.00E+00	0.00E+00
5	2.58E-08	0	0.00E+00	0.00E+00
6	2.58E-08	0	0.00E+00	0.00E+00
7	2.58E-08	0	0.00E+00	0.00E+00
8	2.58E-08	0	0.00E+00	0.00E+00
9	2.58E-08	0	0.00E+00	8.54E-07
10	2.58E-08	2	5.17E-08	5.17E-08
11	2.58E-08	0	0.00E+00	0.00E+00
12	2.58E-08	0	0.00E+00	0.00E+00
13	2.58E-08	0	0.00E+00	0.00E+00
14	2.58E-08	2	5.17E-08	5.17E-08

15	2.58E-08	0	0.00E+00	0.00E+00
16	2.58E-08	0	0.00E+00	0.00E+00
17	2.58E-08	0	0.00E+00	4.27E-07
18	2.58E-08	0	0.00E+00	0.00E+00
19	2.58E-08	0	0.00E+00	0.00E+00
20	2.58E-08	0	0.00E+00	0.00E+00
21	2.58E-08	0	0.00E+00	0.00E+00
22	2.58E-08	0	0.00E+00	0.00E+00
23	2.58E-08	0	0.00E+00	0.00E+00
24	2.58E-08	0	0.00E+00	0.00E+00

Total HHDT/Day	4.0
	including deliveries (2 per day, 10am, 2pm)
Annual HHDT Based On Max Day	1460
Actual HHDT Based On Tonnage	17542
Ratio	12.0150

Annual					Maximum Day	Annual Mean				
HGV Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480,000	480000	26445	0.725	0.007	0.011	0.000	0.0003	0.0003	0.65
Phase 1 Trucks & Rail	720,000	240000	13846	0.725	0.007	0.011	0.000	0.0002	0.0002	0.34
Phase 1 Alternative	1,350,000	480000	26445	0.725	0.007	0.011	0.000	0.0003	0.0003	0.65
Phase 2	1,160,000	214400	12503	0.725	0.007	0.011	0.000	0.0001	0.0002	0.31
Phase 2 Alternative	1,160,000	310400	17542	0.725	0.007	0.011	0.000	0.0002	0.0002	0.43
LDA Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	movements/day	movement per year	distance travelled (miles)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	0.725	0.00615	0.00611	0.000	0.000023	0.000025	0.05
Phase 1 Trucks & Rail	720000	24	4992	0.725	0.00615	0.00611	0.000	0.000030	0.000034	0.07
Phase 1 Alternative	1350000	40	10400	0.725	0.00615	0.00611	0.001	0.000064	0.000070	0.14
Phase 2	1,160,000	80	20800	0.725	0.00615	0.00611	0.001	0.000127	0.000140	0.28
Phase 2 Alternative	1,160,000	80	20800	0.725	0.00615	0.00611	0.001	0.000127	0.000140	0.28
									tpa	
							SO2			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.0004	0.0003	0.0004	0.705
						Phase 1 Trucks & Rail	0.0004	0.0002	0.0002	0.410
						Phase 1 Alternative	0.0006	0.0004	0.0004	0.794
						Phase 2	0.0012	0.0003	0.0003	0.590
						Phase 2 Alternative	0.0012	0.0003	0.0004	0.714

SO2 Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor SO2

EMFAC2011 Emission Rates							0.6214		0.6214
Region Type:	GAI						mile to km		mile to km
Region:	Solano (SF)								
Calendar Year:	2016								
Season:	Annual								
Speed:	20	miles/hr							
Vehicle Classification:	EMFAC2011 Categories					Annual			0
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	SO2_run			Combined
						(gms/mile)			(gms/mile)
Solano (SF)	2016	Annual	T7 Single	DSL	Aggregated	0.0191	Annual		0.019
						0.0167	Summer		
						0.0167	Winter		

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Cate	Fuel_Type	air_basin	season	SO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					0.060	annual
	Speed	5	miles/hr		0.071	summer
		8.046	km/hr		0.062	winter

HHDT Emission Factor

		SO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	0.0119	0.0191	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	0.0104	0.0167	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	0.0104	0.0167	EMFAC2011	
Idling T7 Single (ann)	g/vkt	0.0075	0.0120	EMFAC2011	
Idling T7 Single (summer)	g/vkt	0.0089	0.0142	EMFAC2011	
Idling T7 Single (winter)	g/vkt	0.0077	0.0123	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	0.0115	0.0186	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (summer)	g/vkt	0.0103	0.0165	Sum	
Composite Emission Factor (winter)	g/vkt	0.0102	0.0164	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	SO2_RUNEX	SO2_STREX	SO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	20	0.00344		0.003
2016	Annual	LDA	DSL	Aggregated	20	0.00372		0.004
2016	Summer	LDA	GAS	Aggregated	20	0.00372		0.004
2016	Summer	LDA	DSL	Aggregated	20	0.00372		0.004
2016	Winter	LDA	GAS	Aggregated	20	0.00339		0.003
2016	Winter	LDA	DSL	Aggregated	20	0.00372		0.004

Idling Calculation								
2016	Annual	LDA	GAS	Aggregated	SO2			
					Annual	Winter	Summer	
Speed	5	miles/hr	GAS	Aggregated	0.00344	0.00339		0.00372
	8.046	km/hr	DSL	Aggregated	0.00372	0.00372		0.00372

		SO2	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	0.00214	0.00344	EMFAC2011	No start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Tailpipe Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Tailpipe DSL LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	0.00214	0.00344	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Gas LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Idling Diesel LDA (sum)	g/vkt	0.00231	0.00372	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	0.00214	0.00344	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor Gas (sum)	g/vkt	0.00231	0.00372	sum	
Composite Emission Factor DSL (sum)	g/vkt	0.00231	0.00372	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	0.00214	0.00344	sum	Based on 0.38% Diesel
Composite Emission Factor (sum)	g/vkt	0.00231	0.00372	sum	

AERMOD Model Inputs
Paved road modelled as a series of point sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		14	m	14	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.720	km	0.720	to junction Sonoma Blvd
Emission Factor/vehicle		0.007	g/hr	0.002	based on Winter
Emission Factor/vehicle		0.008	g/hr	0.002	based on Annual
Emission Factor/vehicle		2.03E-06	g/sec	9.25E-06	includes shift trips/day
Emission Factor/vehicle		2.31E-06	g/sec	8.56E-06	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		3.99E-08	g/sec	1.81E-07	based on winter
Emission Factor/vehicle/AERMOD Source		4.53E-08	g/sec	1.68E-07	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5 — **Maximum Day**

Milestone 5 — **Maximum Day**

Weekday Hours	SO2 Emission Factor	Milestone5 Trucks	SO2 Emission Factor	SO2 Including LDA
1	3.99E-08	0.00	0.00E+00	1.81E-07
2	3.99E-08	0.00	0.00E+00	0.00E+00
3	3.99E-08	0.00	0.00E+00	0.00E+00
4	3.99E-08	0.00	0.00E+00	0.00E+00
5	3.99E-08	0.00	0.00E+00	0.00E+00
6	3.99E-08	0.00	0.00E+00	0.00E+00
7	3.99E-08	0.00	0.00E+00	0.00E+00
8	3.99E-08	0.00	0.00E+00	0.00E+00
9	3.99E-08	0.00	0.00E+00	3.63E-07
10	3.99E-08	2.00	1.60E-07	1.60E-07
11	3.99E-08	0.00	0.00E+00	0.00E+00
12	3.99E-08	0.00	0.00E+00	0.00E+00
13	3.99E-08	0.00	0.00E+00	0.00E+00
14	3.99E-08	2.00	1.60E-07	1.60E-07
15	3.99E-08	0.00	0.00E+00	0.00E+00
16	3.99E-08	0.00	0.00E+00	0.00E+00
17	3.99E-08	0.00	0.00E+00	1.81E-07
18	3.99E-08	0.00	0.00E+00	0.00E+00
19	3.99E-08	0.00	0.00E+00	0.00E+00
20	3.99E-08	0.00	0.00E+00	0.00E+00
21	3.99E-08	0.00	0.00E+00	0.00E+00
22	3.99E-08	0.00	0.00E+00	0.00E+00
23	3.99E-08	0.00	0.00E+00	0.00E+00
24	3.99E-08	0.00	0.00E+00	0.00E+00
		4.0		

including deliveries (2 per day, 10am, 2pm)

SO2 Public Paved Road (Exhaust Emissions)		HHDT	LDA	
Controlled Emission factor, E	g/VKT	0.0103	0.0023	Lemon
Controlled Emission factor, E	g/VKT	0.0103	0.0023	Sonoma Blvd

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

Sonoma North of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	to junction Sonoma Blvd
Emission Factor/vehicle		0.005	g/hr	0.001	based on winter
Emission Factor/vehicle		0.00000150	g/sec	0.00000674	includes shift trips/day
Controlled Emission factor, E		6.80E-08	g/sec	3.06E-07	

Sonoma North of Lemon		0.525
Split	0.05	km

phase 2 alternative

Weekday Hours	SO2 Emissions (g/sec)	SO2 0	SO2 Emissions (g/sec)	SO2 Including LDA
1	6.80E-08	0.00	0.00E+00	1.53E-08
2	6.80E-08	0.00	0.00E+00	0.00E+00
3	6.80E-08	0.00	0.00E+00	0.00E+00
4	6.80E-08	0.00	0.00E+00	0.00E+00
5	6.80E-08	0.00	0.00E+00	0.00E+00
6	6.80E-08	0.00	0.00E+00	0.00E+00
7	6.80E-08	0.00	0.00E+00	0.00E+00
8	6.80E-08	0.00	0.00E+00	0.00E+00
9	6.80E-08	0.00	0.00E+00	3.06E-08
10	6.80E-08	0.10	1.36E-08	1.36E-08
11	6.80E-08	0.00	0.00E+00	0.00E+00
12	6.80E-08	0.00	0.00E+00	0.00E+00
13	6.80E-08	0.00	0.00E+00	0.00E+00
14	6.80E-08	0.10	1.36E-08	1.36E-08
15	6.80E-08	0.00	0.00E+00	0.00E+00

16	6.80E-08	0.00	0.00E+00	0.00E+00
17	6.80E-08	0.00	0.00E+00	1.53E-08
18	6.80E-08	0.00	0.00E+00	0.00E+00
19	6.80E-08	0.00	0.00E+00	0.00E+00
20	6.80E-08	0.00	0.00E+00	0.00E+00
21	6.80E-08	0.00	0.00E+00	0.00E+00
22	6.80E-08	0.00	0.00E+00	0.00E+00
23	6.80E-08	0.00	0.00E+00	0.00E+00
24	6.80E-08	0.00	0.00E+00	0.00E+00
				g/sec

0.2
including deliveries (2 per day, 10am, 2pm)

Sonoma South of Lemon

Paved road modelled as a series of point sources

		HHDT		LDA	
		SO2		SO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	to junction Sonoma Blvd
Emission Factor/vehicle		0.008	g/hr	0.002	based on winter
Emission Factor/vehicle		2.10E-06	g/sec	9.44E-06	includes shift trips/day
Controlled Emission factor, E		6.76E-08	g/sec	3.05E-07	

Sonoma South of Lemon				0.735
Split	0.39			km

phase 2 alternative

	SO2	SO2	SO2	SO2
Weekday Hours	Emissions (g/sec)	0	Emissions (g/sec)	Including LDA
1	6.76E-08	0.00	0.00E+00	1.19E-07
2	6.76E-08	0.00	0.00E+00	0.00E+00
3	6.76E-08	0.00	0.00E+00	0.00E+00
4	6.76E-08	0.00	0.00E+00	0.00E+00
5	6.76E-08	0.00	0.00E+00	0.00E+00
6	6.76E-08	0.00	0.00E+00	0.00E+00
7	6.76E-08	0.00	0.00E+00	0.00E+00
8	6.76E-08	0.00	0.00E+00	0.00E+00
9	6.76E-08	0.00	0.00E+00	2.38E-07
10	6.76E-08	0.78	1.05E-07	1.05E-07
11	6.76E-08	0.00	0.00E+00	0.00E+00
12	6.76E-08	0.00	0.00E+00	0.00E+00
13	6.76E-08	0.00	0.00E+00	0.00E+00
14	6.76E-08	0.78	1.05E-07	1.05E-07
15	6.76E-08	0.00	0.00E+00	0.00E+00
16	6.76E-08	0.00	0.00E+00	0.00E+00
17	6.76E-08	0.00	0.00E+00	1.19E-07
18	6.76E-08	0.00	0.00E+00	0.00E+00
19	6.76E-08	0.00	0.00E+00	0.00E+00
20	6.76E-08	0.00	0.00E+00	0.00E+00
21	6.76E-08	0.00	0.00E+00	0.00E+00
22	6.76E-08	0.00	0.00E+00	0.00E+00
23	6.76E-08	0.00	0.00E+00	0.00E+00
24	6.76E-08	0.00	0.00E+00	0.00E+00
				g/hr

1.6
including deliveries (2 per day, 10am, 2pm)

Lemon St East Of Sonoma

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		16	m	16	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	to junction Sonoma Blvd
Emission Factor/vehicle		0.008	g/hr	0.002	based on winter
Emission Factor/vehicle		0.0000023	g/sec	0.0000105	includes shift trips/day
Controlled Emission factor, E		4.58E-08	g/sec	2.07E-07	

Lemon St East Of Sonoma				0.82
Split	0.56			km

phase 2 alternative

	SO2	SO2	SO2	SO2
Weekday Hours	Emissions (g/sec)	0	Emissions (g/sec)	Including LDA
1	4.58E-08	0	0.00E+00	1.16E-07
2	4.58E-08	0	0.00E+00	0.00E+00
3	4.58E-08	0	0.00E+00	0.00E+00
4	4.58E-08	0	0.00E+00	0.00E+00
5	4.58E-08	0	0.00E+00	0.00E+00
6	4.58E-08	0	0.00E+00	0.00E+00
7	4.58E-08	0	0.00E+00	0.00E+00
8	4.58E-08	0	0.00E+00	0.00E+00
9	4.58E-08	0	0.00E+00	2.31E-07
10	4.58E-08	1	1.03E-07	1.03E-07
11	4.58E-08	0	0.00E+00	0.00E+00
12	4.58E-08	0	0.00E+00	0.00E+00
13	4.58E-08	0	0.00E+00	0.00E+00
14	4.58E-08	1	1.03E-07	1.03E-07
15	4.58E-08	0	0.00E+00	0.00E+00
16	4.58E-08	0	0.00E+00	0.00E+00
17	4.58E-08	0	0.00E+00	1.16E-07
18	4.58E-08	0	0.00E+00	0.00E+00
19	4.58E-08	0	0.00E+00	0.00E+00
20	4.58E-08	0	0.00E+00	0.00E+00
21	4.58E-08	0	0.00E+00	0.00E+00
22	4.58E-08	0	0.00E+00	0.00E+00
23	4.58E-08	0	0.00E+00	0.00E+00
24	4.58E-08	0	0.00E+00	0.00E+00
				g/hr

2.2
including deliveries (2 per day, 10am, 2pm)

Sonoma South of Magazine

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	to junction Sonoma Blvd
Emission Factor/vehicle		0.007	g/hr	0.002	based on winter
Emission Factor/vehicle		0.0000020	g/sec	0.0000090	includes shift trips/day
#REF!		6.86E-08	g/sec	3.09E-07	

Sonoma South of Magazine				0.698
Split	0.39			km

phase 2 alternative

	SO2	SO2	SO2	SO2

Weekday Hours	Emissions (g/sec)	0	Emissions (g/sec)	Including LDA
1	6.86E-08	0	0.00E+00	1.21E-07
2	6.86E-08	0	0.00E+00	0.00E+00
3	6.86E-08	0	0.00E+00	0.00E+00
4	6.86E-08	0	0.00E+00	0.00E+00
5	6.86E-08	0	0.00E+00	0.00E+00
6	6.86E-08	0	0.00E+00	0.00E+00
7	6.86E-08	0	0.00E+00	0.00E+00
8	6.86E-08	0	0.00E+00	0.00E+00
9	6.86E-08	0	0.00E+00	2.41E-07
10	6.86E-08	1	1.07E-07	1.07E-07
11	6.86E-08	0	0.00E+00	0.00E+00
12	6.86E-08	0	0.00E+00	0.00E+00
13	6.86E-08	0	0.00E+00	0.00E+00
14	6.86E-08	1	1.07E-07	1.07E-07
15	6.86E-08	0	0.00E+00	0.00E+00
16	6.86E-08	0	0.00E+00	0.00E+00
17	6.86E-08	0	0.00E+00	1.21E-07
18	6.86E-08	0	0.00E+00	0.00E+00
19	6.86E-08	0	0.00E+00	0.00E+00
20	6.86E-08	0	0.00E+00	0.00E+00
21	6.86E-08	0	0.00E+00	0.00E+00
22	6.86E-08	0	0.00E+00	0.00E+00
23	6.86E-08	0	0.00E+00	0.00E+00
24	6.86E-08	0	0.00E+00	0.00E+00
				g/s

1.6

including deliveries (2 per day, 10am, 2pm)

	Deliveries	Staff
Distance Travelled	80.47	39.91
Units	km	km
Estimated Average Mileage (2-way)	(50 miles)	(24.8 miles)

Annual					Maximum Day	Annual Mean				
HGV Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	trucks tonnage per year	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480,000	26,445	80.467	0.83	0.93	0.007	0.0246	0.0271	54.18
Phase 1 Trucks & Rail	720000	240,000	13,846	80.467	0.83	0.93	0.007	0.0129	0.0142	28.37
Phase 1 Alternative	1350000	480,000	26,445	80.467	0.83	0.93	0.007	0.0246	0.0271	54.18
Phase 2	1160000	214,400	12,503	80.467	0.83	0.93	0.007	0.0116	0.0128	25.62
Phase 2 Alternative	1160000	310,400	17,542	80.467	0.83	0.93	0.007	0.0163	0.0180	35.94
LDA Traffic					SO2	SO2	SO2	SO2	SO2	SO2
	tonnage	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	24	3744	39.910	0.09	0.09	0.005	0.000320	0.000352	0.70
Phase 1 Trucks & Rail	720000	24	4992	39.910	0.09	0.09	0.005	0.000426	0.000470	0.94
Phase 1 Alternative	1350000	40	10400	39.910	0.09	0.09	0.008	0.000888	0.000979	1.96
Phase 2	1160000	80	20800	39.910	0.09	0.09	0.016	0.001776	0.001958	3.92
Phase 2 Alternative	1160000	80	20800	39.910	0.09	0.09	0.016	0.001776	0.001958	3.92
									tpa	
							SO2			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	0.012	0.0249	0.0274	54.9
						Phase 1 Trucks & Rail	0.012	0.0133	0.0147	29.3
						Phase 1 Alternative	0.015	0.0255	0.0281	56.1
						Phase 2	0.024	0.0134	0.0148	29.5
						Phase 2 Alternative	0.024	0.0181	0.0199	39.9

2020	Lbs/Year			Exhaust	Fugitive	Exhaust	Fugitive					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	1,266	2,825	24,003	556.9		529.8		476.0	1,600	1,784,870	178	103
Material Handling					180.3		27.2					
Raw Material Storage			1,103		1.4		0.3					
Barge												
Hopper Conveyor	17	201	56	15.8		14.5		15.8	9	285,099		
Unpaved Rd (Front Loader & Excavator)	405	2,483	1,047	17.6	171.1	16.2	17.1	17.6	20	1,923,733	-	-
Industrial Paved Rd (finished product)	118	137	524	1.1	67.8	1.1	16.9	0.4	1	115,774	-	-
Public Paved Rd	712	6,779	24,816	80.3	11,918.2	76.7	2,929.6	35.0	70	6,410,007	-	-
Bag Filters					363.2					30,642,803	1,224	341
Stack	3,064	22,606	11,175	493.6		493.6			359	16,219,622	-	-
Rail	11	494	1,398	9.6		9.3		9.6	2	258,341	21	7
Onsite										834,598	-	-
Total	**5,594**	**35,525**	**64,122**	**1,174.9**	**12,701.9**	**1,141.2**	**2,991.1**	**554.5**	**2,061**	**58,474,848**	**1,423**	**450**

2020 (lbs/day)				Exhaust	Fugitive	Exhaust	Fugitive					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	3.47	7.74	65.76	1.53	-	1.45	-	1.30	4.38	4,890.06	0.49	0.28
Material Handling	-	-	-	-	0.49	-	0.07	-	-	-	-	-
Raw Material Storage	-	-	3.02	-	0.00	-	0.00	-	-	-	-	-
Barge	-	-	-	-	-	-	-	-	-	-	-	-
Unpaved Rd (Forklift)	0.05	0.55	0.15	0.04	-	0.04	-	0.04	0.02	781.09	-	-
Unpaved Rd (Front Loader & Excavator)	1.11	6.80	2.87	0.05	0.47	0.04	0.05	0.05	0.05	5,271	-	-
Industrial Paved Rd (finished product)	0.32	0.37	1.44	0.00	0.19	0.00	0.05	0.00	0.00	317.19	-	-
Public Paved Rd	1.95	18.57	67.99	0.22	32.65	0.21	8.03	0.10	0.19	17,561.66	-	-
Bag Filters	-	-	-	-	0.99	-	-	-	-	83,952.88	3.35	0.93
Stack	8.39	61.93	30.62	1.35	-	1.35	-	-	0.98	44,437.32	-	-
Rail	0.03	1.35	3.83	0.03	-	0.03	-	0.03	0.01	707.78	0.06	0.02
Onsite	-	-	-	-	-	-	-	-	-	2,286.57	-	-
Total (lbs/day)	**15.33**	**97.33**	**175.68**	**3.22**	**34.80**	**3.13**	**8.19**	**1.52**	**5.65**	**160,205**	**3.90**	**1.23**
Total (tons/year)	**2.80**	**17.76**	**32.06**	**0.59**	**6.35**	**0.57**	**1.50**	**0.28**	**1.030**	**29,237**	**0.71**	**0.23**
					6.94		2.07					

2020 (tons/year)				Exhaust	Fugitive	Exhaust	Fugitive					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	0.63	1.41	12.00	0.28	-	0.26	-	0.24	0.80	892.44	0.09	0.05
Material Handling	-	-	-	-	0.09	-	0.01	-	-	-	-	-
Raw Material Storage	-	-	0.55	-	0.00	-	0.00	-	-	-	-	-
Barge	-	-	-	-	-	-	-	-	-	-	-	-
Unpaved Rd (Forklift)	0.01	0.10	0.03	0.01	-	0.01	-	0.01	0.00	142.55	-	-
Unpaved Rd (Front Loader & Excavator)	0.20	1.24	0.52	0.01	0.09	0.01	0.01	0.01	0.01	961.87	-	-
Industrial Paved Rd (finished product)	0.06	0.07	0.26	0.00	0.03	0.00	0.01	0.00	0.00	57.89	-	-
Public Paved Rd	0.36	3.39	12.41	0.04	5.96	0.04	1.46	0.02	0.04	3,205.00	-	-
Bag Filters	-	-	-	-	0.18	-	-	-	-	15,321.40	0.61	0.17

Stack	1.53	11.30	5.59	0.25	-	0.25	-	-	0.18	8,109.81	-	-
Rail	0.01	0.25	0.70	0.00	-	0.00	-	0.00	0.00	129.17	0.01	0.00
Onsite	-	-	-	-	-	-	-	-	-	417.30	-	-
Total (tons/year)	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03	29,237.42	0.71	0.23

Phase 1 Alternative			2020	2019	2018	2017	2016
			Lbs/Year				
Source	**ROG**	**CO**	**NOx**	**NOx**	**NOx**	**NOx**	**NOx**
Shipping			36,636				
Barge			-				
Unpaved Rd (Forklift)			395				
Unpaved Rd (Front Loader & Excavator)			659				
Industrial Paved Rd (finished product)			373				
Public Paved Rd			20,114				
Stack and Bag Filters							
Rail			4,476				
Total			62,654				
Tonnage			1,350,000				

	Lbs/Year											
Phase 1 Alternative	**2020**	**2020**	**2020**	**2020**	**2020**	**2020**	**2020**	**2020**	**2020**	**2018**	**2018**	**2018**
2020				**Exhaust**	**Fugitive**	**Exhaust**	**Fugitive**					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	1,972	4,312	36,636	849.9		809.0		726.6	2,440.2	2,762,910	270.3	154.5
Barge	-		-							-	-	-
Material Handling					291.8		44.2					
Raw Material Storage Piles					4.3		0.6					
Unpaved Rd (Forklift)	87	231	395	1.6	68.5	1.4	6.9	1.6	0.8	84,223	-	-
Unpaved Rd (Front Loader & Excavator)	221	2,110	659	18.9	90.7	17.3	9.1	18.9	12.6	1,208,321	-	-
Industrial Paved Rd (finished product)	40	98	373	0.8	66.7	0.8	12.9	0.7	0.7	75,260	-	-
Public Paved Rd	404	5,240	20,114	63.9	9,583.7	61.1	2,358.0	61.6	54.3	5,097,129	-	-
Stack and Bag Filters												
Rail	36	1,630	4,476	33.4		32.4		33.4	7.2	838,567	66.8	21.9
Onsite										?	-	-
Total	**2,760**	**13,620**	**62,654**	**969**	**10,106**	**922**	**2,432**	**843**	**2,516**	**10,066,409**	**337**	**176**

Vallejo Marine Terminal

2020 (lbs/day)				**Exhaust**	**Fugitive**	**Exhaust**	**Fugitive**					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	5.40	11.81	100.37	2.33	-	2.22	-	1.99	6.69	7,569.62	0.74	0.42
Barge	-	-	-	-	-	-	-	-	-	-	-	-
Material Handling	-	-	-	-	0.80	-	0.12	-	-	-	-	-
Raw Material Storage Piles	-	-	-	-	0.01	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)	0.24	0.63	1.08	0.00	0.19	0.00	0.02	0.00	0.00	230.75	-	-
Unpaved Rd (Front Loader & Excavator)	0.61	5.78	1.81	0.05	0.25	0.05	0.02	0.05	0.03	3,310.47	-	-
Industrial Paved Rd (finished product)	0.11	0.27	1.02	0.00	0.18	0.00	0.04	0.00	0.00	206.19	-	-
Public Paved Rd	1.11	14.36	55.11	0.18	26.26	0.17	6.46	0.17	0.15	13,964.74	-	-
Stack and Bag Filters	-	-	-	-	-	-	-	-	-	-	-	-
Rail	0.10	4.47	12.26	0.09	-	0.09	-	0.09	0.02	2,297.44	0.18	0.06
Onsite	-	-	-	-	-	-	-	-	-	?	-	-
Total (lbs/day)	**7.56**	**37.32**	**171.65**	**2.65**	**27.69**	**2.53**	**6.66**	**2.31**	**6.89**	**27,579.20**	**0.92**	**0.48**
Total (tons/year)	**1.38**	**6.81**	**31.33**	**0.48**	**5.05**	**0.46**	**1.22**	**0.42**	**1.26**	**5,033.20**	**0.17**	**0.09**
					5.54		**1.68**					
Orcem	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03	29,237.42	0.71	0.23
VMT+Orcem	**4.18**	**24.57**	**63.39**	**1.07**	**11.40**	**1.03**	**2.71**	**0.70**	**2.29**	**34,270.63**	**0.88**	**0.31**
					12.48		**3.74**					

2020 (tons/year)				**Exhaust**	**Fugitive**	**Exhaust**	**Fugitive**					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	0.99	2.16	18.32	0.42	-	0.40	-	0.36	1.22	1,381.45	0.14	0.08
Barge	-	-	-	-	-	-	-	-	-	-	-	-
Material Handling	-	-	-	-	0.15	-	0.02	-	-	-	-	-
Raw Material Storage Piles	-	-	-	-	0.00	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)	0.04	0.12	0.20	0.00	0.03	0.00	0.00	0.00	0.00	42.11	-	-
Unpaved Rd (Front Loader & Excavator)	0.11	1.05	0.33	0.01	0.05	0.01	0.00	0.01	0.01	604.16	-	-
Industrial Paved Rd (finished product)	0.02	0.05	0.19	0.00	0.03	0.00	0.01	0.00	0.00	37.63	-	-
Public Paved Rd	0.20	2.62	10.06	0.03	4.79	0.03	1.18	0.03	0.03	2,548.56	-	-
Stack and Bag Filters	-	-	-	-	-	-	-	-	-	-	-	-
Rail	0.02	0.81	2.24	0.02	-	0.02	-	0.02	0.00	419.28	0.03	0.01
Onsite	-	-	-	-	-	-	-	-	-	#VALUE!	-	-
Total (tons/year)	1.38	6.81	31.33	0.48	5.05	0.46	1.22	0.42	1.26	5,033.20	0.17	0.09
Orcem	2.80	17.76	32.06	0.59	6.35	0.57	1.50	0.28	1.03	29,237.42	0.71	0.23
VMT+Orcem	4.18	24.57	63.39	1.07	11.40	1.03	2.71	0.70	2.29	34,270.63	0.88	0.31

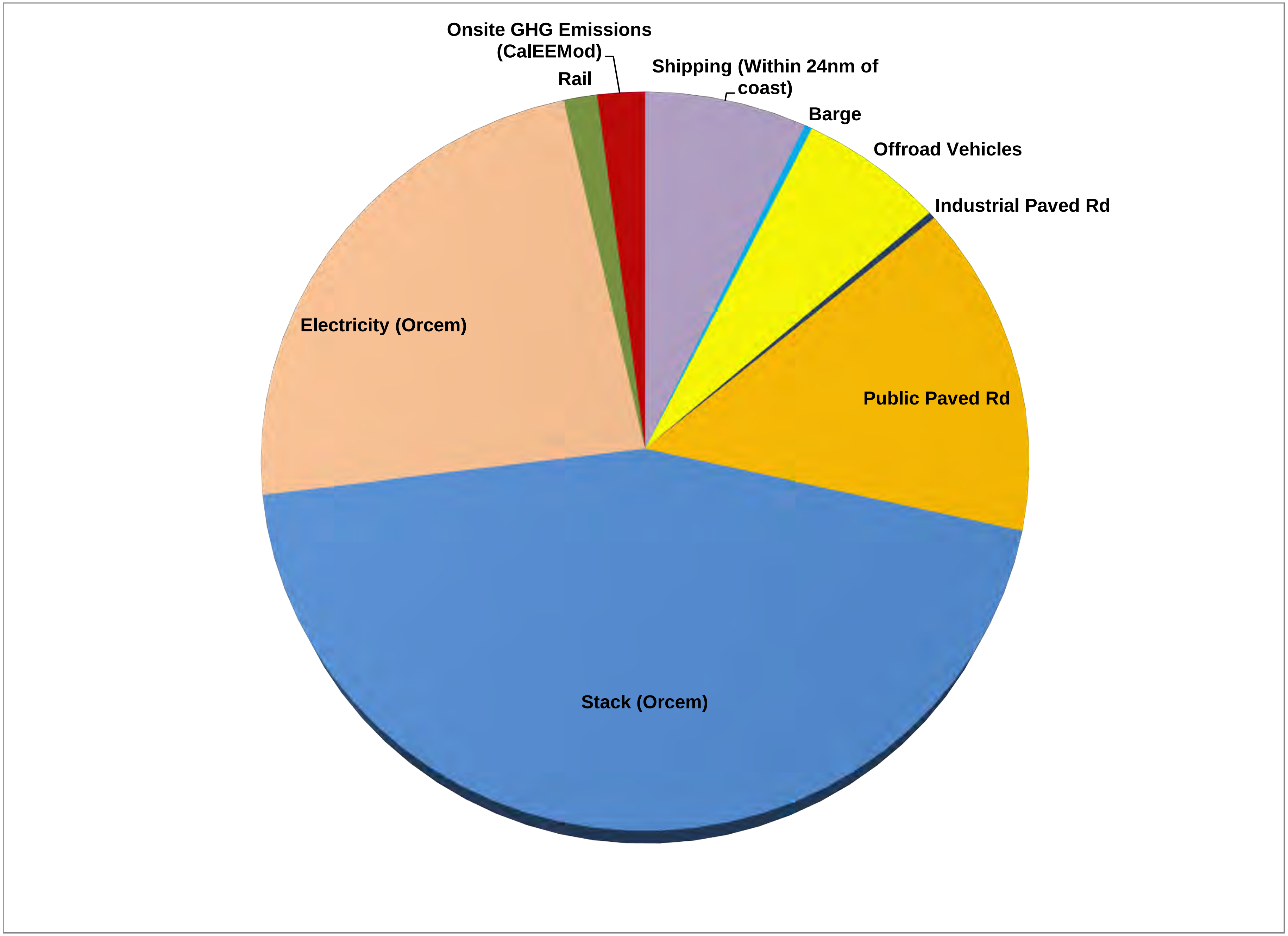
Phase 2 Alternative	**2018**	**2020**	**2018**	**2020**	**2020**	**2020**	**2020**	**2020**	**2018**	**2018**	**2018**	**2018**
2018	**Lbs/Year**			**Exhaust**	**Fugitive**	**Exhaust**	**Fugitive**					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	2,000	4,312	40,212	853.2		808.7		729.8	2,441.3	2,762,910	275.6	158.5
Barge	559	1,348	1,639	38.1		35.1		38.1	1.8	281,638	31.1	9.1
Material Handling					265.0		40.1					
Raw Material Storage Piles					8.5		1.3					
Unpaved Rd (Forklift)	50	251	382	1.9		1.8	6.9		0.8	84,223	-	-
Unpaved Rd (Front Loader & Excavator)	241	3,058	857	30.7	187.8	28.2	11.9	30.7	16.8	1,611,094	-	-
Industrial Paved Rd (finished product)	110	86	288	0.5	33.7	0.6	9.2	0.5	0.7	82,888	-	-
Public Paved Rd	362	4,150	13,658	40.9	6,208.8	43.5	1,620.4	40.9	41.5	3,667,377	-	-
Stack and Bag Filters												
Rail	32	1,443	3,963	29.6		20.1		29.6	6.3	742,566	59.2	15.7
Onsite										592,399	-	-
Total	**3,356**	**14,649**	**60,998**	**995**	**6,704**	**938**	**1,690**	**870**	**2,509**	**9,825,095**	**366**	**183**

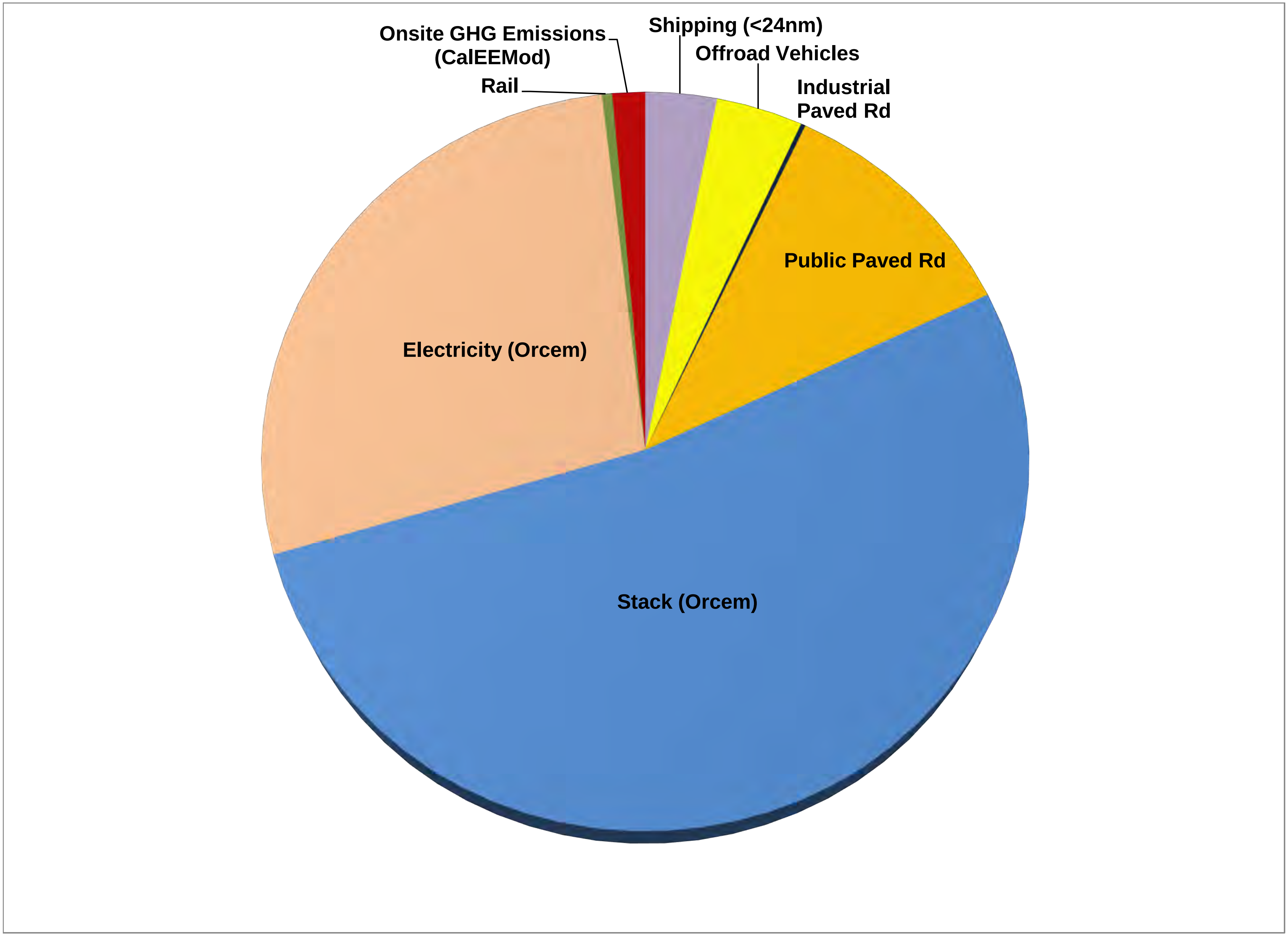
2018	**lbs/day**			**Exhaust**	**Fugitive**	**Exhaust**	**Fugitive**					
Source	**ROG**	**CO**	**NOx**	**PM10**	**PM10**	**PM2.5**	**PM2.5**	**DPM**	**SO2**	**CO2**	**CH4**	**N2O**
Shipping	5.48	11.81	110.17	2.34	-	2.22	-	2.00	6.69	7,569.62	0.76	0.43
Barge	1.53	3.69	4.49	0.10	-	0.10	-	0.10	0.00	771.61	0.09	0.02
Material Handling	-	-	-	-	0.73	-	0.11	-	-	-	-	-
Raw Material Storage Piles	-	-	-	-	0.02	-	0.00	-	-	-	-	-
Unpaved Rd (Forklift)	0.14	0.69	1.05	0.01	-	0.00	0.02	-	0.00	230.75	-	-
Unpaved Rd (Front Loader & Excavator)	0.66	8.38	2.35	0.08	0.51	0.08	0.03	0.08	0.05	4,413.96	-	-
Industrial Paved Rd (finished product)	0.30	0.24	0.79	0.00	0.09	0.00	0.03	0.00	0.00	227.09	-	-
Public Paved Rd	0.99	11.37	37.42	0.11	17.01	0.12	4.44	0.11	0.11	10,047.61	-	-
Stack and Bag Filters	-	-	-	-	-	-	-	-	-	-	-	-
Rail	0.09	3.95	10.86	0.08	-	0.06	-	0.08	0.02	2,034.43	0.16	0.04
Onsite	-	-	-	-	-	-	-	-	-	1,623.01	-	-
Total (lbs/day)	**9.19**	**40.13**	**167.12**	**2.73**	**18.37**	**2.57**	**4.63**	**2.38**	**6.87**	**26,918.07**	**1.00**	**0.50**
Total (tons/year)	**1.68**	**7.32**	**30.50**	**0.50**	**3.35**	**0.47**	**0.84**	**0.43**	**1.25**	**4,912.55**	**0.18**	**0.09**
					3.85		**1.31**					
Orcem	-	-	-	-	-	-	-	-	-	-	-	-
VMT+Orcem	**1.68**	**7.32**	**30.50**	**0.50**	**3.35**	**0.47**	**0.84**	**0.43**	**1.25**	**4,912.55**	**0.18**	**0.09**
					3.85		**1.31**					
					7.70		2.63					

APPENDIX GHG EMITS

Orcem California Inc., Mode 1 (Milestone 5)

		CO_2	
Scenarios	Operations	Exhaust	Units
Milestone 5	**Shipping (<24nm)**	1784870	lbs/year


Onsite GHG Emissions (CalEEMod)
Rail
Shipping (Within 24nm of coast)
Barge
Offroad Vehicles
Industrial Paved Rd
Electricity (Orcem)
Public Paved Rd
Stack (Orcem)


Onsite GHG Emissions (CalEEMod)
Shipping (<24nm)
Offroad Vehicles
Industrial Paved Rd
Rail
Public Paved Rd
Electricity (Orcem)
Stack (Orcem)

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported	
Production Capacity	100 tonnes per hour	
Hours Of Operation	7600 hour per year	
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)	
Shipment Load	40,0000 tonnes (19 times per year, every 2.7 weeks)	
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days
Duration of ship unloading	132	132 hrs (5.5 days)

Operations	Number Of Events / Year	Hours Of Operation (per year)	Mitigation Reduction (%)	Mitigation Required
Handymax Ship	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	19	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for milestone 5 manuverving = 2hrs x 19 = 38hrs.	**30%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Excavator)	Ongoing	Based on hours of operation of 24 hrs per day Monday - Saturday (7600 hrs per year as a worst-case). Front loader tonnage will be 14.6 mtonnes per trip. Number of trips per hour = (100 tonnes per hour / 14.6 tonnes) = 6.8 trips per hour	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Stack	Ongoing	Based on hours of operation of 24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case).	**N/A**	No Mitigation Apart From 50m Stack Height
Rail	100	Rail will replace trucks - as truck movements decrease rail movements increase. Total tonnage unchanged at 760000 tonnes / year. Worst-case assumes no decrease in trucks.	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in PM10 compared to Tier II EPA emission rates.

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600	per year			
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	132 hrs (5.5 days)		**CO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	26689	lbs/day

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	303	tonnes per hour Averaged Over 5.5 Days			
Duration of ship unloading	132	132 hrs (5.5 days)		**CO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	19	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	1784870	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.139**	CO2 at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**1.24**	CO2 at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CO2**
Slow	Marine Distillate (0.1% S)	**588.9939562**
Medium	Marine Distillate (0.1% S)	**645**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CO2**
Slow	Marine Distillate (0.1% S)	**588.9939562**
Medium	Marine Distillate (0.1% S)	**645**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CO2**
Medium	Marine Distillate (0.1% S)	**689.9929199**
		g/kW-HR

Boiler

	CO2	
Marine Distillate (0.1% S)	**921.49**	CARB (20080)
	g/kW-HR	

Tug

	CO2
Marine Distillate (0.1% S)	**690**
	g/kW-HR

		Emission Factors (g/kW-hr)						units?		units?		Raw (kg/kW-hr)		
	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20	CH4	CO2	N20	Sulfur Fuel
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	590.5319	0.001767	0.000596	0.195542	0.001767	0.090%
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	588.994	0.001765	0.000595	0.195032	0.001765	0.090%
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
									corrected units			**mistake on units**		
			http://www.arb.ca.gov/msei/categories.htm#ogv_category									**MMT x 907200 x 365 / MW-hrs**		

Dock		23.13	nm	23.13		AWN	73673	
GG		8.72		8.91			1700	
		1.5		1.5			1300	
Sea Buoy		7.4		6.1	Link not included			
		40.75	nm	39.64			76673	meters
	1.1508	46.8951					41.43703	nm
		75454.22						
		72454.22						

Out to Sea Buoy	33.35		33.54	nm
		1.1508	38.59783	statute miles
			62103.91	meters
			59103.91	meters - 3000 meters for maneuvering

			g/hp-hr							
	Area	Engine	NOx	PM	ROG	CO	SOx	CO2	Fuel	Sulfur
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172	184.1585	10.13513514
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172		10.13513514
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172		10.13513514
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172		10.13513514
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172		10.13513514
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172		10.13513514
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172		10.13513514
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172		10.13513514
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172		10.13513514
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172		10.13513514
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172		10.13513514
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172		10.13513514
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172		10.13513514
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172		10.13513514
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172		10.13513514
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172		10.13513514
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172		10.13513514
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172		10.13513514
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172		10.13513514
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172		10.13513514

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	143	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	137	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**8.900**	CH4 at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**2.136**	CH4 at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	POLA (2013)	
Tug Auxillary Engine	0.43	POLA (2013)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CH4**
Slow	Marine Distillate (0.1% S)	**0.07**
Medium	Marine Distillate (0.1% S)	**0.08**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CH4**
Slow	Marine Distillate (0.1% S)	**0.07**
Medium	Marine Distillate (0.1% S)	**0.08**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CH4**
Medium	Marine Distillate (0.1% S)	**0.09**
		g/kW-HR

Boiler

	CH4	
Marine Distillate (0.1% S)	**0.03**	*POLA (2013)*
	g/kW-HR	

Tug

	CH4
Marine Distillate (0.1% S)	**0.09**
	g/kW-HR

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Milestone 5**		
Visits Per Year	19	visits	
Hours Per Visit	143	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	137	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.42**	N2O at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**1.21**	N2O at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	POLA (2013)	
Tug Auxillary Engine	0.43	POLA (2013)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Main Engine

Transit

Engine Speed	**Fuel**	**N20**
Slow	Marine Distillate (0.1% S)	**0.029**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**N20**
Slow	Marine Distillate (0.1% S)	**0.029**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**N20**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Boiler

	N20	
Marine Distillate (0.1% S)	**0.075**	*POLA (2013)*
	g/kW-HR	

Tug

	N20
Marine Distillate (0.1% S)	**0.020**
	g/kW-HR

lbs to grams	453.59	0.002205
tonnes to tons	1.1023	

Mobile Hoppers / Conveyors

	Load Factor	hp	CO2
Hopper / Conveyor	0.40	201	184.0000
			g/(hp-hr)
Deterioration Rate	3.70E-07	g/(hr-hr^2)	
Age	5	years	(2015 Model)
Activity	1318	hours/year	Based on average age of 5 yrs
Fuel Correction Factor	0.852		
Emission Rate	12604.314	g/hr	

Activity Factor	1	ractional usage per hour

Emission Rate /Hopper / Conveyor PM10	3.501198	g/s
PM2.5/PM10 Ratio	0.92	
Emission Rate / Hopper / Conveyor PM2.5	3.221103	g/s

			Milestone 5
Sources	pm10 Emission Rate		Annual Emission Rate
Diesel Hopper 1	3.501198	g/s	4.56E-01
Diesel Hopper 2	3.501198	g/s	4.56E-01
Diesel Conveyor 1	3.501198	g/s	4.56E-01
Diesel Conveyor 2	3.501198	g/s	4.56E-01
Diesel Conveyor 3	3.501198	g/s	4.56E-01
Diesel Conveyor 4	3.501198	g/s	4.56E-01
Diesel Conveyor 5	3.501198	g/s	4.56E-01
Diesel Conveyor 6	3.501198	g/s	4.56E-01
Diesel Conveyor 7	3.501198	g/s	4.56E-01

	tonnage	hours of operation	PM10 g/hr	PM10 lbs/day	PM10 MTPA	PM10 tpa	PM10 lbs/yr	Annual Mean g/sec
milestone 1	120000	180	113438.828	6003.1828	20.4190	22.5079	45015.703	6.5E-01
milestone 2	240000	360	113438.828	6003.1828	40.8380	45.0157	90031.406	1.3E+00
milestone 3	360000	540	113438.828	6003.1828	61.2570	67.5236	135047.110	1.9E+00
milestone 4	480000	720	113438.828	6003.1828	81.6760	90.0314	180062.813	2.6E+00
milestone 5	760000	1140	113438.828	6003.1828	129.3203	142.5497	285099.454	4.1E+00

Unpaved Road - Industrial (Excavator in stockpile)

OFFROAD2011	Load Factor	HP	CO2
Excavator	0.38	175	530.6
			g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	3	years	(2013 Model)
Activity	1396	hours/year	Based on average age of 3 yrs
	(capped at 12,000 hrs)		
Fuel Correction Factor	1		
Emission Rate	35284.9	g/hr	

Activity Factor	0.25	Fractional usage per hour
Emission Rate / Excavator	2.45	g/s

Unpaved Road - Industrial (Front Loader stockpile to hopper)

OFFROAD2011	Load Factor	HP	CO2
Front Loader	0.36	369	530.78
CAT980K			g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	3	years	(2013 Model)
Historical Activity	957	hours/year	3 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	70508.82	g/hr	

Activity Factor	0.75	Fractional usage per hour

Emission Rate / Front Loader & Excavator	17.140	g/s	Both excavator and front loader

	24-HR Maximum	Annual
Sources (Slag Heap N)	12	26
Sources (Slag Heap S)	5	13

	24-HR Maximum	Annual	
Emission Rate / Front Loader & Excavator / Source (SHN)	1.42831	0.65922	g/s
Emission Rate / Front Loader & Excavator/ Source (SHS)	3.42794	1.31844	g/s

CO2	Front Loader - Gypsum Loading			
Emission Rate	70508.82	g/hr		
	19.5858	g/sec		Volume of front loader
Speed	16	km/hr	(10 miles/hr)	Density of Gypsum
Mass Emission per vehicle	4406.80	g/km		Tonnage / front loader
Gypsum Storage Sources	12			Tons / front loader
Spacing storage	0.010	km		Gypsum Tonnage
				3,522
Distance Travelled S3	0.240	km	2-way average	7,044
	Maximum Day		Annual	10,566
Trips / hour	1	two-way	0.22	14,088
				22,306
Emissions per hour S3	1057.63	g/hr	231.308	
Emissions per sec S3	0.29379	g/sec	0.06425	
	CO2 Maximum Day		CO2 Annual	
Emissions per sec S3/source	2.45E-02	g/sec	5.35E-03	

CO_2 Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SF)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO2_run		
						(gms/mile)		
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	2722.0	Annual	
						3322.2	Summer	
						3322.2	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					6239.0	annual
	Speed	5	miles/hr		7466.2	summer
		8.046	km/hr		6469.3	winter

HHDT Emission Factor					
		CO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	2064.40	3322.2	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	2064.40	3322.2	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	1691.44	2722.0	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	927.90	1493.2	EMFAC2011	
Idling T7 Single (Win)	g/vkt	804.00	1293.9	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	775.38	1247.8	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	1979.17	3185.0	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Win)	g/vkt	1969.87	3170.1	Sum	
Composite Emission Factor (Ann)	g/vkt	1622.74	2611.4	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	402.8	464.1	402.801
2020	Annual	LDA	DSL	Aggregated	10	560.5	0.0	560.494
2020	Summer	LDA	GAS	Aggregated	10	899.7	464.1	899.659
2020	Summer	LDA	DSL	Aggregated	10	427.8	0.0	427.777
2020	Winter	LDA	GAS	Aggregated	10	799.8	464.1	799.790
2020	Winter	LDA	DSL	Aggregated	10	427.8	0.0	427.777

LDA Idling Calculation								
2020	Annual	LDA	GAS	Aggregated		CO2_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	882.8	1078.3	1206.6
	8.046	km/hr	DSL	Aggregated	Aggregated	672.8	463.5	463.5

		CO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	865.0	1392.0	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	348.3	560.5	EMFAC2011	
Tailpipe Gas LDA (summer)	g/vkt	1173.7	1888.9	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (summer)	g/vkt	265.8	427.8	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	548.6	882.8	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	418.1	672.8	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.8	1206.6	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.0	463.5	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	841.3	1353.8	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	353.5	568.9	sum	
Composite Emission Factor Gas (summer)	g/vkt	1141.9	1837.7	sum	
Composite Emission Factor DSL (summer)	g/vkt	267.5	430.5	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	839.4	1350.8	sum	Based on 0.38% Diesel
Composite Emission Factor (summer)	g/vkt	1138.6	1832.4	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining volume sources

		HHDT		LDA	
		CO2		CO2	
Spacing of point sources		9	m	9	
AERMOD Point Sources		83		83	
Distance Travelled Onsite		0.755	km	0.755	
		0.469	miles	0.469	
Emission Factor/vehicle		1494.270	g/hr	859.661	based on summer
Emission Factor/vehicle		1225.169	g/hr	633.757	based on annual
Emission Factor/vehicle		0.41508	g/sec	3.82072	includes all trips/shift
Emission Factor/vehicle		0.34032	g/sec	2.81670	includes all trips/shift
Emission Factor/vehicle/AERMOD Source		5.00E-03	g/sec	4.60E-02	based on summer
Emission Factor/vehicle/AERMOD Source		4.10E-03	g/sec	3.39E-02	based on annual

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	CO2 Emission Factor	CO2 Vehicles / hr	CO2 Emission Factor	CO2 Including LDA
1	5.00E-03	5	2.43E-02	7.036E-02
2	5.00E-03	6	3.24E-02	3.243E-02
3	5.00E-03	10	4.86E-02	4.865E-02
4	5.00E-03	11	5.68E-02	5.676E-02
5	5.00E-03	13	6.49E-02	6.486E-02
6	5.00E-03	13	6.49E-02	6.486E-02
7	5.00E-03	13	6.49E-02	6.486E-02
8	5.00E-03	13	6.49E-02	6.486E-02
9	5.00E-03	13	6.49E-02	1.569E-01
10	5.00E-03	13	6.49E-02	6.486E-02
11	5.00E-03	15	7.49E-02	7.487E-02
12	5.00E-03	13	6.49E-02	6.486E-02
13	5.00E-03	11	5.68E-02	5.676E-02
14	5.00E-03	7	3.43E-02	3.433E-02
15	5.00E-03	5	2.43E-02	2.432E-02
16	5.00E-03	0	0.00E+00	0.000E+00
17	5.00E-03	0	0.00E+00	4.603E-02
18	5.00E-03	0	0.00E+00	0.000E+00
19	5.00E-03	0	0.00E+00	0.000E+00
20	5.00E-03	0	0.00E+00	0.000E+00

21	5.00E-03	0	0.00E+00	0.000E+00
22	5.00E-03	0	0.00E+00	0.000E+00
23	5.00E-03	2	8.11E-03	8.108E-03
24	5.00E-03	3	1.62E-02	1.622E-02

Total HHDT/Day	166.1
	including deliveries (2 per day, 10am, 2pm)

Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours

	CO2 Emission Factor	Milestone5 Vehicles / hr	CO2 Emission Factor	24-Hour Maximum CO2 Including LDA
1	5.00E-03	5	2.43E-02	7.04E-02
2	5.00E-03	6	3.24E-02	3.24E-02
3	5.00E-03	10	4.86E-02	4.86E-02
4	5.00E-03	11	5.68E-02	5.68E-02
5	5.00E-03	13	6.49E-02	6.49E-02
6	5.00E-03	13	6.49E-02	6.49E-02
7	5.00E-03	13	6.49E-02	6.49E-02
8	5.00E-03	19	9.49E-02	9.49E-02
9	5.00E-03	19	9.49E-02	1.87E-01
10	5.00E-03	19	9.49E-02	9.49E-02
11	5.00E-03	21	1.05E-01	1.05E-01
12	5.00E-03	19	9.49E-02	9.49E-02
13	5.00E-03	17	8.68E-02	8.68E-02
14	5.00E-03	13	6.43E-02	6.43E-02
15	5.00E-03	11	5.43E-02	5.43E-02
16	5.00E-03	6	3.00E-02	3.00E-02
17	5.00E-03	6	3.00E-02	7.60E-02
18	5.00E-03	0	0.00E+00	0.00E+00
19	5.00E-03	0	0.00E+00	0.00E+00
20	5.00E-03	0	0.00E+00	0.00E+00
21	5.00E-03	0	0.00E+00	0.00E+00
22	5.00E-03	0	0.00E+00	0.00E+00
23	5.00E-03	2	8.11E-03	8.11E-03
24	5.00E-03	3	1.62E-02	1.62E-02

Total HHDT/Day	226.1
	including deliveries (2 per day, 10am, 2pm)

Annual Average Diurnal Emission Factors Based On Truck Movement Breakdown

Including Rail Loading - 16 wagons in 10 hours (100 events per year)

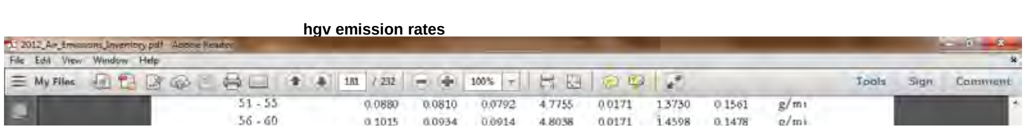
Normal Loading	6600	Hrs
Rail Loading	1000	Hrs
Total	7600	Hrs

	CO2 Emission Factor	Milestone5 Vehicles / hr	CO2 Emission Factor	CO2 Including LDA
1	4.10E-03	4.86	1.99E-02	5.39E-02
2	4.10E-03	6.49	2.66E-02	2.66E-02
3	4.10E-03	9.73	3.99E-02	3.99E-02
4	4.10E-03	11.35	4.65E-02	4.65E-02
5	4.10E-03	12.97	5.32E-02	5.32E-02
6	4.10E-03	12.97	5.32E-02	5.32E-02
7	4.10E-03	12.97	5.32E-02	5.32E-02
8	4.10E-03	13.76	5.64E-02	5.64E-02
9	4.10E-03	13.76	5.64E-02	1.24E-01
10	4.10E-03	13.76	5.64E-02	5.64E-02
11	4.10E-03	15.76	6.46E-02	6.46E-02
12	4.10E-03	13.76	5.64E-02	5.64E-02
13	4.10E-03	12.14	4.98E-02	4.98E-02
14	4.10E-03	7.65	3.14E-02	3.14E-02
15	4.10E-03	5.65	2.32E-02	2.32E-02
16	4.10E-03	0.79	3.24E-03	3.24E-03
17	4.10E-03	0.79	3.24E-03	3.72E-02
18	4.10E-03	0.00	0.00E+00	0.00E+00
19	4.10E-03	0.00	0.00E+00	0.00E+00
20	4.10E-03	0.00	0.00E+00	0.00E+00
21	4.10E-03	0.00	0.00E+00	0.00E+00
22	4.10E-03	0.00	0.00E+00	0.00E+00
23	4.10E-03	1.62	6.65E-03	6.65E-03
24	4.10E-03	3.24	1.33E-02	1.33E-02

Total HHDT/Day	174.0
	including deliveries (2 per day, 10am, 2pm)

Annual HGV Traffic					Maximum Day CO2	Annual Mean CO2	CO2	CO2	CO2	CO2
	tonnage		trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1	120000		8481	0.755	1494.270	1225.169	745.071	10.3910	11.4540	22907.93
milestone 2	240000		14578	0.755	1494.270	1225.169	745.071	17.8611	19.6883	39376.55
milestone 3	360000		20676	0.755	1494.270	1225.169	745.071	25.3313	27.9226	55845.28
milestone 4	480000		22723	0.755	1494.270	1225.169	745.071	27.8397	30.6877	61375.35
milestone 5	760000		32534	0.755	1494.270	1225.169	745.071	39.8600	43.9377	87875.37
					Maximum Day	Annual Mean				
LDA Traffic					CO2	CO2	CO2	CO2	CO2	CO2
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
milestone 1		14	2184	0.755	859.661	633.757	26.538	1.3841	1.5257	3051.44
milestone 2		24	4992	0.755	859.661	633.757	45.493	3.1637	3.4874	6974.73
milestone 3		24	6240	0.755	859.661	633.757	45.493	3.9546	4.3592	8718.41
milestone 4		64	16640	0.755	859.661	633.757	121.315	10.5457	11.6245	23249.09
milestone 5		64	19968	0.755	859.661	633.757	121.315	12.6549	13.9495	27898.91
									tpa	
							CO2			
							lbs/day	MTPA	tpa	lbs/year
					Combined	milestone 1	771.61	11.7751	12.9797	25959.4
						milestone 2	790.56	21.0248	23.1756	46351.3
						milestone 3	790.56	29.2859	32.2818	64563.7
						milestone 4	866.39	38.3854	42.3122	84624.4
						milestone 5	866.39	52.5149	57.8871	115774.3

hgv emission rates



61 - 65	0.1174	0.1080	0.1057	4.9570	0.0171	1.5716	0.1451	g/mi
66 - 70	0.1357	0.1248	0.1221	5.2527	0.0171	1.7085	0.1481	g/mi

Table 7.7: Speed-Specific GHG Emission Factors, g/hr and g/mi

Speed Range (mph)	CO_2	N_2O	CH_4	Units
0 (Idle)	4,933	0.1592	0.2536	g/hr
1 - 5	4,077	0.0588	0.1725	g/mi
6 - 10	3,368	0.0588	0.1004	g/mi
11 - 15	2,765	0.0588	0.0510	g/mi
16 - 20	2,181	0.0588	0.0219	g/mi
21 - 25	2,035	0.0588	0.0191	g/mi
26 - 30	1,911	0.0588	0.0166	g/mi
31 - 35	1,807	0.0588	0.0144	g/mi
36 - 40	1,725	0.0588	0.0126	g/mi
41 - 45	1,663	0.0588	0.0111	g/mi
46 - 50	1,623	0.0588	0.0100	g/mi
51 - 55	1,605	0.0588	0.0092	g/mi
56 - 60	1,607	0.0588	0.0087	g/mi
61 - 65	1,631	0.0588	0.0085	g/mi
66 - 70	1,676	0.0588	0.0087	g/mi

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor CO2

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SF)							
Calendar Year:	2020							
Season:	Annual							
Speed:	20	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO2_run		
						(gms/mile)		
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	2004.2	Annual	
						2152.0	Summer	
						2152.0	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					6239.0	annual
	Speed	5	miles/hr		7466.2	summer
		8.046	km/hr		6469.3	winter

HHDT Emission Factor					
		CO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	1245.38	2004.15	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	1337.23	2151.96	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	1337.23	2151.96	EMFAC2011	
Idling T7 Single (ann)	g/vkt	775.38	1247.80	EMFAC2011	
Idling T7 Single (summer)	g/vkt	927.90	1493.23	EMFAC2011	
Idling T7 Single (winter)	g/vkt	804.00	1293.85	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	1210.13	1947.43	Sum	
Composite Emission Factor (summer)	g/vkt	1306.53	2102.56	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (winter)	g/vkt	1297.24	2087.60	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	20	402.8		402.8
2020	Annual	LDA	DSL	Aggregated	20	378.2		378.2
2020	Summer	LDA	GAS	Aggregated	20	536.5		536.5
2020	Summer	LDA	DSL	Aggregated	20	337.8		337.8
2020	Winter	LDA	GAS	Aggregated	20	492.0		492.0
2020	Winter	LDA	DSL	Aggregated	20	337.8		337.8

Idling Calculation							
2020	Annual	LDA	GAS	Aggregated	CO2		
					Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	882.8	1078.3	1206.6
	8.046	km/hr	DSL	Aggregated	672.8	463.5	463.5

		CO2	g/mile		Comments
Tailpipe Gas LDA (ann)	g/vkt	250.3	402.8	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	235.0	378.2	EMFAC2011	No start emissions - onsite only
Tailpipe Gas LDA (summer)	g/vkt	333.4	536.5	EMFAC2011	
Tailpipe DSL LDA (summer)	g/vkt	209.9	337.8	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	548.6	882.8	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	418.1	672.8	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.8	1206.6	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.0	463.5	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	272.7	438.8	sum	
Composite Emission Factor DSL (ann)	g/vkt	248.7	400.3	sum	Assumption - Based On Idling for 7.5% of time

Composite Emission Factor Gas (summer)	g/vkt	364.6	**586.8**	sum	**Assumption - Based On idling for [illegible]% of time**
Composite Emission Factor DSL (summer)	g/vkt	215.8	**347.2**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**272.6**	**438.7**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (summer)	g/vkt	**364.1**	**585.9**	sum	

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT CO2		LDA CO2	
Spacing of point sources		**14**	**m**	**14**	2-way roadway
AERMOD Point Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**940.7**	**g/hr**	**262.1**	**based on Summer**
Emission Factor/vehicle		**871.3**	**g/hr**	**196.3**	**based on Annual**
Emission Factor/vehicle		**2.61E-01**	**g/sec**	**1.16E+00**	**includes shift trips/day**
Emission Factor/vehicle		**2.42E-01**	**g/sec**	**8.72E-01**	**includes shift trips/day**
Emission Factor/vehicle/AERMOD Source		**5.12E-03**	**g/sec**	**2.28E-02**	**based on summer**
Emission Factor/vehicle/AERMOD Source		**4.75E-03**	**g/sec**	**1.71E-02**	**based on annual**

Staff Numbers	Per Shift		Per Day
milestone 1	7	1 shift	14
milestone 2	12	1 shift	24
milestone 3	12	1 shift	24
milestone 4	16	2 shift	64
milestone 5	16	2 shift	64

Diurnal Emission Factors Based On Truck Movement Breakdown

2 shift changes assumed for milestone 5

Milestone 5

	Maximum Day	Annual		Maximum Day	Maximum Day
Weekday Hours	**Milestone5 Emission Factor**	**Milestone5 Emission Factor**	**Milestone5 Trucks**	**Milestone5 Emission Factor**	**Milestone5 Including LDA**
1	5.12E-03	4.75E-03	4.86	4.98E-02	7.27E-02
2	5.12E-03	4.75E-03	6.49	6.65E-02	6.65E-02
3	5.12E-03	4.75E-03	9.73	9.97E-02	9.97E-02
4	5.12E-03	4.75E-03	11.35	1.16E-01	1.16E-01
5	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
6	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
7	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
8	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
9	5.12E-03	4.75E-03	12.97	1.33E-01	1.79E-01
10	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
11	5.12E-03	4.75E-03	14.97	1.53E-01	1.53E-01
12	5.12E-03	4.75E-03	12.97	1.33E-01	1.33E-01
13	5.12E-03	4.75E-03	11.35	1.16E-01	1.16E-01
14	5.12E-03	4.75E-03	6.86	7.03E-02	7.03E-02
15	5.12E-03	4.75E-03	4.86	4.98E-02	4.98E-02
16	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
17	5.12E-03	4.75E-03	0.00	0.00E+00	2.28E-02
18	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
19	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
20	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
21	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
22	5.12E-03	4.75E-03	0.00	0.00E+00	0.00E+00
23	5.12E-03	4.75E-03	1.62	1.66E-02	1.66E-02
24	5.12E-03	4.75E-03	3.24	3.32E-02	3.32E-02
			166.1		

including deliveries (2 per day, 10am, 2pm)

	To junct of Sonoma Blvd	Deliveries	Staff
Distance Travelled	0.720	80.47	39.91
Units	km	km	km
Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual HGV Traffic	tonnage		trucks per year	distance travelled (km)	Maximum Day CO2 g/trip	Annual Mean CO2 g/trip	CO2 lbs/day	CO2 MTPA	CO2 tpa	CO2 lbs/year
milestone 1	120000		8481	80.47	84282	83968	30874.1	712.2	785.0	1570015.3
milestone 2	240000		14578	80.47	84282	83968	30874.1	1224.1	1349.4	2698706.2
milestone 3	360000		20676	80.47	84282	83968	30874.1	1736.1	1913.7	3827405.2
milestone 4	480000		22723	80.47	84282	83968	30874.1	1908.0	2103.2	4206412.9
milestone 5	760000		32534	80.47	84282	83968	30874.1	2731.8	3011.3	6022615.3
LDA Traffic		**movements/day**	**movement per year**	**distance travelled (km)**	**CO2 g/trip**	**CO2 g/trip**	**CO2 lbs/day**	**CO2 MTPA**	**CO2 tpa**	**CO2 lbs/year**
milestone 1		14	2184	39.91	9505	8800	293.4	19.2	21.2	42371.0
milestone 2		24	4992	39.91	9505	8800	503.0	43.9	48.4	96847.9
milestone 3		24	6240	39.91	9505	8800	503.0	54.9	60.5	121059.9
milestone 4		64	16640	39.91	9505	8800	1341.3	146.4	161.4	322826.5
milestone 5		64	19968	39.91	9505	8800	1341.3	175.7	193.7	387391.8
							CO2 lbs/day	**MTPA**	**tpa tpa**	**lbs/year**
				Combined		milestone 1	31167.5	731.4	806.2	1612386
						milestone 2	31377.1	1268.1	1397.8	2795554
						milestone 3	31377.1	1791.0	1974.2	3948465
						milestone 4	32215.4	2054.4	2264.6	4529239
						milestone 5	32215.4	2907.6	3205.0	6410007

2020		HHDT	LDA	
Emission factor, E (annual)	g/VKT	1043.51	220.50	Sonoma Blvd
Emission factor, E (summer)	g/VKT	1047.41	238.16	Sonoma Blvd

		Length	Width	Area
SONOM_S	Sonoma South of Lemon	735	24	17640
SONOM_N	Sonoma North of Lemon	525	24	12600
LEMON_E	Lemon East of Sonoma	820	16	13120
SONOM_S2	Sonoma South of Magazine	698	24	16752

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 7% O2, Dry	15,174	1.34	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**73**	ppm at 3% O2	0.158	ratio
NOX Emission Level	56.7	ppm at 7% O2		

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2) (73 PPM)	**106.96**	2.00	3.142	381.05	1.71	1.34	15174	1.62	1623	0.451	3.5781	85.87
SO2	2.78	2.00	3.142	381.05	1.71	1.34	15174	0	42	0.012	0.0928	2.23
CO	175.84	2.00	3.142	381.05	1.71	1.34	15174	2.67	2668	0.741	5.8824	141.18
PM10	15.91	2.00	3.142	381.05	1.71	1.34	15174	0.24	241	0.067	0.5322	12.77
PM2.5	14.32	2.00	3.142	381.05	1.71	1.34	15174	0.22	217	0.060	0.4790	11.50
TOC	23.03	2.00	3.142	381.05	1.71	1.34	15174	0.35	349	0.097	0.7703	18.49
CO2	120523	2.00	3.142	381.05	1.71	1.34	15174	1829	1828880	**508**	4032	96767
CH4	4.8146	2.00	3.142	381.05	1.71	1.34	15174	0.07	73	**0.020**	0.1611	3.87
N2O	1.3397	2.00	3.142	381.05	1.71	1.34	15174	0.02	20	**0.006**	0.0448	1.08
Actual	**(mg/Nm3)**	**Diameter (m)**	**(m2)**	**(K)**	**(m/s)**	**(m/s)**	**(m3/hr)**	**Rate (kg/hr)**	**g/hr**	**g/s**	**g/kWh**	
NOX (as NO2)	16.92	3.00	7.069	381.05	3.36	3.29	83821	1.42	1418	0.394	0.0760	
SO2	0.44	3.00	7.069	381.05	3.36	3.29	83821	0	37	0.010	0.0020	
CO	27.82	3.00	7.069	381.05	3.36	3.29	83821	2.33	2332	0.648	0.1253	
PM	2.52	3.00	7.069	381.05	3.36	3.29	83821	0.21	211	0.059	0.0113	
TOC	3.64	3.00	7.069	381.05	3.36	3.29	83821	0.31	305	0.085	0.0164	

Normal Operation	Volume Flow (m3/hr)	Velocity (m/s)		
298K, 7% O2, Dry	15,174	1.34	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**73**	ppm at 3% O2	0.158	ratio
NOX Emission Level	56.7	ppm at 7% O2		

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2) (73 PPM)	**106.96**	2.00	3.142	381.05	1.71	1.34	15174	1.62	1623	0.451	3.5781	85.87
SO2	2.78	2.00	3.142	381.05	1.71	1.34	15174	0	42	0.012	0.0928	2.23
CO	175.84	2.00	3.142	381.05	1.71	1.34	15174	2.67	2668	0.741	5.8824	141.18
PM10	15.91	2.00	3.142	381.05	1.71	1.34	15174	0.24	241	0.067	0.5322	12.77
PM2.5	14.32	2.00	3.142	381.05	1.71	1.34	15174	0.22	217	0.060	0.4790	11.50
TOC	23.03	2.00	3.142	381.05	1.71	1.34	15174	0.35	349	0.097	0.7703	18.49
CO2	120523	2.00	3.142	381.05	1.71	1.34	15174	1829	1828880	**508**	4032	96767
CH4	4.8146	2.00	3.142	381.05	1.71	1.34	15174	0.07	73	**0.020**	0.1611	3.87
N2O	1.3397	2.00	3.142	381.05	1.71	1.34	15174	0.02	20	**0.006**	0.0448	1.08
Actual	**(mg/Nm3)**	**Diameter (m)**	**(m2)**	**(K)**	**(m/s)**	**(m/s)**	**(m3/hr)**	**Rate (kg/hr)**	**g/hr**	**g/s**	**g/kWh**	
NOX (as NO2)	16.92	3.00	7.069	381.05	3.36	3.29	83821	1.42	1418	0.394	0.0760	
SO2	0.44	3.00	7.069	381.05	3.36	3.29	83821	0	37	0.010	0.0020	
CO	27.82	3.00	7.069	381.05	3.36	3.29	83821	2.33	2332	0.648	0.1253	
PM	2.52	3.00	7.069	381.05	3.36	3.29	83821	0.21	211	0.059	0.0113	
TOC	3.64	3.00	7.069	381.05	3.36	3.29	83821	0.31	305	0.085	0.0164	

Normal Operation	Volume Flow	Velocity		
	(m3/hr)	(m/s)		
298K, 7% O2, Dry	15,174	1.34	mass emission calculation	
Actual	83,821	7.41	**model input**	
NOX Emission Level	**73**	ppm at 3% O2	0.158	ratio
NOX Emission Level	56.7	ppm at 7% O2		

Normalised To 298K	Conc. (mg/Nm3)	Duct Diameter (m)	surface area (m2)	stack temp (K)	velocity (m/s)	Velocity @ ntp (m/s)	Vol flow @ ntp (m3/hr)	Mass Emission Rate (kg/hr)	Emission g/hr	Emission g/s	Emission lb/hr	Emission lb/day
NOX (as NO2) (73 PPM)	**106.96**	2.00	3.142	381.05	1.71	1.34	15174	1.62	1623	0.451	3.5781	85.87
SO2	2.78	2.00	3.142	381.05	1.71	1.34	15174	0	42	0.012	0.0928	2.23
CO	175.84	2.00	3.142	381.05	1.71	1.34	15174	2.67	2668	0.741	5.8824	141.18
PM10	15.91	2.00	3.142	381.05	1.71	1.34	15174	0.24	241	0.067	0.5322	12.77
PM2.5	14.32	2.00	3.142	381.05	1.71	1.34	15174	0.22	217	0.060	0.4790	11.50
TOC	23.03	2.00	3.142	381.05	1.71	1.34	15174	0.35	349	0.097	0.7703	18.49
CO2	120523	2.00	3.142	381.05	1.71	1.34	15174	1829	1828880	**508**	4032	96767
CH4	4.8146	2.00	3.142	381.05	1.71	1.34	15174	0.07	73	**0.020**	0.1611	3.87
N2O	1.3397	2.00	3.142	381.05	1.71	1.34	15174	0.02	20	**0.006**	0.0448	1.08
Actual	**(mg/Nm3)**	**Diameter (m)**	**(m2)**	**(K)**	**(m/s)**	**(m/s)**	**(m3/hr)**	**Rate (kg/hr)**	**g/hr**	**g/s**	**g/kWh**	
NOX (as NO2)	16.92	3.00	7.069	381.05	3.36	3.29	83821	1.42	1418	0.394	0.0760	
SO2	0.44	3.00	7.069	381.05	3.36	3.29	83821	0	37	0.010	0.0020	
CO	27.82	3.00	7.069	381.05	3.36	3.29	83821	2.33	2332	0.648	0.1253	
PM	2.52	3.00	7.069	381.05	3.36	3.29	83821	0.21	211	0.059	0.0113	
TOC	3.64	3.00	7.069	381.05	3.36	3.29	83821	0.31	305	0.085	0.0164	

Switcher Movements When Empty

Switcher Notch Position	% of full power	BHP	Duty Cylce % (based on Davis Yard Trim operations)	BHP Weighted	Switcher CO2 (g/hr)
Idle	0.81%	5.67	44.20%	2.51	1699.16
1	4.76%	33.32	5.00%	1.67	1129.55
2	14.18%	99.26	25.00%	24.82	16824.57
3	27.80%	194.6	2.30%	4.48	3034.59
4	42.07%	294.49	21.50%	63.32	42927.81
5	57.30%	401.1	1.50%	6.02	4079.19
6	72.51%	507.57	1.60%	8.12	5506.12
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**1.00**				

Switcher Movements When Empty

Switcher Notch Position	% of full power	BHP	Duty Cylce % (based on Davis Yard Trim operations)	BHP Weighted	Switcher CH4 (g/hr)
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**1.00**				

Switcher Movements When Empty

Switcher	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			%	Weighted	N2O (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.04
1	4.76%	33.32	5.00%	1.67	0.03
2	14.18%	99.26	25.00%	24.82	0.42
3	27.80%	194.6	2.30%	4.48	0.08
4	42.07%	294.49	21.50%	63.32	1.08
5	57.30%	401.1	1.50%	6.02	0.10
6	72.51%	507.57	1.60%	8.12	0.14
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**1.00**				

ORECEM CALIFORNIA INC

Solano-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	60.91	1000sqft	1.40	60,910.00	20

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 56

Climate Zone 4 **Operational Year** 2016

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Employee Numbers

Land Use Change -

Construction Off-road Equipment Mitigation -

Operational Off-Road Equipment - SITE SPECIFIC DATA

Energy Use -

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	250.00
tblArchitecturalCoating	EF_Residential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Residential_Interior	100.00	250.00

tblLandUse	Population	0.00	20.00
tblProjectCharacteristics	OperationalYear	2014	2016

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	MT/yr					
Area		1.0900e-003	1.0900e-003	0.0000	0.0000	1.1500e-003
Energy		262.1680	262.1680	9.3800e-003	3.3100e-003	263.3899
Waste		0.0000	32.4786	1.9194	0.0000	72.7865
Water		24.8704	29.3391	0.4600	0.0111	42.4257
Total						

CO2E

1.1500e-003

167.7374

95.6525

2.3 Vegetation

Vegetation

	CO2e
Category	MT

Vegetation Land Change	0.0000
Total	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: Y

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated												167.0941	167.0941	7.5600e-003	1.5600e-003	167.7374
Electricity Unmitigated												167.0941	167.0941	7.5600e-003	1.5600e-003	167.7374
NaturalGas Mitigated												95.0739	95.0739	1.8200e-003	1.7400e-003	95.6525
NaturalGas Unmitigated												95.0739	95.0739	1.8200e-003	1.7400e-003	95.6525

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	1.78162e+006												95.0739	95.0739	1.8200e-003	1.7400e-003	95.6525
Total													**95.0739**	**95.0739**	**1.8200e-003**	**1.7400e-003**	**95.6525**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	1.78162e+006												95.0739	95.0739	1.8200e-003	1.7400e-003	95.6525
Total													**95.0739**	**95.0739**	**1.8200e-003**	**1.7400e-003**	**95.6525**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	574381	167.0941	7.5600e-003	1.5600e-003	167.7374

Total		167.0941	7.5600e-003	1.5600e-003	167.7374

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	574381	167.0941	7.5600e-003	1.5600e-003	167.7374
Total		**167.0941**	**7.5600e-003**	**1.5600e-003**	**167.7374**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated												1.0900e-003	1.0900e-003	0.0000	0.0000	1.1500e-003
Unmitigated												1.0900e-003	1.0900e-003	0.0000	0.0000	1.1500e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating												0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products												0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping												1.0900e-003	1.0900e-003	0.0000	0.0000	1.1500e-003
Total												**1.0900e-003**	**1.0900e-003**	**0.0000**	**0.0000**	**1.1500e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating												0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products												0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping												1.0900e-003	1.0900e-003	0.0000	0.0000	1.1500e-003
Total												**1.0900e-003**	**1.0900e-003**	**0.0000**	**0.0000**	**1.1500e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	29.3391	0.4600	0.0111	42.4257
Unmitigated	29.3391	0.4601	0.0111	42.4329

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Manufacturing	14.0854 / 2.65	29.3391	0.4600	0.0111	42.4257
Total		**29.3391**	**0.4600**	**0.0111**	**42.4257**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			

Mitigated	32.4786	1.9194	0.0000	72.7865
Unmitigated	32.4786	1.9194	0.0000	72.7865

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Manufacturing	160	32.4786	1.9194	0.0000	72.7865
Total		**32.4786**	**1.9194**	**0.0000**	**72.7865**

Gas Consumption	GGBS	Clinker
kWh/t	94.2	50
MMBTU	0.32	0.17

Mode 1	Year 1	Year 2	Year 3	Year 4	Year 5
Tonnes Produced	115052	230103	345155	460206	728660
Gas Used (MWh)	10838	21676	32514	43351	68640
Gas Used (MMBTU)	36980	73961	110941	147921	234209

Mode 2	Year 1	Year 2	Year 3	Year 4	Year 5
Tonnes Produced	133333	266667	400000	533333	844444
Gas Used (kWh)	6667	13333	20000	26667	42222
Gas Used (MMBTU)	22748	45495	68243	90990	144068

Electricity Consumption	**GGBS**	**Clinker**			
kWh/t	**53**	**44**			
Mode 1	Year 1	Year 2	Year 3	Year 4	Year 5
Tonnes Produced	115052	230103	345155	460206	728660
Electricity Used (MWh)	6109	12218	18328	24437	38692
Mode 2	Year 1	Year 2	Year 3	Year 4	Year 5
Tonnes Produced	133333	266667	400000	533333	844444
Electricity Used (MWh)	5867	11733	17600	23467	37156
Hours Per Year	Year 1	Year 2	Year 3	Year 4	Year 5
Mode 1	1598	3196	4794	6392	10120
Mode 2	1534	3069	4603	6138	9718
Tonnes Per Hour	Year 1	Year 2	Year 3	Year 4	Year 5
Mode 1	72	72	72	72	72
Mode 2	87	87	87	87	87

		Electricity (tonnes CO2)	
Mode	Milestone	GGBFS	Cement
	1	1,379	0
	2	2,614	0
	3	3,703	0
	4	4,647	0
1	5	7,357	0
	1	0	1,683
	2	0	3,366
	3	0	5,048
	4	0	6,731
2	5	0	10,658
	1	1,452	757
	2	2,904	1,010
	3	4,356	1,262
	4	4,647	1,515
3	5	7,357	1,515

1. PG&E Carbon Dioxide (CO_2) Emissions Rates[2]

Electric:	0.524	lbs CO2 per kWh
Natural Gas:	13.446	lbs CO2 per therm

PG&E's ClimateSmart program, authorized by the California Public Utilities Commission in Decision 06-12-032 — The most accurate measure of emissions from power generation involves calculating the emissions from each plant operating in the portfolio of generating assets for each hour of the day and year, and this can vary considerably by time of day, year, and with seasonal variations in weather.

http://www.pge.com/about/environment/calculator/assumptions.shtml

		Finished Product Out (mtpa)	
Mode	Milestone	GGBFS	Cement
	1	109,299	0
	2	207,093	0
	3	293,381	0
	4	368,165	0
1	5	582,928	0
	1	0	133,333
	2	0	266,667
	3	0	400,000
	4	0	533,333
2	5	0	844,444
	1	115,052	60,000
	2	230,103	80,000
	3	345,155	100,000
	4	368,165	120,000
3	5	582,928	120,000

		: CO2 emissions associated with Cement I	
Mode	Milestone	GGBFS	Cement
	1	93,997	0
	2	178,100	0
	3	252,308	0
	4	316,622	0
1	5	501,318	0
	1	0	114,666
	2	0	229,334
	3	0	344,000
	4	0	458,666
2	5	0	726,222
	1	98,945	51,600
	2	197,889	68,800
	3	296,833	86,000
	4	316,622	103,200
3	5	501,318	103,200

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	292 tons per hour				
Duration of ship unloading	137 hrs (5.7 days)			**CO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	9	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	281822	lbs/year

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	292 tons per hour				
Duration of ship unloading	137 hrs (5.7 days)			**CO_2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	9	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	563643	lbs/year

Orcem California Inc., Mode 1 (Milestone 5)

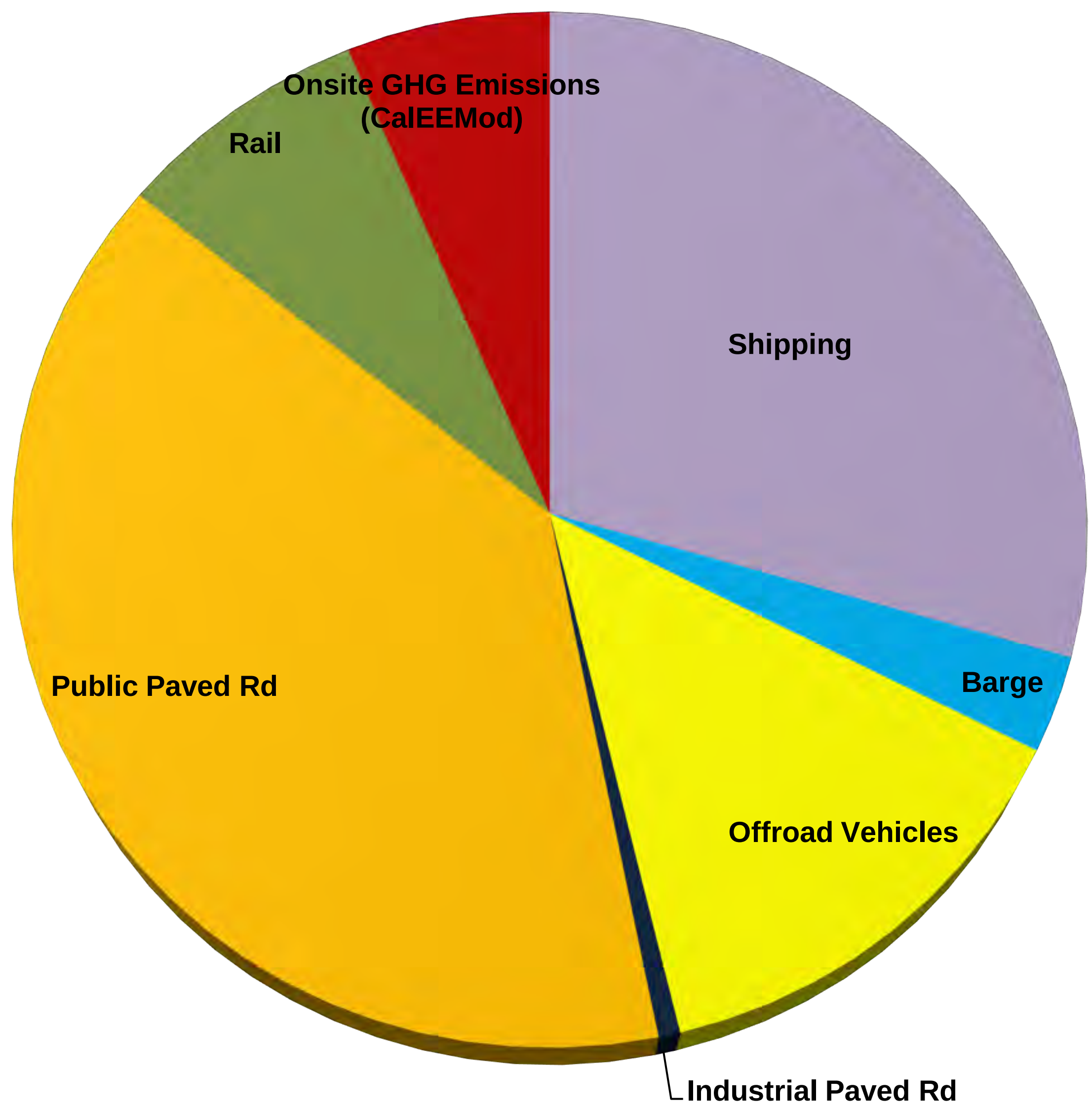
Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	292 tons per hour				
Duration of ship unloading	137 hrs (5.7 days)			**CO_2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	9	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	845465	lbs/year

Orcem California Inc., Mode 1 (Milestone 5)

Milestone 5	760,000 tonnes per year of GBFS imported				
Production Capacity	100 tons per hour				
Hours Of Operation	7600 hour per year				
Operational Details	24 hrs per day Monday-Saturday (7600 hrs per year as a worst-case)				
Shipment Load	40,0000 tons (19 times per year, every 2.7 weeks)				
Ship Unloading Capacity	292 tons per hour				
Duration of ship unloading	137 hrs (5.7 days)			**CO_2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Milestone 5	**Shipping**	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for milestone 5 - 132 hrs of hotelling x 19 = 2508 hrs, manuverving & transit = 2hrs x 19 = 38hrs	1127287	lbs/year

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported		
Hours Of Operation	5760		
Operational Details	24 days per month, 2 10-hour shift		
Shipment Load	40,0000 metric tonnes		
Ship Unloading Capacity	303		
Duration of ship unloading	132	**CO_2**	
Scenarios	**Operations**	**Exhaust**	**Units**
Phase 2 Alternative	**Shipping**	2762909.9	lbs/year
	Barge	281638.0	lbs/year



Onsite GHG Emissions (CalEEMod)
Rail
Shipping
Barge
Offroad Vehicles
Public Paved Rd
Industrial Paved Rd

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000	tons per year of sand / aggregate imported
Hours Of Operation	5760	hrs
Operational Details	24 days per month, 2 10-hour shift	
Shipment Load	40,000	metric tonnes
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days
Duration of ship unloading	132	hrs (5.5 days)
Rail Loading	9072	mtonnes per day

Operations	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Mitigation Reduction (%)**	**Mitigation Required**
Handymax Ship	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Barge	12	Each shipmment in first hour has transit and maneuverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, maneuverving & transit = 2hrs x 1 = 2hrs	**0%**	No specific mitigation - based on an assumption of 0.1% S fuel which is mandated in California
Tug Boats	29	Two tugs are used for manouverving inwards. Followed by another 1 hour of manouverving emissions outwards . On an annual basis for Phase 2 Alternative manuverving = 2hrs x 29 = 58hrs.	**25%**	Based On A 2010 Tug Boat Engine (As Advised By VMT) Relative To Default Value
Unpaved Rd (Front Loader & Forklift)	Ongoing	Based on hours of operation of 20 hrs per day Monday - Saturday (5760 hrs per year as a worst-case).	**90%**	2013+
Industrial Paved Rd (Finished Product)	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Public Paved Rd	Ongoing - based on weekly traffic profile	Trips numbers based on hourly breakdown supplied by traffic consultants	**0%**	Default
Rail	Varies	Rail will replace trucks - as truck movements decrease rail movements increase under various scenarios	**45% - 55%**	Based on The Used Of Ultra-Low Emissions Road-Switcher Locomotives (National Railway Equipment Company) for both switching and line haul. (VMT Supplied Data). Reduction of 45-55% in NOX compared to Tier II EPA emission rates.

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)		**CO_2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
NO2 **Phase 2 Alternative**	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	26689.3	lbs/day
	Barge	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs	7824.7	lbs/day

VMT, Phase 2 (Alternative) - Based On Year 2016

Phase 2	1,160,000 tons per year of sand / aggregate imported				
Hours Of Operation	5760				
Operational Details	24 days per month, 2 10-hour shift				
Shipment Load	40,0000 metric tonnes				
Ship Unloading Capacity	303	tonnes per hour averaged over 5.5 days			
Duration of ship unloading	132	hrs (5.5 days)		**CO2**	
Scenarios	**Operations**	**Number Of Events / Year**	**Hours Of Operation (per year)**	**Exhaust**	**Units**
Phase 2 Alternative	**Shipping**	29	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 132hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 132 hrs of hotelling x 29 = 3828 hrs, manuverving & transit = 2hrs x 29 = 58hrs	2762909.9	lbs/year
	Barge	12	Each shipmment in first hour has transit and manouverving emissions. Thereafter, hoteling occurs for 20hrs followed by another 1 hour of manouverving and transit emissions. On an annual basis for Phase 2 Alternative - 20 hrs of hotelling x 1 = 20 hrs, manuverving & transit = 2hrs x 1 = 2 hrs	281638	lbs/year

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**		
Visits Per Year	29	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	
Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.139**	CO2 at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**1.24**	CO2 at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CO2**
Slow	Marine Distillate (0.1% S)	**588.9939562**
Medium	Marine Distillate (0.1% S)	**645**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CO2**
Slow	Marine Distillate (0.1% S)	**588.9939562**
Medium	Marine Distillate (0.1% S)	**645**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CO2**
Medium	Marine Distillate (0.1% S)	**689.9929199**
		g/kW-HR

Boiler

	CO2	
Marine Distillate (0.1% S)	**921.49**	CARB (20080)
	g/kW-HR	

Tug

	CO2
Marine Distillate (0.1% S)	**587.1720361**
	g/kW-HR

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**		
Visits Per Year	29	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	
Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**8.900**	CH4 at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**2.136**	CH4 at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**CH4**
Slow	Marine Distillate (0.1% S)	**0.07**
Medium	Marine Distillate (0.1% S)	**0.08**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**CH4**
Slow	Marine Distillate (0.1% S)	**0.07**
Medium	Marine Distillate (0.1% S)	**0.08**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**CH4**
Medium	Marine Distillate (0.1% S)	**0.09**
		g/kW-HR

Boiler

	CH4	
Marine Distillate (0.1% S)	**0.03**	*POLA (2013)*
	g/kW-HR	

Tug

	CH4
Marine Distillate (0.1% S)	**0.09**
	g/kW-HR

Shipping (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Maneuvering	Maneuvering prior to hotelling covers a distance of 1300 m
Transit	Modelling undertaked for 73673m of transit prior to maneuvering based on 24nmiles from Golden Gate Bridge (Low Emission Zone)
Ship Type	Bulk Cargo
Transit Engine Speed	12 knots (6.17 m/s) until 3km from port when it reduces to 7 knots
Maneuvering Engine Speed	5 knots inwards, 7 knots outwards
Fuel Type	Marine Distillate (0.1% S)

Shipping Emission Factor

Assumption	**Phase 2 Alternative**		
Visits Per Year	29	visits	
Hours Per Visit	138	hrs	
Ship Capacity	40000	metric tonne	
Hotelling Time	132	hrs	
Hotelling Time (Highest Day)	20.82	hrs	
Transit & Maneuvering Time	6	hours (roundtrip)	
Transit distance assessed (>3km)	59103.91169	metres	
Transit Distance (within 3km)	1700	metres	
Maneurvering Distance	1300	metres	

Bulk Emission Details (CARB (2011) Appendix D)		*1.1508*	*0.5144*
	knots	**miles/hr**	**m/s**
Main Engine Speed (> 3km)	12	13.81	6.17
Main Engine (3km from port)	7	8.06	3.60
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Main Power	7803	kilowatts	
Auxiliary power	2459	kilowatts	
Boiler Power	109	kilowatts	
Tug Power	1620	kilowatts	(2172 hp - Average)
Tug (auiliary)	95	kilowatts	
Load Factor			
Main Engine	82.5%	at cruise speed	
Maximum Handymax speed	15.00	knots	
Main Engine Speed (> 3km)	51.2%	RSZ (12 knots)	(average speed)
Main Engine (3km from port)	10.2%	Slow-down approaching port	
Main Engine	3.7%	Maneuvering (5 knots)	inwards
Main Engine	10.2%	Maneuvering (7 knots)	outwards
Low Adjustment Factor (5 knots)	**2.42**	N2O at 3.7%	(USEPA (2009))
Low Adjustment Factor (7 knots)	**1.21**	N2O at 10.2%	(USEPA (2009))
Load Factor			
Tug Main Engine	0.31	CARB (POO EI)	
Tug Auxillary Engine	0.43	CARB (POO EI)	
Auxilliary Engine			
Hoteling	0.061	POLA (2013)	
Maneuvering	0.275	POLA (2013)	
Transit	0.104	POLA (2013)	

Source: (CARB (2011) Appendix D)

Main Engine

Transit

Engine Speed	**Fuel**	**N20**
Slow	Marine Distillate (0.1% S)	**0.029**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Maneuvering

Engine Speed	**Fuel**	**N20**
Slow	Marine Distillate (0.1% S)	**0.029**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Auxiliary Engine

Engine Speed	**Fuel**	**N20**
Medium	Marine Distillate (0.1% S)	**0.029**
		g/kW-HR

Boiler

	N20	
Marine Distillate (0.1% S)	**0.075**	*POLA (2013)*
	g/kW-HR	

Tug

	N20
Marine Distillate (0.1% S)	**0.020**
	g/kW-HR

		Emission Factors (g/kW-hr)						units?		units?		Raw (kg/kW-hr)		
	Engine	ROG	CO	NOx	PM10	PM25	SOx	CH4	CO2	N20	CH4	CO2	N20	Sulfur Fuel
2016	Main	0.684384	1.373007	16.48613	0.250161	0.244157	0.350823	0.000596	590.5319	0.001767	0.000596	0.195542	0.001767	0.090%
2016	Auxiliary	0.520003	1.100007	12.79184	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2016	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2017	Main	0.687273	1.380594	16.59357	0.250119	0.244116	0.350038	0.000595	588.994	0.001765	0.000595	0.195032	0.001765	0.090%
2017	Auxiliary	0.520003	1.100007	12.24667	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2017	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2018	Main	0.686693	1.380009	15.16523	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2018	Auxiliary	0.520003	1.100007	11.63401	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2018	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2019	Main	0.686693	1.380009	14.34383	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2019	Auxiliary	0.520003	1.100007	10.98484	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2019	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
2020	Main	0.686693	1.380009	13.74815	0.250052	0.24405	0.351264	0.000594	588.994	0.001764	0.000594	0.195032	0.001764	0.090%
2020	Auxiliary	0.520003	1.100007	10.53416	0.250014	0.230013	0.399003	0.000663	689.9929	0.008527	0.000663	0.228476	0.008527	0.087%
2020	Boiler	0.110001	0.200001	1.995013	0.133361	0.130027	1.50151	0.000244	921.4905	0.001274	0.000244	0.305131	0.001274	0.246%
									corrected units			**mistake on units**		
			http://www.arb.ca.gov/msei/categories.htm#ogv_category									**MMT x 907200 x 365 / MW-hrs**		

Dock		23.13	nm	23.13	AWN	73673	
GG		8.72		8.91		1700	
		1.5		1.5		1300	
Sea Buoy		7.4		6.1	Link not included		
		40.75	nm	39.64		76673	meters
	1.1508	46.8951				41.43703	nm
		75454.22					
		72454.22					

Out to Sea Buoy	33.35		33.54	nm
		1.1508	38.59783	statute miles
			62103.91	meters
			59103.91	meters - 3000 meters for maneuvering

			g/hp-hr								
	Area	Engine	NOx	PM	ROG	CO	SOx	CO2	g/kW-hr	Fuel	Sulfur
2016	Tow Boats	ME	5.481009	0.17551	0.574049	3.761079	0.005951	587.172	787.3977	184.1585	10.13514
2016	Tow Boats	AE	5.735951	0.2692	0.882978	4.184697	0.005951	587.172			10.13514
2016	Tug Boats	ME	5.993178	0.221536	0.59271	3.741996	0.005951	587.172			10.13514
2016	Tug Boats	AE	5.688221	0.235429	0.857612	4.112628	0.005951	587.172			10.13514
2017	Tow Boats	ME	5.12455	0.148197	0.568294	3.933971	0.005951	587.172			10.13514
2017	Tow Boats	AE	5.478201	0.227274	0.876332	4.187284	0.005951	587.172			10.13514
2017	Tug Boats	ME	5.578117	0.187058	0.58314	3.951161	0.005951	587.172			10.13514
2017	Tug Boats	AE	5.315164	0.20533	0.854163	4.186492	0.005951	587.172			10.13514
2018	Tow Boats	ME	5.110766	0.149272	0.571738	3.97177	0.005951	587.172			10.13514
2018	Tow Boats	AE	5.489824	0.228878	0.883696	4.208624	0.005951	587.172			10.13514
2018	Tug Boats	ME	5.544197	0.18687	0.587547	4.010128	0.005951	587.172			10.13514
2018	Tug Boats	AE	5.310354	0.203882	0.861704	4.210386	0.005951	587.172			10.13514
2019	Tow Boats	ME	5.094493	0.150162	0.574833	4.009126	0.005951	587.172			10.13514
2019	Tow Boats	AE	5.500531	0.230337	0.890772	4.229212	0.005951	587.172			10.13514
2019	Tug Boats	ME	5.539156	0.189178	0.592638	4.056496	0.005951	587.172			10.13514
2019	Tug Boats	AE	5.333395	0.206477	0.870666	4.236473	0.005951	587.172			10.13514
2020	Tow Boats	ME	4.656133	0.115441	0.567697	4.215111	0.005951	587.172			10.13514
2020	Tow Boats	AE	5.452584	0.223209	0.891178	4.230997	0.005951	587.172			10.13514
2020	Tug Boats	ME	5.19743	0.161516	0.587955	4.244569	0.005951	587.172			10.13514
2020	Tug Boats	AE	5.285778	0.200119	0.872218	4.241026	0.005951	587.172			10.13514

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Barge Emission Factor

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	CO_2		Time (hrs)	inward	outward	Barge Emission Rate
Main	1197831	g/hr	0.540	2.57	3.60	345.004
				m/s	m/s	
Auxiliary	44184.7	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

· 3000 hp was assumed as the rated horsepower of the main engine(s).

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Barge Emission Factor

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	**miles/hr**	**m/s**
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	CH4		Time (hrs)	inward	outward	Barge Emission Rate
Main	132	g/hr	0.540	2.57	3.60	**0.038**
				m/s	m/s	
Auxiliary	4.9	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

· 3000 hp was assumed as the rated horsepower of the main engine(s).

Barge (Exhaust Emissions) - 5km from facility & hotelling

Assumptions

Barge Emission Factor

Assumption	Phase 2 Alternative	
Visits Per Year	12	visits
Hours Per Visit	22.0	hrs
Barge Capacity	14000	ton
Hotelling Time	20	hrs
Transit & Maneuvering Time	2	hours (roundtrip)
Transit distance assessed	3700	metres
Maneurvering Distance	1300	metres

Phase	Annual Tonnage	Truck Tonnage
Phase 1 Trucks Only	480000	480000
Phase 1 Trucks & Rail	720000	240000
Phase 1 Alternative	1350000	480000
Phase 2	1160000	214400
Phase 2 Alternative	1160000	310400

Bulk Emission Details (CARB (2011) Appendix D)		1.1508	0.5144
	knots	miles/hr	m/s
Maneuving speed	5	5.75	2.57
Outbound speed	7	8.06	3.60
Barge Main Engine	0.68	CARB (POO EI)	
Barge Auxillary Engine	0.43	CARB (POO EI)	

Bulk Emission Details (CARB (2011) Appendix D)

	N2O		Time (hrs)	inward	outward	Barge Emission Rate
Main	39	g/hr	0.540	2.57	3.60	0.011
				m/s	m/s	
Auxiliary	1.4	g/hr	0.540	2.57	3.60	

Barge - Main Engines

In relation to the main engines likely to be used for the barge into port, the following assumptions were made:

- 3000 hp was assumed as the rated horsepower of the main engine(s).

Unpaved Road - Industrial (Forklift)

OFFROAD2011	Load Factor	HP	CO2
Forklift	0.20	100	530.6
		hp	g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	3	years	(2013 Model)
Activity	1800	hours/year	(capped at 12,000 hrs)
Fuel Correction Factor	1		
Emission Rate	10612.00	g/hr	
Activity Factor	0.50	Fractional usage per hour	

CO2	Maximum Day	
Emission Rate	5306.00	g/hr
Emission Rate	1.4739	g/sec
Sources	1	
Emissions per sec S1/source	1.4739	g/sec
	CO2	
Emissions per sec S1/source	1.4739	g/sec

Unpaved Road - Industrial (Front Loader stockpile to truck/barge/rail loading)

OFFROAD2011	Load Factor	HP	CO2
Front Loader	0.36	369	530.60
			g/(hp-hr)
Deterioration Rate	0.00E+00	g/(hr-hr^2)	
Age	3	years	(2013 Model)
Historical Activity	957	hours/year	3 years old
	(capped at 12000 hrs)		
Fuel Correction Factor	1		
Emission Rate	70484.90	g/hr	

Activity Factor	90%	Fractional usage per hour

Emission Rate / Front Loader	17.6212	g/s

	Maximum Day	Annual
Truck Loading Sources	5	1
TransLoading Sources	4	1
Rail Loading Sources	5	1
Barge Loading Sources	5	1

Phase
Phase 1 Trucks Only
Phase 1 Trucks & Rail
Phase 1 Alternative
Phase 2
Phase 2 Alternative

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								0.6214
Region Type:	GAI							mile to km
Region:	Solano (SF)							
Calendar Year:	2020							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO2_run		
						(gms/mile)		
Solano (SF)	2020	Annual	T7 Single	DSL	Aggregated	2722.0	Annual	
						3322.2	Summer	
						3322.2	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO2 (g/hr-veh)	
2020	HHDT	D	SF	A		
					6239.0	annual
	Speed	5	miles/hr		7466.2	summer
		8.05	km/hr		6469.3	winter

HHDT Emission Factor					
		CO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	2064.40	3322.18	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	2064.40	3322.18	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	1691.44	2721.99	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	927.90	1493.23	EMFAC2011	
Idling T7 Single (Win)	g/vkt	804.00	1293.85	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	775.38	1247.80	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	1979.17	3185.01	Sum	
Composite Emission Factor (Win)	g/vkt	1969.87	3170.06	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	1622.74	2611.43	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	10	654.8	12.0	654.837
2020	Annual	LDA	DSL	Aggregated	10	560.5	0.0	560.494
2020	Summer	LDA	GAS	Aggregated	10	899.7	464.1	899.659
2020	Summer	LDA	DSL	Aggregated	10	427.8	0.0	427.777
2020	Winter	LDA	GAS	Aggregated	10	799.8	464.1	799.790
2020	Winter	LDA	DSL	Aggregated	10	427.8	0.0	427.777

LDA Idling Calculation						
2020	Annual	LDA	GAS	Aggregated		CO2_RUNEX

							Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated		882.8	1078.3	1206.6
	8.046	km/hr	DSL	Aggregated	Aggregated		672.8	463.5	463.5

		CO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	423.6	681.8	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	348.3	560.5	EMFAC2011	
Tailpipe Gas LDA (summer)	g/vkt	1203.6	1937.0	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (summer)	g/vkt	265.8	427.8	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	548.6	882.8	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	418.1	672.8	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.8	1206.6	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.0	463.5	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	433.0	696.8	sum	
Composite Emission Factor DSL (ann)	g/vkt	353.5	568.9	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor Gas (summer)	g/vkt	1169.6	1882.2	sum	
Composite Emission Factor DSL (summer)	g/vkt	267.5	430.5	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	432.7	696.4	sum	Based on 0.38% Diesel
Composite Emission Factor (summer)	g/vkt	1166.2	1876.7	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		LDA	
	CO2		CO2	
Spacing of point sources	9	m	9	
AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	1425.0	g/hr	839.6	based on summer
Emission Factor/vehicle	1168.4	g/hr	311.6	based on annual
Emission Factor/vehicle	0.396	g/sec	4.665	includes all trips/day
Emission Factor/vehicle	0.325	g/sec	1.731	
Emission Factor/vehicle/AERMOD Source	4.95E-03	g/sec	5.83E-02	based on summer
Emission Factor/vehicle/AERMOD Source	4.06E-03	g/sec	2.16E-02	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Weekday Hours	CO2 Emissions (g/s)	CO2 Vehicles Per Hour	CO2 Emissions (g/s)	CO2 Including LDA	CO2 Vehicles Per Hour	CO2 Including LDA
1	4.95E-03	0	0.00E+00	5.83E-02	0	0.00E+00
2	4.95E-03	0	0.00E+00	0.00E+00	0	0.00E+00
3	4.95E-03	0	0.00E+00	0.00E+00	0	0.00E+00
4	4.95E-03	3	1.48E-02	1.48E-02	2	8.20E-03
5	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02
6	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02

Annualised Emission Rate
Vehicles Per Hour
0
0.00E+00
0.00E+00
0.00E+00
0.00E+00
0.00E+00

7	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
8	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
9	4.95E-03	4	1.98E-02	1.36E-01	2	1.09E-02	0.00E+00
10	4.95E-03	6	2.97E-02	2.97E-02	3	1.64E-02	0.00E+00
11	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
12	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
13	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
14	4.95E-03	6	2.97E-02	2.97E-02	3	1.64E-02	0.00E+00
15	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
16	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
17	4.95E-03	4	1.98E-02	7.81E-02	2	1.09E-02	0.00E+00
18	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
19	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
20	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
21	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
22	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
23	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
24	4.95E-03	4	1.98E-02	1.98E-02	2	1.09E-02	0.00E+00
							0.00E+00

Total HHDT/Day	87.0	48.1
	including deliveries (2 per day, 10am, 2pm)	
Annual HHDT Based On Max Day	31755	
Actual HHDT Based On Tonnage	17542	
Ratio	0.5524	

Annualised
0.00E+00

Annual					Maximum Day	Annual Mean				
HGV Traffic					Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only	480000	480000	26445	0.720	1424.999	1168.373	273.36	30.90	34.06	68116.52
Phase 1 Trucks & Rail	720000	240000	13846	0.720	1424.999	1168.373	273.36	16.18	17.83	35665.55
Phase 1 Alternative	1350000	480000	26445	0.720	1424.999	1168.373	273.36	30.90	34.06	68116.52
Phase 2	1160000	214400	12503	0.720	1424.999	1168.373	273.36	14.61	16.10	32204.12
Phase 2 Alternative	1160000	310400	17542	0.720	1424.999	1168.373	273.36	20.50	22.59	45184.50
LDA Traffic					Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)	Emissions (g/s)
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa	lbs/year
Phase 1 Trucks Only		24	3744	0.720	839.635	311.558	44.4335	1.1665	1.2858	2571.61
Phase 1 Trucks & Rail		24	4992	0.720	839.635	311.558	44.4335	1.5553	1.7144	3428.81
Phase 1 Alternative		40	10400	0.720	839.635	311.558	74.0558	3.2402	3.5717	7143.35
Phase 2		80	20800	0.720	839.635	311.558	148.1115	6.4804	7.1434	14286.70
Phase 2 Alternative		80	20800	0.720	839.635	311.558	148.1115	6.4804	7.1434	14286.70
									tpa	
							Emissions (g/s)			
							lbs/day	MTPA	tpa	lbs/year
				Combined		Phase 1 Trucks Only	317.798	32.064	35.344	70688.1
						Phase 1 Trucks & Rail	317.798	17.733	19.547	39094.4
						Phase 1 Alternative	347.421	34.138	37.630	75259.9
						Phase 2	421.476	21.088	23.245	46490.8
						Phase 2 Alternative	421.476	26.976	29.736	59471.2

Phase	Annual Tonnage	Annual Ships	Annual Tonnage Truck	Annual Tonnage Rail	Annual Tonnage Barge	Trucks Daily	Trucks Hourly	Rail Number/Annum	Barge Number/Annum	Rail Hrs/Annum	Barge Hrs/Annum
Phase 1 Trucks Only	480000	12	480000	0	0	1667	83	0	0	0	0
Phase 1 Trucks & Rail	720000	18	240000	480000	0	833	42	52.9	0	1269.8	0
Phase 1 Alternative	1350000	34	480000	870000	0	1667	83	95.9	0	2301.6	0
Phase 2	1160000	29	360000	360000	720000	1250	63	39.7	51.4	952.4	1234.3
Phase 2 Alternative	**1160000**	**29**	**480000**	**864000**	**96000**	**1667**	**83**	**95.2**	**1.0**	**2285.7**	**24.0**

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor CO2

EMFAC2011 Emission Rates								0.6214
Region Type:	**GAI**							mile to km
Region:	**Solano (SF)**							
Calendar Year:	**2020**							
Season:	**Annual**							
Speed:	**20**	**miles/hr**						
Vehicle Classification:	**EMFAC2011 Categories**					**Annual**		
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO2_run**		
						(gms/mile)		
Solano (SF)	**2020**	**Annual**	**T7 Single**	**DSL**	**Aggregated**	**2004.2**	**Annual**	
						2152.0	**Summer**	
						2152.0	**Winter**	

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NO2 (g/hr-veh)	
2020	**HHDT**	**D**	**SF**	**A**		
					6239.0	**annual**
	Speed	**5**	**miles/hr**		**7466.2**	**summer**
		8.046	**km/hr**		**6469.3**	**winter**

HHDT Emission Factor

		CO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	1245.38	2004.15	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	1337.23	2151.96	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	1337.23	2151.96	EMFAC2011	
Idling T7 Single (ann)	g/vkt	775.38	1247.80	EMFAC2011	
Idling T7 Single (summer)	g/vkt	927.90	1493.23	EMFAC2011	
Idling T7 Single (winter)	g/vkt	804.00	1293.85	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**1210.13**	**1947.43**	Sum	
Composite Emission Factor (summer)	g/vkt	**1306.53**	**2102.56**	Sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor (winter)	g/vkt	1297.24	2087.60	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2020	Annual	LDA	GAS	Aggregated	**20**	402.8		**402.801**
2020	Annual	LDA	DSL	Aggregated	**20**	378.2		**378.174**
2020	Summer	LDA	GAS	Aggregated	**20**	536.5		**536.509**
2020	Summer	LDA	DSL	Aggregated	**20**	337.8		**337.796**
2020	Winter	LDA	GAS	Aggregated	**20**	492.0		**491.965**
2020	Winter	LDA	DSL	Aggregated	**20**	337.8		**337.796**

Idling Calculation							
2020	**Annual**	**LDA**	**GAS**	**Aggregated**	**(gms/mile)**		
					Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	882.8	1078.3	1206.6
	8.046	**km/hr**	DSL	Aggregated	672.8	463.5	463.5

		CO2	g/mile		
Tailpipe Gas LDA (ann)	g/vkt	250.300	**402.801**	EMFAC2011	
Tailpipe DSL LDA (ann)	g/vkt	234.997	**378.174**	EMFAC2011	**No starting emissions - onsite only**
Tailpipe Gas LDA (summer)	g/vkt	333.386	**536.509**	EMFAC2011	
Tailpipe DSL LDA (summer)	g/vkt	209.906	**337.796**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	548.603	**882.850**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	418.069	**672.786**	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.788	**1206.611**	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.037	**463.530**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	272.673	**438.805**	sum	
Composite Emission Factor DSL (ann)	g/vkt	248.728	**400.270**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor Gas (summer)	g/vkt	364.617	**586.766**	sum	
Composite Emission Factor DSL (summer)	g/vkt	215.766	**347.226**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**272.582**	**438.658**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (summer)	g/vkt	**364.051**	**585.856**	sum	

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT		LDA	
		CO2		**CO2**	
Spacing of point sources		**14**	**m**	**14**	2-way roadway
AERMOD Point Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**940.70**	**g/hr**	**262.12**	based on Summer
Emission Factor/vehicle		**871.29**	**g/hr**	**196.26**	based on Annual
Emission Factor/vehicle		**0.261**	**g/sec**	**1.456**	includes shift trips/day
Emission Factor/vehicle		**0.242**	**g/sec**	**1.090**	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		**5.12E-03**	**g/sec**	**2.86E-02**	**based on summer**
Emission Factor/vehicle/AERMOD Source		**4.75E-03**	**g/sec**	**2.14E-02**	**based on annual**

Staff Numbers		
Phase 1 Trucks Only	12	1 shift
Phase 1 Trucks & Rail	12	1 shift
Phase 1 Alternative	20	1 shift
Phase 2	20	2 shift
Phase 2 Alternative	20	2 shift

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative

					based on summer	based on annual		Annualised Emission Rate
	CO2	Milestone5	Milestone5	CO2	CO2	Milestone5	CO2	CO2
Weekday Hours	**Emission Factor**	**VMT**	**vmt**	**Emission Factor**	**Including LDA**	**Emission Factor**	**Including LDA**	**Including LDA**
1	**5.12E-03**	**0**	**0.00**	**0.00E+00**	**2.86E-02**	**0.00E+00**	**2.138E-02**	**2.14E-02**
2	**5.12E-03**	**0**	**0.00**	**0.00E+00**	**0.00E+00**	**0.00E+00**	**0.000E+00**	**0.00E+00**
3	**5.12E-03**	**3**	**0.00**	**3.07E-02**	**3.07E-02**	**0.00E+00**	**0.000E+00**	**0.00E+00**
4	**5.12E-03**	**4**	**1.66**	**4.10E-02**	**4.10E-02**	**1.70E-02**	**1.698E-02**	**1.70E-02**
5	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
6	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
7	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
8	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
9	**5.12E-03**	**6**	**2.21**	**6.15E-02**	**1.19E-01**	**2.26E-02**	**6.540E-02**	**6.54E-02**
10	**5.12E-03**	**4**	**3.31**	**4.10E-02**	**4.10E-02**	**3.40E-02**	**3.396E-02**	**3.40E-02**
11	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
12	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
13	**5.12E-03**	**6**	**2.21**	**6.15E-02**	**6.15E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
14	**5.12E-03**	**4**	**3.31**	**4.10E-02**	**4.10E-02**	**3.40E-02**	**3.396E-02**	**3.40E-02**
15	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
16	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
17	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**6.95E-02**	**2.26E-02**	**4.402E-02**	**4.40E-02**
18	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
19	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
20	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
21	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
22	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
23	**5.12E-03**	**4**	**2.21**	**4.10E-02**	**4.10E-02**	**2.26E-02**	**2.264E-02**	**2.26E-02**
24	**5.12E-03**	**0**	**2.21**	**0.00E+00**	**0.00E+00**	**2.26E-02**	**2.264E-02**	**2.26E-02**
		87.0	**48.1**					**Annualised**
		including deliveries (2 per day, 10am, 2pm)						**2.41E-02**

	To junct of Sonoma Blvd	Deliveries	Staff
Distance Travelled	**0.720**	**80.47**	**39.91**
Units	**km**	**km**	**km**
Estimated Average Mileage (2-way)		**(50 miles)**	**(24.8 miles)**

Annual					Maximum Day	Annual Mean			
HGV Traffic					**CO2**	**CO2**	**CO2**	**CO2**	**CO2**
	tonnage	**truck tonnage**	**trucks per year**	**distance travelled (km)**	**g/trip**	**g/trip**	**lbs/day**	**MTPA**	**tpa**

Phase 1 Trucks Only	480000	480000	26445	80.47	84282.06	83968.02	16168.249	2220.5	2447.7
Phase 1 Trucks & Rail	720000	240000	13846	80.47	84282.06	83968.02	16168.249	1162.7	1281.6
Phase 1 Alternative	1350000	480000	26445	80.47	84282.06	83968.02	16168.249	2220.5	2447.7
Phase 2	1160000	214400	12503	80.47	84282.06	83968.02	16168.249	1049.8	1157.2
Phase 2 Alternative	1160000	310400	17542	80.47	84282.06	83968.02	16168.249	1473.0	1623.6
LDA Traffic					CO2	CO2	CO2	CO2	CO2
		movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day	MTPA	tpa
Phase 1 Trucks Only		24	3744	39.91	9504.98	8800.07	465.700	32.947	36.318
Phase 1 Trucks & Rail		24	4992	39.91	9504.98	8800.07	465.700	43.930	48.424
Phase 1 Alternative		40	10400	39.91	9504.98	8800.07	776.166	91.521	100.883
Phase 2		80	20800	39.91	9504.98	8800.07	1552.332	183.041	201.767
Phase 2 Alternative		80	20800	39.91	9504.98	8800.07	1552.332	183.041	201.767
									tpa
							CO2		
							lbs/day	MTPA	tpa
				Combined		Phase 1 Trucks Only	16633.9	2253.5	2484.0
						Phase 1 Trucks & Rail	16633.9	1206.6	1330.0
						Phase 1 Alternative	16944.4	2312.0	2548.6
						Phase 2	17720.6	1232.9	1359.0
						Phase 2 Alternative	17720.6	1656.0	1825.4

		Length	Width
SONOM_S	Sonoma South of Lemon	735	24
SONOM_N	Sonoma North of Lemon	525	24
LEMON_E	Lemon East of Sonoma	820	16
SONOM_S2	Sonoma South of Magazine	698	24

2020		HHDT	LDA	
Emission factor, E (annual)	g/VKT	1043.509	220.498	Sonoma Blvd
Emission factor, E (summer)	g/VKT	1047.411	238.160	Sonoma Blvd
Emission factor, E	g/VKT	1297.237	364.051	Lemon

Sonoma North of Lemon

Paved road modelled as a series of point sources

		HHDT CO2		LDA CO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	
Emission Factor/vehicle		547.84	g/hr	115.76	based on winter
Emission Factor/vehicle		0.152	g/sec	0.643	includes shift trips/day
Emission factor, E (summer)		6.92E-03	g/sec	2.92E-02	

Sonoma North of Lemon			0.525
Split	0.05		km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.92E-03	0.00	0.00E+00	1.46E-03	1.46E-03
2	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.92E-03	0.08	1.15E-03	1.15E-03	1.15E-03
5	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
6	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
7	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
8	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
9	6.92E-03	0.11	1.53E-03	4.45E-03	4.45E-03
10	6.92E-03	0.17	2.29E-03	2.29E-03	2.29E-03
11	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
12	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
13	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
14	6.92E-03	0.17	2.29E-03	2.29E-03	2.29E-03
15	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
16	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
17	6.92E-03	0.11	1.53E-03	2.99E-03	2.99E-03
18	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
19	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
20	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
21	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
22	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
23	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
24	6.92E-03	0.11	1.53E-03	1.53E-03	1.53E-03
				g/sec	g/sec
		2.4 including deliveries (2 per day, 10am, 2pm)			Annualised 1.63E-03
			Distance		

Sonoma South of Lemon

Paved road modelled as a series of point sources

		HHDT CO2		LDA CO2	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		31		31	
Distance Travelled (Lemon Street)		0.735	km	0.735	
Emission Factor/vehicle		766.979	g/hr	162.066	based on winter
Emission Factor/vehicle		0.21305	g/sec	0.900366	includes shift trips/day
Emission factor, E (summer)		6.87E-03	g/sec	2.90E-02	

Sonoma South of Lemon			0.735
Split	0.39		km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.87E-03	0.00	0.00E+00	1.13E-02	1.13E-02
2	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.87E-03	0.65	8.88E-03	8.88E-03	8.88E-03
5	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
6	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02

7	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
8	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
9	6.87E-03	0.86	1.18E-02	3.45E-02	3.45E-02
10	6.87E-03	1.29	1.78E-02	1.78E-02	1.78E-02
11	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
12	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
13	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
14	6.87E-03	1.29	1.78E-02	1.78E-02	1.78E-02
15	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
16	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
17	6.87E-03	0.86	1.18E-02	2.32E-02	2.32E-02
18	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
19	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
20	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
21	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
22	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
23	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
24	6.87E-03	0.86	1.18E-02	1.18E-02	1.18E-02
				g/hr	g/sec
		18.7			Annualised
		including deliveries (2 per day, 10am, 2pm)			1.26E-02

Distance

Lemon St East Of Sonoma

Paved road modelled as a series of point sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of point sources	16	m	16	2-way roadway
AERMOD Point Sources	51		51	
Distance Travelled (Lemon Street)	0.820	km	0.820	
Emission Factor/vehicle	858.877	g/hr	195.292	based on winter
Emission Factor/vehicle	0.23858	g/sec	1.084953	includes shift trips/day
Emission factor, E (summer)	4.68E-03	g/sec	2.13E-02	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	4.68E-03	0.00	0.00E+00	1.19E-02	1.19E-02
2	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	4.68E-03	0.93	8.68E-03	8.68E-03	8.68E-03
5	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
6	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
7	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
8	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
9	4.68E-03	1.24	1.16E-02	3.54E-02	3.54E-02
10	4.68E-03	1.86	1.74E-02	1.74E-02	1.74E-02
11	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
12	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
13	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
14	4.68E-03	1.86	1.74E-02	1.74E-02	1.74E-02
15	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
16	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
17	4.68E-03	1.24	1.16E-02	2.35E-02	2.35E-02
18	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
19	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
20	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
21	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
22	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
23	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
24	4.68E-03	1.24	1.16E-02	1.16E-02	1.16E-02
				g/hr	g/sec
		26.9			Annualised
		including deliveries (2 per day, 10am, 2pm)			1.25E-02

actual vs round

48.1

0.0

Sonoma South of Magazine

Paved road modelled as a series of point sources

	HHDT		LDA	
	HHDT		HHDT	
Spacing of point sources	24	m	24	2-way roadway
AERMOD Point Sources	29		29	
Distance Travelled (Lemon Street)	0.698	km	0.698	
Emission Factor/vehicle	728.369	g/hr	153.907	based on winter
Emission Factor/vehicle	0.20232	g/sec	0.855042	includes shift trips/day
Emission factor, E (summer)	6.98E-03	g/sec	2.95E-02	

Sonoma South of Magazine		0.698
Split	0.39	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.98E-03	0.00	0.00E+00	1.15E-02	1.15E-02
2	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.98E-03	0.65	9.02E-03	9.02E-03	9.02E-03
5	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
6	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
7	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
8	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
9	6.98E-03	0.86	1.20E-02	3.50E-02	3.50E-02
10	6.98E-03	1.29	1.80E-02	1.80E-02	1.80E-02
11	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
12	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
13	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02

14	6.98E-03	1.29	1.80E-02	1.80E-02	1.80E-02
15	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
16	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
17	6.98E-03	0.86	1.20E-02	2.35E-02	2.35E-02
18	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
19	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
20	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
21	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
22	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
23	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
24	6.98E-03	0.86	1.20E-02	1.20E-02	1.20E-02
				g/s	g/s
		18.7			Annualised
		including deliveries (2 per day, 10am, 2pm)			1.28E-02

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	CO2 (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	1699.16
1	4.76%	33.32	5.00%	1.67	1129.55
2	14.18%	99.26	25.00%	24.82	16824.57
3	27.80%	194.6	2.30%	4.48	3034.59
4	42.07%	294.49	21.50%	63.32	42927.81
5	57.30%	401.1	1.50%	6.02	4079.19
6	72.51%	507.57	1.60%	8.12	5506.12
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	1.00				

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			**m/s**	**Weighted**	**CH4 (g/hr)**
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.13
1	4.76%	33.32	5.00%	1.67	0.08
2	14.18%	99.26	25.00%	24.82	1.24
3	27.80%	194.6	2.30%	4.48	0.22
4	42.07%	294.49	21.50%	63.32	3.17
5	57.30%	401.1	1.50%	6.02	0.30
6	72.51%	507.57	1.60%	8.12	0.41
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	**1.00**				

Switcher When Empty	% of full power	BHP	Duty Cylce	BHP	Switcher
Notch Position			m/s	Weighted	N2O (g/hr)
			(based on Davis Yard Trim operations)		
Idle	0.81%	5.67	44.20%	2.51	0.04
1	4.76%	33.32	5.00%	1.67	0.03
2	14.18%	99.26	25.00%	24.82	0.42
3	27.80%	194.6	2.30%	4.48	0.08
4	42.07%	294.49	21.50%	63.32	1.08
5	57.30%	401.1	1.50%	6.02	0.10
6	72.51%	507.57	1.60%	8.12	0.14
7	89.76%	628.32	0.00%	0.00	0.00
8	105.31%	737.17	0.00%	0.00	0.00
Fuel Correction Factor	1.00				

VMT

Solano-San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	48.50	1000sqft	1.11	48,500.00	42

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 56

Climate Zone 4 **Operational Year** 2016

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Employee Numbers

Land Use Change -

Construction Off-road Equipment Mitigation -

Operational Off-Road Equipment - SITE SPECIFIC DATA

Energy Use -

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Nonresidential_Interior	100.00	250.00
tblArchitecturalCoating	EF_Residential_Exterior	150.00	250.00
tblArchitecturalCoating	EF_Residential_Interior	100.00	250.00
tblLandUse	Population	0.00	42.00
tblProjectCharacteristics	OperationalYear	2014	2016

2.0 Emissions Summary

2.2 Overall Operational

<u>Unmitigated Operational</u>

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area												8.7000e-004	8.7000e-004	0.0000	0.0000	9.2000e-004
Energy												208.7531	208.7531	7.4700e-003	2.6300e-003	209.7260
Mobile												190.9877	190.9877	7.7900e-003	0.0000	191.1512
Waste												0.0000	12.2079	0.7215	0.0000	27.3586
Water												17.6548	21.2130	0.3663	8.7900e-003	31.6307
Total												**417.3964**	**433.1625**	**1.1030**	**0.0114**	**459.8674**

4.0 Operational Detail - Mobile

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: Y

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated												133.0498	133.0498	6.0200e-003	1.2400e-003	133.5620
Electricity Unmitigated												133.0498	133.0498	6.0200e-003	1.2400e-003	133.5620
NaturalGas Mitigated												75.7032	75.7032	1.4500e-003	1.3900e-003	76.1640
NaturalGas Unmitigated												75.7032	75.7032	1.4500e-003	1.3900e-003	76.1640

5.2 Energy by Land Use - NaturalGas

Unmitigated

	co2eq
area	9.2000e-004

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	1.41863e+006												75.7032	75.7032	1.4500e-003	1.3900e-003	76.1640
Total													**75.7032**	**75.7032**	**1.4500e-003**	**1.3900e-003**	**76.1640**

water	**31.6250**
waste	**27.3586**
electricity	**133.5620**
natural ga	**76.1640**
sum	**268.7105**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	457355	133.0498	6.0200e-003	1.2400e-003	133.5620
Total		**133.0498**	**6.0200e-003**	**1.2400e-003**	**133.5620**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated												8.7000e-004	8.7000e-004	0.0000	0.0000	9.2000e-004
Unmitigated												8.7000e-004	8.7000e-004	0.0000	0.0000	9.2000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	tons/yr										MT/yr					
Architectural Coating												0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products												0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping												8.7000e-004	8.7000e-004	0.0000	0.0000	9.2000e-004
Total												**8.7000e-004**	**8.7000e-004**	**0.0000**	**0.0000**	**9.2000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	21.2130	0.3662	8.7800e-003	31.6250
Unmitigated	21.2130	0.3663	8.7900e-003	31.6307

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	12.2079	0.7215	0.0000	27.3586
Unmitigated	12.2079	0.7215	0.0000	27.3586

NOX Onsite Paved Road (Exhaust Emissions) - Assumed 10 miles/hr

HHDT Emission Factor

EMFAC2011 Emission Rates								*0.6214*
Region Type:	GAI							*mile to km*
Region:	Solano (SF)							
Calendar Year:	2016							
Season:	Annual							
Speed:	10	miles/hr						
Vehicle Classification:	EMFAC2011 Categories					Annual		
Region	CalYr	Season	Veh_Class	Fuel	MdlYr	CO2_run		
						(gms/mile)		
Solano (SF)	2016	Annual	T7 Single	DSL	Aggregated	2722.0	Annual	
						3322.2	Summer	
						3322.2	Winter	

HHDT Idling Emission Factors						
CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	CO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					6239.0	annual
	Speed	5	miles/hr		7466.2	summer
		8.05	km/hr		6469.3	winter

HHDT Emission Factor					
		CO2_run	g/mile		
Tailpipe T7 Single (Sum)	g/vkt	2064.40	3322.18	EMFAC2011	
Tailpipe T7 Single (Win)	g/vkt	2064.40	3322.18	EMFAC2011	
Tailpipe T7 Single (Ann)	g/vkt	1691.44	2721.99	EMFAC2011	
Idling T7 Single (Sum)	g/vkt	927.90	1493.23	EMFAC2011	
Idling T7 Single (Win)	g/vkt	804.00	1293.85	EMFAC2011	
Idling T7 Single (Ann)	g/vkt	775.38	1247.80	EMFAC2011	
Composite Emission Factor (Sum)	g/vkt	1979.17	3185.01	Sum	
Composite Emission Factor (Win)	g/vkt	1969.87	3170.06	Sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor (Ann)	g/vkt	1622.74	2611.43	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	10	815.6	464.1	815.576
2016	Annual	LDA	DSL	Aggregated	10	427.8	0.0	427.777
2016	Summer	LDA	GAS	Aggregated	10	899.7	464.1	899.659
2016	Summer	LDA	DSL	Aggregated	10	427.8	0.0	427.777
2016	Winter	LDA	GAS	Aggregated	10	799.8	464.1	799.790
2016	Winter	LDA	DSL	Aggregated	10	427.8	0.0	427.777

LDA Idling Calculation

2015	Annual	LDA	GAS	Aggregated		CO2_RUNEX		
						Annual	Winter	Summer
Speed	5	miles/hr	GAS	Aggregated	Aggregated	1097.2	1078.3	1206.6
	8.046	km/hr	DSL	Aggregated	Aggregated	463.5	463.5	463.5

		CO2_run	g/mile		Comment
Tailpipe Gas LDA (ann)	g/vkt	1151.4	1852.9	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (ann)	g/vkt	265.8	427.8	EMFAC2011	
Tailpipe Gas LDA (summer)	g/vkt	1203.6	1937.0	EMFAC2011	start emissions - onsite only
Tailpipe DSL LDA (summer)	g/vkt	265.8	427.8	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	681.8	1097.2	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	288.0	463.5	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.8	1206.6	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.0	463.5	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	1116.2	1796.2	sum	Assumption - Based On Idling for 7.5% of time
Composite Emission Factor DSL (ann)	g/vkt	267.5	430.5	sum	
Composite Emission Factor Gas (summer)	g/vkt	1169.6	1882.2	sum	
Composite Emission Factor DSL (summer)	g/vkt	267.5	430.5	sum	
% Of Diesel LDA	0.38%				Based on ratio of gas:diesel VMT
Composite Emission Factor (Ann)	g/vkt	1112.9	1791.0	sum	Based on 0.38% Diesel
Composite Emission Factor (summer)	g/vkt	1166.2	1876.7	sum	

AERMOD Model Inputs

Paved road modelled as a series of adjoining point sources

	HHDT		LDA	
	CO2		CO2	
Spacing of point sources	9	m	9	
AERMOD Point Sources	80		80	
Distance Travelled Onsite	0.720	km	0.720	
	0.447	miles	0.447	
Emission Factor/vehicle	1425.0	g/hr	839.6	based on summer
Emission Factor/vehicle	1168.4	g/hr	801.3	based on annual
Emission Factor/vehicle	0.396	g/sec	4.665	includes all trips/day
Emission Factor/vehicle	0.325	g/sec	4.452	
Emission Factor/vehicle/AERMOD Source	4.95E-03	g/sec	5.83E-02	based on summer
Emission Factor/vehicle/AERMOD Source	4.06E-03	g/sec	5.56E-02	based on annual

Staff Numbers			Trips
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

	NOX	NOX	NOX	NOX
Weekday Hours	Emissions (g/s)	Vehicles Per Hour	Emissions (g/s)	Including LDA
1	4.95E-03	0	0.00E+00	5.83E-02
2	4.95E-03	0	0.00E+00	0.00E+00
3	4.95E-03	0	0.00E+00	0.00E+00
4	4.95E-03	0	0.00E+00	0.00E+00

5	4.95E-03	0	0.00E+00	0.00E+00
6	4.95E-03	0	0.00E+00	0.00E+00
7	4.95E-03	0	0.00E+00	0.00E+00
8	4.95E-03	0	0.00E+00	0.00E+00
9	4.95E-03	0	0.00E+00	1.17E-01
10	4.95E-03	2	9.90E-03	9.90E-03
11	4.95E-03	0	0.00E+00	0.00E+00
12	4.95E-03	0	0.00E+00	0.00E+00
13	4.95E-03	0	0.00E+00	0.00E+00
14	4.95E-03	2	9.90E-03	9.90E-03
15	4.95E-03	0	0.00E+00	0.00E+00
16	4.95E-03	0	0.00E+00	0.00E+00
17	4.95E-03	0	0.00E+00	5.83E-02
18	4.95E-03	0	0.00E+00	0.00E+00
19	4.95E-03	0	0.00E+00	0.00E+00
20	4.95E-03	0	0.00E+00	0.00E+00
21	4.95E-03	0	0.00E+00	0.00E+00
22	4.95E-03	0	0.00E+00	0.00E+00
23	4.95E-03	0	0.00E+00	0.00E+00
24	4.95E-03	0	0.00E+00	0.00E+00

Annual					Maximum Day		
HGV Traffic					Emissions (g/s)	Emissions (g/s)	Emissions (g/s)
	tonnage	truck tonnage	trucks per year	distance travelled (km)	g/trip		lbs/day
Phase 1 Trucks Only	480000	480000	26981	0.720	1424.999		0.00
Phase 1 Trucks & Rail	720000	240000	13750	0.720	1424.999		0.00
Phase 1 Alternative	1350000	480000	26981	0.720	1424.999		0.00
Phase 2	1160000	214400	12339	0.720	1424.999		0.00
Phase 2 Alternative	1160000	310400	17631	0.720	1424.999		0.00
LDA Traffic					Emissions (g/s)		0
		movements/day	movement per year	distance travelled (km)	g/trip		lbs/day
Phase 1 Trucks Only		24	3744	0.720	839.635		44.4335
Phase 1 Trucks & Rail		24	4992	0.720	839.635		44.4335
Phase 1 Alternative		40	10400	0.720	839.635		74.0558
Phase 2		80	20800	0.720	839.635		148.1115
Phase 2 Alternative		80	20800	0.720	839.635		148.1115
							0
							lbs/day
				Combined		Phase 1 Trucks Only	44.433
						Phase 1 Trucks & Rail	44.433
						Phase 1 Alternative	74.056

Phase 2	148.112		
Phase 2 Alternative	148.112		

Phase	Annual Tonnage	Annual Ships	Annual Tonnage			Trucks	Trucks	Rail	Barge	Rail	Barge
			Truck	Rail	Barge	Daily	Hourly	Number/Annum	Number/Annum	Hrs/Annum	Hrs/Annum
Phase 1 Trucks Only	480000	12	480000	0	0	1667	83	0	0	0	0
Phase 1 Trucks & Rail	720000	18	240000	480000	0	833	42	52.9	0	1269.8	0
Phase 1 Alternative	1350000	34	480000	870000	0	1667	83	95.9	0	2301.6	0
Phase 2	1160000	29	360000	360000	720000	1250	63	39.7	51.4	952.4	1234.3
Phase 2 Alternative	**1160000**	**29**	**480000**	**864000**	**96000**	**1667**	**83**	**95.2**	**1.0**	**2285.7**	**24.0**

Public Paved Road (Exhaust Emissions)

(Assumed 20 miles/hr for all vehicles to Lemon Street Junction)

HHDT Emission Factor CO2

EMFAC2011 Emission Rates							*0.6214*
Region Type:	**GAI**						*mile to km*
Region:	**Solano (SF)**						
Calendar Year:	**2016**						
Season:	**Annual**						
Speed:	**20**	**miles/hr**					
Vehicle Classification:	**EMFAC2011 Categories**				**Annual**		
Region	**CalYr**	**Season**	**Veh_Class**	**Fuel**	**MdlYr**	**CO2_run**	
						(gms/mile)	
Solano (SF)	**2016**	**Annual**	**T7 Single**	**DSL**	**Aggregated**	**2152.0**	**Annual**
						2152.0	**Summer**
						2152.0	**Winter**

HHDT Idling Emission Factors

CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	NO2 (g/hr-veh)	
2016	HHDT	D	SF	A		
					7047.5	annual
	Speed	5	miles/hr		7466.2	summer
		8.046	km/hr		6469.3	winter

HHDT Emission Factor

		CO2_run	g/mile		
Tailpipe T7 Single (ann)	g/vkt	1337.23	2151.96	EMFAC2011	
Tailpipe T7 Single (summer)	g/vkt	1337.23	2151.96	EMFAC2011	
Tailpipe T7 Single (winter)	g/vkt	1337.23	2151.96	EMFAC2011	
Idling T7 Single (ann)	g/vkt	875.86	1409.49	EMFAC2011	
Idling T7 Single (summer)	g/vkt	927.90	1493.23	EMFAC2011	
Idling T7 Single (winter)	g/vkt	804.00	1293.85	EMFAC2011	
Composite Emission Factor (Ann)	g/vkt	**1302.63**	**2096.28**	Sum	
Composite Emission Factor (summer)	g/vkt	**1306.53**	**2102.56**	Sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor (winter)	g/vkt	1297.24	2087.60	Sum	

LDA Emission Factor

CalYr	Season	Veh_Class	Fuel	MdlYr	Speed	CO2_RUNEX	CO2_STREX	CO2_RUNEX
					miles/hr	(gms/mile)	(gms/vehicle/day)	(gms/mile)
2016	Annual	LDA	GAS	Aggregated	**20**	497.9		**497.912**
2016	Annual	LDA	DSL	Aggregated	**20**	337.8		**337.796**
2016	Summer	LDA	GAS	Aggregated	**20**	536.5		**536.509**
2016	Summer	LDA	DSL	Aggregated	**20**	337.8		**337.796**
2016	Winter	LDA	GAS	Aggregated	**20**	492.0		**491.965**
2016	Winter	LDA	DSL	Aggregated	**20**	337.8		**337.796**

Idling Calculation							
2016	**Annual**	**LDA**	**GAS**	**Aggregated**	**(gms/mile)**		
					Annual	**Winter**	**Summer**
Speed	**5**	**miles/hr**	GAS	Aggregated	1097.2	1078.3	1206.6
	8.046	**km/hr**	DSL	Aggregated	463.5	463.5	463.5

		CO2	g/mile		

Tailpipe Gas LDA (ann)	g/vkt	309.403	**497.912**	EMFAC2011	**No starting emissions - onsite only**
Tailpipe DSL LDA (ann)	g/vkt	209.906	**337.796**	EMFAC2011	
Tailpipe Gas LDA (summer)	g/vkt	333.386	**536.509**	EMFAC2011	
Tailpipe DSL LDA (summer)	g/vkt	209.906	**337.796**	EMFAC2011	
Idling Gas LDA (ann)	g/vkt	681.813	**1097.222**	EMFAC2011	
Idling Diesel LDA (ann)	g/vkt	288.037	**463.530**	EMFAC2011	
Idling Gas LDA (summer)	g/vkt	749.788	**1206.611**	EMFAC2011	
Idling Diesel LDA (summer)	g/vkt	288.037	**463.530**	EMFAC2011	
Composite Emission Factor Gas (ann)	g/vkt	337.334	**542.861**	sum	**Assumption - Based On Idling for 7.5% of time**
Composite Emission Factor DSL (ann)	g/vkt	215.766	**347.226**	sum	
Composite Emission Factor Gas (summer)	g/vkt	364.617	**586.766**	sum	
Composite Emission Factor DSL (summer)	g/vkt	215.766	**347.226**	sum	
% Of Diesel LDA	0.38%				
Composite Emission Factor (Ann)	g/vkt	**336.872**	**542.117**	sum	**Based on 0.38% Diesel**
Composite Emission Factor (summer)	g/vkt	**364.051**	**585.856**	sum	

AERMOD Model Inputs

Paved road modelled as a series of point sources

		HHDT CO2		LDA CO2	
Spacing of point sources		**14**	**m**	**14**	2-way roadway
AERMOD Point Sources		**51**		**51**	
Distance Travelled (Lemon Street)		**0.720**	**km**	**0.720**	to junction Sonoma Blvd
Emission Factor/vehicle		**940.70**	**g/hr**	**262.12**	based on Summer
Emission Factor/vehicle		**937.89**	**g/hr**	**242.55**	based on Annual
Emission Factor/vehicle		**0.261**	**g/sec**	**1.456**	includes shift trips/day
Emission Factor/vehicle		**0.261**	**g/sec**	**1.347**	includes shift trips/day
Emission Factor/vehicle/AERMOD Source		**5.12E-03**	**g/sec**	**2.86E-02**	**based on summer**
Emission Factor/vehicle/AERMOD Source		**5.11E-03**	**g/sec**	**2.64E-02**	**based on annual**

Staff Numbers			**Trips**
Phase 1 Trucks Only	12	1 shift	24
Phase 1 Trucks & Rail	12	1 shift	24
Phase 1 Alternative	20	1 shift	40
Phase 2	20	2 shift	80
Phase 2 Alternative	20	2 shift	80

Diurnal Emission Factors Based On Truck Movement Breakdown

Phase 2 Alternative **based on summer**

Weekday Hours	**CO2 Emission Factor**	**Milestone5 VMT**	**CO2 Emission Factor**	**CO2 Including LDA**
1	**5.12E-03**	**0**	**0.00E+00**	**2.86E-02**
2	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
3	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
4	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
5	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
6	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
7	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
8	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
9	**5.12E-03**	**0**	**0.00E+00**	**5.71E-02**
10	**5.12E-03**	**2**	**2.05E-02**	**2.05E-02**
11	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
12	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
13	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
14	**5.12E-03**	**2**	**2.05E-02**	**2.05E-02**
15	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
16	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
17	**5.12E-03**	**0**	**0.00E+00**	**2.86E-02**
18	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
19	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
20	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**
21	**5.12E-03**	**0**	**0.00E+00**	**0.00E+00**

22	5.12E-03	0	0.00E+00	0.00E+00
23	5.12E-03	0	0.00E+00	0.00E+00
24	5.12E-03	0	0.00E+00	0.00E+00

4.0
including deliveries (2 per day, 10am, 2pm)

	To junct of Sonoma Blvd	Deliveries	Staff
Distance Travelled	0.720	80.47	39.91
Units	km	km	km
Estimated Average Mileage (2-way)		(50 miles)	(24.8 miles)

Annual				Maximum Day	Annual Mean	
HGV Traffic				CO2	CO2	CO2
			distance travelled (km)	g/trip	g/trip	lbs/day
Phase 1 Trucks Only			80.47	84282.06	83968.02	743.368
Phase 1 Trucks & Rail			80.47	84282.06	83968.02	743.368
Phase 1 Alternative			80.47	84282.06	83968.02	743.368
Phase 2			80.47	84282.06	83968.02	743.368
Phase 2 Alternative			80.47	84282.06	83968.02	743.368
LDA Traffic				CO2	CO2	CO2
	movements/day	movement per year	distance travelled (km)	g/trip	g/trip	lbs/day
Phase 1 Trucks Only	24	3744	39.91	9504.98	8800.07	465.700
Phase 1 Trucks & Rail	24	4992	39.91	9504.98	8800.07	465.700
Phase 1 Alternative	40	10400	39.91	9504.98	8800.07	776.166
Phase 2	80	20800	39.91	9504.98	8800.07	1552.332
Phase 2 Alternative	80	20800	39.91	9504.98	8800.07	1552.332
						CO2
						lbs/day
			Combined		Phase 1 Trucks Only	1209.1
					Phase 1 Trucks & Rail	1209.1
					Phase 1 Alternative	1519.5
					Phase 2	2295.7
					Phase 2 Alternative	2295.7

		Length	Width	Area
SONOM_S	Sonoma South of Lemon	735	24	17640
SONOM_N	Sonoma North of Lemon	525	24	12600
LEMON_E	Lemon East of Sonoma	820	16	13120
SONOM_S2	Sonoma South of Magazine	698	24	16752

2016		HHDT	LDA	
Emission factor, E (annual)	g/VKT	1043.509	220.498	Sonoma Blvd
Emission factor, E (summer)	g/VKT	1047.411	238.160	Sonoma Blvd
Emission factor, E	g/VKT	1297.237	364.051	Lemon

Sonoma North of Lemon

Paved road modelled as a series of point sources

	HHDT		LDA	
	CO2		CO2	
Spacing of point sources	*24*	*m*	*24*	*2-way roadway*

AERMOD Point Sources		22		22	
Distance Travelled (Lemon Street)		0.525	km	0.525	
Emission Factor/vehicle		547.84	g/hr	115.76	based on winter
Emission Factor/vehicle		0.152	g/sec	0.643	includes shift trips/day
Emission factor, E (summer)		6.92E-03	g/sec	2.92E-02	

Sonoma North of Lemon		0.525
Split	0.05	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.92E-03	0.00	0.00E+00	1.46E-03	1.46E-03
2	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
5	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
6	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
7	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
8	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
9	6.92E-03	0.00	0.00E+00	2.92E-03	2.92E-03
10	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
11	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
12	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
13	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
14	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
15	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
16	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
17	6.92E-03	0.00	0.00E+00	1.46E-03	1.46E-03
18	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
19	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
20	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
21	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
22	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
23	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
24	6.92E-03	0.00	0.00E+00	0.00E+00	0.00E+00
				g/sec	g/sec
		0.0			Annualised
		including deliveries (2 per day, 10am, 2pm)			2.44E-04
			Distance		

Sonoma South of Lemon

Paved road modelled as a series of point sources

	HHDT	LDA	

	CO2		CO2	
Spacing of point sources	24	m	24	2-way roadway
AERMOD Point Sources	31		31	
Distance Travelled (Lemon Street)	0.735	km	0.735	
Emission Factor/vehicle	766.979	g/hr	162.066	based on winter
Emission Factor/vehicle	0.21305	g/sec	0.900366	includes shift trips/day
Emission factor, E (summer)	6.87E-03	g/sec	2.90E-02	

Sonoma South of Lemon		0.735
Split	0.39	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.87E-03	0.00	0.00E+00	1.13E-02	1.13E-02
2	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
5	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
6	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
7	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
8	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
9	6.87E-03	0.00	0.00E+00	2.27E-02	2.27E-02
10	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
11	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
12	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
13	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
14	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
15	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
16	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
17	6.87E-03	0.00	0.00E+00	1.13E-02	1.13E-02
18	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
19	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
20	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
21	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
22	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
23	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
24	6.87E-03	0.00	0.00E+00	0.00E+00	0.00E+00
				g/hr	g/sec
		0.0			Annualised
		including deliveries (2 per day, 10am, 2pm)			1.89E-03
			Distance		
Lemon St East Of Sonoma					

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		16	m	16	2-way roadway
AERMOD Point Sources		51		51	
Distance Travelled (Lemon Street)		0.820	km	0.820	
Emission Factor/vehicle		858.877	g/hr	195.292	based on winter
Emission Factor/vehicle		0.23858	g/sec	1.084953	includes shift trips/day
Emission factor, E (summer)		4.68E-03	g/sec	2.13E-02	

Lemon St East Of Sonoma		0.82
Split	0.56	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	4.68E-03	0.00	0.00E+00	1.19E-02	1.19E-02
2	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
5	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
6	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
7	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
8	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
9	4.68E-03	0.00	0.00E+00	2.38E-02	2.38E-02
10	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
11	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
12	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
13	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
14	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
15	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
16	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
17	4.68E-03	0.00	0.00E+00	1.19E-02	1.19E-02
18	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
19	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
20	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
21	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
22	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
23	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
24	4.68E-03	0.00	0.00E+00	0.00E+00	0.00E+00
				g/hr	g/sec
		0.0			Annualised
		including deliveries (2 per day, 10am, 2pm)			1.99E-03

actual vs round

0.0

0.0

Sonoma South of Magazine

Paved road modelled as a series of point sources

		HHDT		LDA	
		HHDT		HHDT	
Spacing of point sources		24	m	24	2-way roadway
AERMOD Point Sources		29		29	
Distance Travelled (Lemon Street)		0.698	km	0.698	
Emission Factor/vehicle		728.369	g/hr	153.907	based on winter
Emission Factor/vehicle		0.20232	g/sec	0.855042	includes shift trips/day
Emission factor, E (summer)		6.98E-03	g/sec	2.95E-02	

Sonoma South of Magazine		0.698
Split	0.39	km

Phase 2 Alternative

Weekday Hours	CO2 Emission Factor	Milestone5 VMT	CO2 Emission Factor	CO2 Including LDA	Annualised Emission Rate CO2 Emission Factor
1	6.98E-03	0.00	0.00E+00	1.15E-02	1.15E-02
2	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
3	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
4	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
5	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
6	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
7	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
8	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
9	6.98E-03	0.00	0.00E+00	2.30E-02	2.30E-02
10	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
11	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
12	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
13	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
14	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
15	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
16	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
17	6.98E-03	0.00	0.00E+00	1.15E-02	1.15E-02
18	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
19	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
20	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
21	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
22	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
23	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00
24	6.98E-03	0.00	0.00E+00	0.00E+00	0.00E+00

		g/s	g/s
0.0			Annualised
including deliveries (2 per day, 10am, 2pm)			1.92E-03