San Luis Low Point Improvement Project Environmental Impact Statement / Environmental Impact Report

Appendix O: Detailed Air Quality Emission Calculations

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Appendix O
Detailed Air Quality Emission Calculations

O.1 Assessment Methods

The following sections provide additional discussion of emission estimation methodologies used for each source group. Attachment 1 summarizes the emission factors and detailed calculations for each emissions source.

For the unpaved haul roads and other sources of fugitive dust (e.g., grading), it was assumed that they would be watered regularly to reduce emissions. Fugitive dust emissions would be reduced by 61 percent with watering (Countess Environmental 2006). For the paved haul roads, it was assumed that a pipe-grid trackout-control device would be installed to minimize trackout from unpaved roads and other dirt construction areas. Paved road dust emissions would be reduced by 80 percent with the installation of the control device (Countess Environmental 2006).

In cases where emission factors are only available for inhalable particulate matter (PM_{10}), emissions of fine particulate matter (PM2.5) are estimated using speciation profiles published by California Air Resources Board (CARB) (2016).

O.1.1 On-Site Construction Equipment Engine Emissions

Emission factors were developed using several of CARB's emission factor models. For off-road construction equipment, the OFFROAD2017 Web Database (CARB 2017) was primarily used to estimate emissions. Emission factors were developed by Merced and Santa Clara Counties for calendar years 2020 to 2022.

The average power rating (horsepower [hp]) for the equipment was weighted from the equipment population and hp bins contained in the models. The emission factors that were developed for each piece of equipment are multiplied by the number of pieces of each equipment type that would be used during each phase of construction for each alternative. Peak daily and annual emissions were calculated based on the emission factors and data provided by the design engineers. Table O-1 summarizes the maximum daily equipment counts for each alternative. Although the equipment counts represent the maximum daily values, it is not assumed that every piece of equipment would operate simultaneously.

Table O-1. Off-Road Engine Equipment Counts

Equipment Type	Lower San Felipe Intake Alternative – Tunneling Option	Lower San Felipe Intake Alternative – Pipeline Option	Treatment Alternative	San Luis Reservoir Enlargement and Treatment Alternative[1]	Pacheco Reservoir Expansion Alternative
Aerial Lifts	0	0	0	0	2
Air Compressors	0	0	0	0	4
Boomtrucks	0	0	0	0	3
Bulldozer	2	2	1	4	6
Cement and Mortar Mixers	0	0	0	0	1
Chipper	0	0	0	0	0
Concrete Pumpers	2	1	2	2	0
Concrete Saw Cutters	0	0	2	2	0
Cranes	4	3	2	2	7
Drill Rig	1	0	0	0	0
Dump Truck	0	0	0	13	10
Excavator	1	1	1	3	1
Flatbed Trucks (on site)	3	3	4	4	3
Grader	2	2	0	1	2
Loaders	2	2	1	1	12
Maintenance Trucks	0	0	0	0	23
Portable Diesel Generators	7	4	0	0	4
Pressure Washers	0	0	0	0	2
Pumps	0	0	0	0	5
Roller	0	0	0	0	7
Scraper	1	1	0	0	1
Signal Boards	0	0	0	0	12
Skidders	0	0	0	0	3
Truck Mounted Drill Rig (Wells)	0	0	0	0	4
Vibrating Plate	0	0	0	0	0
Water Truck	2	2	2	5	6
Welders	0	0	0	0	4
Wheel Trencher	0	0	2	2	0
Total	**27**	**21**	**17**	**39**	**122**

Notes:

[1] Equipment inventory represents equipment that would operate during a peak day of construction. It was assumed that all equipment would operate simultaneously throughout construction.

The construction schedule is based on a 10-hour work day (one shift) for all alternatives except the San Luis Reservoir Enlargement Alternative and the Pacheco Reservoir Expansion Alternative, which are based on two shifts (20 hours per day). For the Lower San Felipe Intake Alternative, it was assumed that tunnel boring operations would continue 24 hours per day; therefore, 12 employees would work in the tunnel each day (assumes four workers per 8-hour shift).

O.1.2 Off-Site Haul/Delivery Truck and Construction Worker Engine Emissions and Road Dust

Engine exhaust emissions would occur from several on-road vehicles including dump trucks, concrete trucks, delivery trucks, gravel/paving trucks, and soil hauling trucks. Water trucks and flatbed trucks could also operate onsite during construction activities. Furthermore, emissions would also occur from construction workers commuting to the various construction sites. Off-site vehicle trip assumptions are consistent with those used in Chapter 15, Traffic and Transportation.

Haul and delivery truck emission factors were estimated using EMFAC2014 (CARB 2014) for heavy-duty diesel engines while the water and flatbed trucks were assumed to be medium-duty vehicles. Construction worker commuting emissions were estimated from the specific county's fleet mix for passenger automobiles and light-duty trucks. Both gasoline and diesel engines were assumed to be used by the construction workers.

For the haul/delivery trucks and construction workers, emission factors were estimated from the combined speeds in the various counties (i.e., a "burden" model run), rather than a specific speed. The onsite trucks were assumed to operate at 40 miles per hour (mph). In addition to engine exhaust emissions, emission factors for tire wear, brake wear, and re-entrained paved road dust were also estimated. The EMFAC2014 model estimates tire wear and brake wear, but paved road dust emissions were estimated using the USEPA's *Compilation of Air Pollutant Emission Factors* (AP-42, USEPA 2011).

O.1.3 Unpaved Road Dust

Fugitive dust emissions would occur from unpaved access roads within the project site. The methodology documented in Section 13.2.2 (USEPA 2006a) of AP-42 was used to estimate fugitive dust emissions from the haul trucks operating on these roads.

AP-42 requires an emission factor to be calculated using variables like the surface material silt content and mean vehicle weight on the roads. Two different equations are provided in AP-42 depending on whether the road is located at an industrial site or a publicly accessible road. The latter equation for publicly accessible roads assumes that the road will be dominated by light-duty vehicles; since haul trucks would be the primary equipment on the various haul roads, the equation for industrial sites (shown below) was used to estimate emissions.

$$E_{ext} = k(s/12)^{a}(W/3)^{b}[(365 - P)/365]$$

Where:

E_{ext} = annual size-specific emission factor extrapolated for natural mitigation (pounds per vehicle mile traveled [lbs/VMT])

k, a, and b empirical constants (Table O-2)

s = surface material silt content (percent)

W = mean vehicle weight (tons)

P = number of days in a year with at least 0.254 millimeters (mm) (0.01 inches [in]) of precipitation, 49 days

Table O-2 summarizes the empirical constants used in the preceding equation and the calculated emission factors for the articulated trucks. A silt content of 8.5 percent was used for all unpaved haul roads, which was estimated as the mean silt content for construction sites by USEPA (2006a). The vehicular weight was estimated as 88 tons, which is the average of the loaded and unloaded Caterpillar 773G weights, which is assumed to be used at the site. The number of days of precipitation was estimated at approximately 49 days for Merced County (CAPCOA 2017).

Table O-2. Unpaved Road Dust Emission Factors

Constant	PM_{10}	$PM_{2.5}$
k (lbs/VMT)	1.5	0.15
a	0.9	0.9
b	0.45	0.45
E_{ext} (lbs/VMT)	4.4	0.4

Source: USEPA 2006a

Key:
lbs/VMT = pounds per vehicle miles traveled; PM10 = inhalable particulate matter; PM2.5 = fine particulate matter

Based on information provided by the project applicant, it was assumed the 13 articulate trucks would move 11,200 cubic yards of soil per day along the haul route.

O.1.4 Material Handling

Fugitive dust emissions would also occur from material handling activities, from truck loading/unloading, and other "drops." The methodology documented in Section 13.2.4 (USEPA 2006b) of AP-42 was used to estimate fugitive dust emissions from these activities. Dust emissions were estimated using the following equation:

$$E = (0.0032)\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

Where:

E = emission factor (pounds per ton [lbs/ton])

k = particle size multiplier (0.35 for PM_{10}, 0.053 for $PM_{2.5}$)

U = wind speed (9.64 mph)[1]

M = material moisture content (7.9 percent)

Emissions were calculated assuming there would be a production rate of 22,400 cubic yards per day (two shifts per day); assuming a construction schedule of 7 days per week (365 days per year), this would result in an annual excavated quantity of 114,464,000 cubic yards. Emission factors were calculated as 0.00038 pounds PM_{10} per ton of soil and 0.000058 pounds $PM_{2.5}$ per ton of soil.

O.1.5 Grading

Fugitive dust emissions would also occur during grading for haul road maintenance. Fugitive dust emissions from this activity were estimated in accordance with Section 11.9 of AP-42 with the following equations (USEPA 1998):

$$E_{TSP} = 0.040(S)^{2.5} \text{ and } E_{PM15} = 0.051(S)^{2.0}$$

Where:

E_{TSP} = emission factor for total suspended particles up to 30 microns (lbs/VMT)

E_{PM15} = emission factor for particles up to 15 microns (lbs/VMT)

S = mean vehicle speed (mph)

To estimate PM_{10} emissions, the equation for total suspended particulate matter (TSP) was multiplied by a scaling factor of 0.60, while the PM_{15} equation was multiplied by 0.031 to estimate $PM_{2.5}$ emissions. The average grader speed was assumed to be 7.1 mph, which is the default value in AP-42. Using these assumptions, the emission factors were calculated as 1.54 pounds PM_{10} per vehicle miles traveled (VMT) and 0.17 pounds $PM_{2.5}$ per VMT.

Grading activities were assumed to occur 30 days per month for 20 hours per day. Using the number of graders provided by the project applicant and assuming construction would occur over a year, the total VMT was estimated for each alternative. The annual VMT was then multiplied by the emission factor to calculate emissions.

O.1.6 Bulldozing

Fugitive dust emissions would also occur during bulldozing. Fugitive dust emissions from this activity were estimated in accordance with Section 11.9 of AP-42 (USEPA 1998) with the following equations:

$$E_{TSP} = \frac{5.7(s)^{1.2}}{(M)^{1.3}} \text{ and } E_{PM15} = \frac{1.0(s)^{1.5}}{(M)^{1.4}}$$

[1] Wind speed estimated for 2015 calendar year data from the Route 152 San Luis meteorological station (CF031) (MesoWest 2016).

Where:

E_{TSP} = emission factor for total suspended particles up to 30 microns (lbs/VMT)

E_{PM15} = emission factor particles up to 30 microns (lbs/VMT)

s = material silt content (6.9 percent)

M = material moisture content (7.9 percent)

To estimate PM_{10} emissions, the equation for TSP was multiplied by the scaling factor of 0.75, while the PM_{15} equation was multiplied by 0.105 to estimate $PM_{2.5}$ emissions (USEPA 1998). The material silt and moisture contents were assumed to be 6.9 and 7.9 percent, respectively, which are the default values in AP-42. Using these assumptions, the emission factors were calculated as 0.75 pounds PM_{10} per hour and 0.41 pounds $PM_{2.5}$ per hour.

As with grading, bulldozing activities were assumed to occur 30 days per month for 20 hours per day. Using the expected duration of construction for the schedule provided by the project applicant and the quantity of dozers, the number of bulldozing hours per dozer was estimated. The project hours were then multiplied by the emission factor to estimate project emissions.

O.1.7 Marine Emissions (Tugboats, Barges, and Dredges)

Marine emissions would occur from vessels used during construction of either a tunnel or pipeline in the Lower San Felipe Intake Alternative. The tugboats used to move the barges and dredges within the San Luis Reservoir and the crew and supply boats would use both propulsion and auxiliary engines. Emission factors were developed following equations contained in CARB's *Initial Statement of Reasons for the Proposed Rulemaking: Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline* (2010).

Data on the average number of engines per vessel, the average annual operating hours per vessel type, and the useful life of each vessel were obtained from CARB's *Emissions Estimation Methodology for Commercial Harbor Craft Operating in California* (2007). Information on the quantity and average horsepower of auxiliary and propulsion engines and the vessel age were estimated from CARB's *Statewide Commercial Harbor Craft Survey* (2004).

The equation used to estimate reactive organic gases (ROG), CO, NOx, or particulate matter (PM) emissions is as follows:

$$E = EF_0 \times F \times \left(1 + D \times \frac{A}{UL}\right) \times HP \times LF \times Hr$$

Where:

E = amount of emissions of a pollutant emitted during one period

EF_0 = the model year, horsepower, and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)

F = fuel correction factor that accounts for emission reduction benefits from burning cleaner fuel

D = horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine

A = age of the engine when the emissions are estimated

UL = 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

SO_2 emissions were estimated based on the sulfur content of diesel fuel. The sulfur content for all marine vessels was assumed to be 15 ppm based on requirements in Title 13 California Code of Regulations, Section 2281(a). The equation used to estimate SO_2 emissions from marine vessels is as follows:

SO_2 (grams per brake horsepower-hour [g/bhp-hr]) = (S content in fuel [ppm]/1,000,000) x (2 grams SO_2/grams S) x Brake Specific Fuel Consumption (184 g/bhp-hr) = 0.00552 g/bhp-hr

Barges would be operated under both the tunnel and pipeline options. Dredges would operate in the Lower San Felipe Intake Alternative during construction of the pipeline; dredges would not be used during tunnel construction.

O.2 Required Fugitive Dust Control Measures

The Bay Area Air Quality Management District (BAAQMD) recommends implementing basic construction mitigation measures at all construction sites, regardless of size, to meet the best management practices threshold for fugitive dust. Additionally, additional construction mitigation measures should be implemented if construction-related emissions exceed the significance thresholds described in its California Environmental Quality Act (CEQA) Guidelines. The feasible control measures for PM_{10} construction emissions are summarized below (BAAQMD 2017):

1. Basic Construction Mitigation Measures Recommended for ALL Proposed Projects:

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

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

    c. 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.

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

    e. 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.

    f. 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 [13 CCR 2845]). Clear signage shall be provided for construction workers at all access points.

    g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.

    h. 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 BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

2. Additional Construction Mitigation Measures Recommended for Projects with Construction Emissions Above Threshold:

    a. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.

    b. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.

    c. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.

    d. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.

    e. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.

    f. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.

    g. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6- to 12-inch compacted layer of wood chips, mulch, or gravel.

    h. Sandbags or other erosion control measures hall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.

    i. Minimizing the idling time of diesel powered construction equipment to two minutes.

    j. The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NOx reduction and 45 percent PM reduction compared to the most recent CARB fleet average. Acceptable options tor reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.

    k. Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).

l. Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM.

m. Requiring all contractors to use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines.

Additionally, for construction activities occurring in Merced County, the construction contractor must follow the requirements of the San Joaquin Valley Air Pollution Control District (SJVAPCD) Regulation VIII for fugitive PM_{10} prohibitions. Rule 8021 specifies the fugitive dust control measures that are required for all construction, demolition, excavation, extraction, and other earthmoving activities. In addition to general requirements to limit the visible dust emissions to 20 percent opacity by applying water or other stabilizers, the SJVAPCD also requires vehicle speeds to be limited to 15 mph on all uncontrolled unpaved access/haul roads within construction sites.

O.3 References

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San Luis Low Point Improvement Project Environmental Impact Statement / Environmental Impact Report

Appendix O: Attachment A, Detailed Air Quality Emission Calculations Tables

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Operations & Maintenance Emissions

Table A-1. Maximum Daily Operational Emissions (lbs/day)

Alternative	ROG	NOx	CO	SOx	PM10	PM2.5
San Felipe Low Point						
LOX Delivery Trucks	0.02	0.53	0.07	0.002	0.02	0.01
Treatment						
Workers	0.001	0.003	0.03	0.0001	0.007	0.002
Solid Waste Disposal	0.004	0.28	0.21	0.0008	0.006	0.002
Treatment Subtotal	0.005	0.28	0.24	0.0009	0.013	0.004

Table A-2. Annual Operational Emissions (tons per year)

Alternative	ROG	NOx	CO	SOx	PM10	PM2.5
San Felipe Low Point						
LOX Delivery Trucks	0.001	0.02	0.003	0.0001	0.001	0.0004
Treatment						
Workers	0.00011	0.0006	0.006	0.000025	0.00120	0.00037
Solid Waste Disposal	0.00002	0.0012	0.001	0.000004	0.00003	0.00001
Treatment Subtotal	0.00013	0.0018	0.007	0.000029	0.00123	0.00038

Operation & Maintenance Trip Assumptions

Lower San Felipe Intake Alternative

Air Compressor Operation	92	days per year	(Assumes 200 HP operating 25% of year)
Air Flow Rate	1,200	scfm	(Mattei Air Compressor, Model MAXIMA 160 X, 200 hp)
	1,728,000	scf per day	
	158,976,000	scf per year	
Delivery Truck Capacity	20	tons per truck	http://www.uigi.com/delivery.html
	483,200	scf/truck	
Equivalent LOX Truck Trips	4	trucks per day	
	330	trucks per year	

Table A-3. LOX Delivery Truck Emissions

Source	ROG	NOx	CO	SOx	PM10	PM2.5
Emission Factor (g/mi)	0.15	4.53	0.62	0.02	0.21	0.078
Emissions (lbs/day)	0.02	0.53	0.07	0.002	0.02	0.01
Emissions (tons per year)	0.001	0.02	0.003	0.0001	0.001	0.0004

Trip Length 6.6 miles

CAPCOA. 2017. CalEEMod User's Guide, Version 2016.3.2, Appendix D: Default Data Tables, Table 4.2, Merced County, Rural C-NW (Commercial-Nonwork)

CalEEMod User's Guide states that C-NW trips include trips made by delivery vehicles of goods associated with the land use.

Conversions

60	minutes per hour	
24	hours per day	
24,160	scf per ton	(http://www.uigi.com/o2_conv.html)
453.6	grams per pound	
2,000	pounds per ton	

O&M Trip Assumptions
Treatment Alternative

Table A-4. Worker Trips

Source	ROG	NOx	CO	SOx	PM10	PM2.5
Emission Factor (g/mi)	0.01	0.06	0.64	0.003	0.14	0.042
Emissions (lbs/day)	0.00060	0.0030	0.031	0.00014	0.0066	0.0020
Emissions (tons/year)	0.00011	0.00055	0.0056	0.000025	0.0012	0.00037

Trip Length Sources:
CAPCOA. 2017. CalEEMod User's Guide, Version 2016.3.2, Appendix D: Default Data Tables, Table 4.2, Santa Clara County, Urban H-W (Home-Work)
Key: FTE = Full Time Equivalent Employees

Full Time Equivalent Employees	1
Trip Length (miles)	10.8

Maintenance Trips

Treatment

Solids Disposal	10%	increase in solids disposal
Santa Teresa	935	additional pounds per day
	171	additional tons per year

Truck Trips	9	trucks per year

(assumes maximum of one truck per day)

Table A-5. Solid Waste Disposal Truck Trips

Source	ROG	NOx	CO	SOx	PM10	PM2.5
Emission Factor (g/mi)	0.14	8.63	6.40	0.02	0.20	0.07
Emissions (lbs/day)	0.0044	0.28	0.21	0.00079	0.0064	0.0022
Emissions (tons/year)	0.000020	0.0012	0.0009	0.0000036	0.000029	0.000010

Trip Length 7.3 miles
CAPCOA. 2017. CalEEMod User's Guide, Version 2016.3.2, Appendix D: Default Data Tables, Table 4.2, Santa Clara County, Urban C-NW (Commercial-Nonwork).
CalEEMod User's Guide states that C-NW trips include trips made by delivery vehicles of goods associated with the land use.

Conversions

20	tons per truck (CalEEMod User's Guide, Version 2016.3.2)
365	days per year
453.6	grams per pound
2000	pounds per ton

Onroad Motor Vehicle Emission Factors
EMFAC2014

Table A-6. Running Emission Factors

Air Basin	Year	Vehicle Type	(grams per mile)											
			ROG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2021	Workers	0.0137	0.0692	0.6917	0.0030	0.0018	0.0080	0.0368	0.0465	0.0017	0.0020	0.0158	0.0194
		Solid Waste Collection Truck	0.1571	9.2475	1.4032	0.0372	0.0127	0.0360	0.0617	0.1104	0.0122	0.0090	0.0265	0.0476
		Haul Truck	0.1478	4.5343	0.6246	0.0152	0.0206	0.0360	0.0617	0.1184	0.0197	0.0090	0.0265	0.0552
	2022	Workers	0.0123	0.0621	0.6401	0.0029	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
		Solid Waste Collection Truck	0.1477	8.4831	1.4779	0.0368	0.0122	0.0360	0.0617	0.1099	0.0117	0.0090	0.0265	0.0471
		Haul Truck	0.1389	4.0451	0.6105	0.0150	0.0174	0.0360	0.0617	0.1152	0.0167	0.0090	0.0265	0.0521
San Francisco Bay Area	2021	Workers	0.0125	0.0638	0.6437	0.0029	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
		Solid Waste Collection Truck	0.1362	8.6253	6.3955	0.0246	0.0099	0.0360	0.0617	0.1077	0.0095	0.0090	0.0265	0.0450
		Haul Truck	0.1530	4.5740	0.6461	0.0153	0.0207	0.0360	0.0617	0.1185	0.0199	0.0090	0.0265	0.0553
	2022	Workers	0.0113	0.0576	0.5996	0.0028	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
		Solid Waste Collection Truck	0.1311	8.0421	6.9215	0.0230	0.0094	0.0360	0.0617	0.1072	0.0090	0.0090	0.0265	0.0445
		Haul Truck	0.1438	4.0871	0.6319	0.0151	0.0176	0.0360	0.0617	0.1153	0.0168	0.0090	0.0265	0.0523

Criteria Pollutant Construction Emissions Summary

Table A-7. Lower San Felipe Intake Alternative (Tunnel Option) - Maximum Daily Unmitigated Emissions

	Daily Emissions (lbs/day)					
Source	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Off-Road Construction Equipment	26	262	131	0	11	10
On-Road Haul Trucks and Delivery Vehicles	1	25	3	0	1	0
Construction Worker Commuting	0	1	13	0	2	1
Marine Emissions (Tugboats and Crew/Supply Vessels)	35	547	141	0	25	23
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**62**	**835**	**288**	**1**	**39**	**34**

Table A-8. Lower San Felipe Intake Alternative (Pipeline Option) - Maximum Daily Unmitigated Emissions

	Daily Emissions (lbs/day)					
Source	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Off-Road Construction Equipment	24	245	120	0	10	9
On-Road Haul Trucks and Delivery Vehicles	0	12	1	0	1	0
Construction Worker Commuting	0	0	4	0	1	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	70	1,095	283	1	50	46
Dredge (Auxiliary Engines)	76	778	284	1	48	44
Total	**170**	**2,130**	**692**	**2**	**109**	**99**

Table A-9. Treatment Alternative - Maximum Daily Unmitigated Emissions

	Daily Emissions (lbs/day)					
Source	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Off-Road Construction Equipment	4	38	27	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	3	0	0	0	0
Construction Worker Commuting	0	1	7	0	1	0
Total	**4**	**41**	**35**	**0**	**4**	**2**
Significance Threshold	54	54	n/a	n/a	82	54
Significant?	No	No	n/a	n/a	No	No

Note:

Significance thresholds from Bay Area Air Quality Management District CEQA Air Quality Guidelines (2017).

Table A-10. CVP Enlarged Reservoir Expansion Alternative - Maximum Daily Unmitigated Emissions

	Maximum Daily Emissions (pounds per day)					
Source	**VOC**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Onsite Construction Equipment	60	627	358	1	26	24
Construction Worker Commuting	1	3	29	0	6	2
Haul Truck Trips	4	175	18	1	9	3
Fugitive Dust						
Material Handling	--	--	--	--	8	1
Bulldozing	--	--	--	--	6	3
Grading	--	--	--	--	85	9
Paved Road Dust - Haul Roads	--	--	--	--	8	2
Unpaved Road Dust - Haul Roads	--	--	--	--	4,529	453
Total	**65**	**805**	**405**	**2**	**4,677**	**497**

Criteria Pollutant Construction Emissions Summary

Table A-11. New Pacheco Reservoir Alternative - Maximum Daily Unmitigated Emissions

Source	Maximum Daily Emissions (pounds per day)					
	VOC	NOx	CO	SOx	PM10	PM2.5
Onsite Construction Equipment	2,100	2,640	2,848	2,026	2,051	2,048
Construction Worker Commuting	0	3	28	0	8	2
Haul Truck Trips	1	28	8	0	4	1
Total	**2,101**	**2,671**	**2,884**	**2,026**	**2,064**	**2,052**
Significance Threshold	54	54	n/a	n/a	82	54
Significant?	Yes	Yes	n/a	n/a	Yes	Yes

Note:
Significance thresholds from Bay Area Air Quality Management District CEQA Air Quality Guidelines (2017).

References

Bay Area Air Quality Management District. 2017. California Environmental Quality Act Air Quality Guidelines. May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en [Accessed October 22, 2018].

San Joaquin Valley Air Pollution Control District. 2015. Guidance for Assessing and Mitigating Air Quality Impacts. March 19. Available online at: http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf [Accessed October 22, 2018].

San Luis Low Point Improvement Project
Criteria Pollutant Construction Emissions Summary

Table A-12. Lower San Felipe Intake Alternative (Tunnel Option) - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
	2020					
Off-Road Construction Equipment	5	52	25	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	1	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	-	-	-	-	-	-
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**5**	**53**	**26**	**0**	**2**	**2**
	2021					
Off-Road Construction Equipment	5	50	25	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	1	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	1	13	3	0	1	1
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**6**	**64**	**29**	**0**	**3**	**2**
	2022					
Off-Road Construction Equipment	4	41	24	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	1	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	1	22	6	0	1	1
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**6**	**64**	**31**	**0**	**3**	**3**
	2023					
Off-Road Construction Equipment	4	36	24	0	2	1
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	0	2	0	0	0	0
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**4**	**38**	**25**	**0**	**2**	**2**
Maximum Annual Emissions	**6**	**64**	**31**	**<1**	**3**	**3**
General Conformity De Minimis Threshold	10	10	n/a	100	100	100
Significant?	No	Yes	n/a	No	No	No
SJVAPCD Significance Threshold	10	10	100	27	15	15
Significant?	No	Yes	No	No	No	No

Note:

Although Merced County is an attainment area for NO2 and SO2, it is a nonattainment area for PM2.5. As a result, it is necessary to provide de minimis thresholds for NO2 and SO2 as precursors to PM2.5 formation.

Table A-13. Lower San Felipe Intake Alternative (Pipeline Option) - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
	2020					
Off-Road Construction Equipment	4	42	20	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	-	-	-	-	-	-
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**4**	**42**	**21**	**0**	**2**	**2**
	2021					
Off-Road Construction Equipment	4	40	20	0	2	2
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	12	185	48	0	8	8
Dredge (Auxiliary Engines)	0	4	2	0	0	0
Total	**16**	**230**	**70**	**0**	**10**	**10**
	2022					
Off-Road Construction Equipment	3	33	19	0	1	1
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	1	17	4	0	1	1
Dredge (Auxiliary Engines)	0	0	0	0	0	0
Total	**4**	**50**	**24**	**0**	**2**	**2**
Maximum Annual Emissions	**16**	**230**	**70**	**<1**	**10**	**10**
De minimis Threshold	10	10	n/a	100	100	100
Significant?	Yes	Yes	n/a	No	No	No
SJVAPCD Significance Threshold	10	10	100	27	15	15
Significant?	Yes	Yes	No	No	No	No

Note:

Although Merced County is an attainment area for NO2 and SO2, it is a nonattainment area for PM2.5. As a result, it is necessary to provide de minimis thresholds for NO2 and SO2 as precursors to PM2.5 formation.

Table A-14. Treatment Alternative - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
	2020					
Off-Road Construction Equipment	1	7	5	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Total	**1**	**7**	**5**	**0**	**0**	**0**
	2021					
Off-Road Construction Equipment	1	7	5	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Total	**1**	**7**	**5**	**0**	**0**	**0**
	2022					
Off-Road Construction Equipment	1	6	4	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Total	**1**	**6**	**5**	**0**	**0**	**0**
Maximum Annual Emissions	**1**	**7**	**5**	**<1**	**<1**	**<1**
De minimis Threshold	100	100	100	100	n/a	100
Significant?	No	No	No	No	n/a	No

Note:

Although Santa Clara County is an attainment area for NO2 and SO2, it is a nonattainment area for PM2.5. As a result, it is necessary to provide de minimis thresholds for NO2 and SO2 as precursors to PM2.5 formation.

Table A-15. CVP Enlarged Reservoir Expansion Alternative - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SOx	PM10	PM2.5
Onsite Construction Equipment	11	114	65	0	5	4
Construction Worker Commuting	0	1	5	0	1	0
Haul Truck Trips	1	32	3	0	2	1
Fugitive Dust						
Material Handling	--	--	--	--	2	0
Bulldozing	--	--	--	--	1	1
Grading	--	--	--	--	16	2
Paved Road Dust - Haul Roads	--	--	--	--	1	0
Unpaved Road Dust - Haul Roads	--	--	--	--	716	72
Total	**12**	**147**	**74**	**0**	**743**	**80**
General Conformity Threshold	10	10	n/a	100	100	100
CEQA Significance Threshold	10	10	100	27	15	15
Exceed De Minimis Threshold?	Yes	Yes	No	No	Yes	No
Exceed CEQA Threshold?	Yes	Yes	No	No	Yes	Yes

Table A-16. New Pacheco Reservoir Alternative - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SOx	PM10	PM2.5
Onsite Construction Equipment	2,038	2,136	2,174	2,024	2,029	2,028
Construction Worker Commuting	0	0	4	0	1	0
Haul Truck Trips	0	3	1	0	0	0
Total	**2,038**	**2,140**	**2,179**	**2,024**	**2,030**	**2,029**
General Conformity Threshold	100	100	100	100	n/a	100
Exceed De Minimis Threshold?	Yes	Yes	Yes	Yes	No	Yes

References

"Subpart B - Determining Conformity of General Federal Actions to State or Federal Implementation Plans." Title 40 Code of

United States Environmental Protection Agency. 2012. The Green Book Nonattainment Areas for Criteria Pollutants (as of July 20, 2012). Available online at: http://www.epa.gov/oaqps001/greenbk/index.html [Accessed on: August 7, 2012].

Criteria Pollutant Construction Emissions Summary

Table A-17. Lower San Felipe Intake Alternative (Tunnel Option) - Maximum Daily Mitigated Emissions

	Daily Emissions (lbs/day)					
Source	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Off-Road Construction Equipment	11	26	100	0	2	1
On-Road Haul Trucks and Delivery Vehicles	0	5	2	0	1	0
Construction Worker Commuting	0	1	13	0	2	1
Marine Emissions (Tugboats and Crew/Supply Vessels)	20	22	138	0	3	3
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**31**	**53**	**254**	**1**	**8**	**5**

Table A-18. Lower San Felipe Intake Alternative (Pipeline Option) - Maximum Daily Mitigated Emissions

	Daily Emissions (lbs/day)					
Source	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Off-Road Construction Equipment	9	21	90	0	2	1
On-Road Haul Trucks and Delivery Vehicles	0	2	1	0	1	0
Construction Worker Commuting	0	0	4	0	1	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	39	43	277	1	6	6
Dredge (Auxiliary Engines)	5	99	77	1	1	1
Total	**53**	**166**	**449**	**2**	**10**	**8**

Table A-19. CVP Enlarged Reservoir Expansion Alternative - Maximum Daily Mitigated Emissions

	Maximum Daily Emissions (pounds per day)					
Source	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Onsite Construction Equipment	17	12	224	1	2	2
Construction Worker Commuting	1	3	29	0	6	2
Haul Truck Trips	2	32	13	1	9	3
Fugitive Dust						
Material Handling	--	--	--	--	8	1
Bulldozing	--	--	--	--	6	3
Grading	--	--	--	--	85	9
Paved Road Dust - Haul Roads	--	--	--	--	8	2
Unpaved Road Dust - Haul Roads	--	--	--	--	116	12
Total	**20**	**47**	**266**	**2**	**240**	**33**

Table A-20. New Pacheco Reservoir Alternative - Maximum Daily Mitigated Emissions

	Maximum Daily Emissions (pounds per day)					
Source	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Onsite Construction Equipment	2,069	2,195	2,705	2,029	2,034	2,033
Construction Worker Commuting	1	3	37	0	12	4
Haul Truck Trips	2	35	14	1	8	2
Total	**2,072**	**2,233**	**2,755**	**2,029**	**2,054**	**2,039**
Significance Threshold	54	54	n/a	n/a	82	54
Significant?	Yes	Yes	n/a	n/a	Yes	Yes

Note:
Significance thresholds from Bay Area Air Quality Management District CEQA Air Quality Guidelines (2017).

Criteria Pollutant Construction Emissions Summary

Table A-21. Lower San Felipe Intake Alternative (Tunnel Option) - Annual Mitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
	2020					
Off-Road Construction Equipment	2	5	17	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	-	-	-	-	-	-
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**2**	**5**	**18**	**0**	**0**	**0**
	2021					
Off-Road Construction Equipment	2	4	17	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	0	1	3	0	0	0
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**2**	**5**	**21**	**0**	**1**	**0**
	2022					
Off-Road Construction Equipment	2	5	17	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	1	1	6	0	0	0
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**3**	**7**	**23**	**0**	**1**	**0**
	2023					
Off-Road Construction Equipment	2	5	17	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	1	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	0	0	0	0	0	0
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**2**	**6**	**19**	**0**	**1**	**0**
Maximum Annual Emissions	**3**	**7**	**23**	**<1**	**1**	**<1**
General Conformity De Minimis Threshold	10	10	n/a	100	100	100
Significant?	No	No	n/a	No	No	No
SJVAPCD Significance Threshold	10	10	100	27	15	15
Significant?	No	No	No	No	No	No

Note:

Although Merced County is an attainment area for NO2 and SO2, it is a nonattainment area for PM2.5. As a result, it is necessary to provide de minimis thresholds for NO2 and SO2 as precursors to PM2.5 formation.

Table A-22. Lower San Felipe Intake Alternative (Pipeline Option) - Annual Mitigated Emissions

Source	Annual Emissions (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
	2020					
Off-Road Construction Equipment	1	3	12	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	-	-	-	-	-	-
Dredge (Auxiliary Engines)	-	-	-	-	-	-
Total	**1**	**3**	**13**	**0**	**0**	**0**
	2021					
Off-Road Construction Equipment	1	3	12	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	5	5	34	0	1	1
Dredge (Auxiliary Engines)	0	1	0	0	0	0
Total	**6**	**9**	**47**	**0**	**1**	**1**
	2022					
Off-Road Construction Equipment	1	4	13	0	0	0
On-Road Haul Trucks and Delivery Vehicles	0	0	0	0	0	0
Construction Worker Commuting	0	0	0	0	0	0
Marine Emissions (Tugboats and Crew/Supply Vessels)	2	3	18	0	0	0
Dredge (Auxiliary Engines)	0	0	0	0	0	0
Total	**4**	**7**	**30**	**0**	**1**	**1**
Maximum Annual Emissions	**6**	**9**	**47**	**<1**	**1**	**1**
De minimis Threshold	10	10	n/a	100	100	100
Significant?	No	No	n/a	No	No	No
SJVAPCD Significance Threshold	10	10	100	27	15	15
Significant?	No	No	No	No	No	No

Note:

Although Merced County is an attainment area for NO2 and SO2, it is a nonattainment area for PM2.5. As a result, it is necessary to provide de minimis thresholds for NO2 and SO2 as precursors to PM2.5 formation.

Table A-23. CVP Enlarged Reservoir Expansion Alternative - Maximum Daily Mitigated Emissions

Source	Annual Emissionsn (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
Onsite Construction Equipment	3	2	41	0	0	0
Construction Worker Commuting	0	1	5	0	1	0
Haul Truck Trips	0	6	2	0	2	0
Fugitive Dust						
Material Handling	--	--	--	--	2	0
Bulldozing	--	--	--	--	1	1
Grading	--	--	--	--	16	2
Paved Road Dust - Haul Roads	--	--	--	--	1	0
Unpaved Road Dust - Haul Roads	--	--	--	--	18	2
Total	**4**	**9**	**49**	**0**	**41**	**6**
De minimis Threshold	10	10	n/a	100	100	100
Significant?	No	No	n/a	No	No	No
SJVAPCD Significance Threshold	10	10	100	27	15	15
Significant?	No	No	No	No	Yes	No

Table A-24. New Pacheco Reservoir Alternative - Maximum Daily Mitigated Emissions

Source	Annual Emissionsn (tons per year)					
	VOC	NOx	CO	SO2	PM10	PM2.5
Onsite Construction Equipment	2,034	2,057	2,149	2,026	2,027	2,027
Construction Worker Commuting	0	1	6	0	2	1
Haul Truck Trips	0	6	2	0	1	0
Total	**2,034**	**2,063**	**2,158**	**2,026**	**2,031**	**2,028**
De minimis Threshold	100	100	100	100	n/a	100
Significant?	Yes	Yes	Yes	Yes	n/a	Yes

Criteria Pollutant Emissions Summary
Off-Road Construction Equipment

Table A-25. Summary of Peak Daily Emissions by Alternative

	Daily Emissions (lbs/day)					
Alternative	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Lower San Felipe Intake Alternative						
Tunnel Option	26.34	261.87	131.23	0.47	10.93	9.85
Pipeline Option	23.73	245.14	119.90	0.45	10.04	8.92
Treatment Alternative	4.03	37.66	26.92	0.06	2.01	1.80

Table A-26. Summary of Annual Emissions by Alternative

	Annual Emissions (tons per year)					
Alternative	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
	2020					
Lower San Felipe Intake Alternative						
Tunnel Option	4.98	52.15	25.48	0.08	2.18	1.97
Pipeline Option	3.91	41.77	20.40	0.06	1.79	1.61
Treatment Alternative	0.73	7.03	4.57	0.01	0.36	0.33
	2021					
Lower San Felipe Intake Alternative						
Tunnel Option	4.87	50.41	25.32	0.08	2.10	1.89
Pipeline Option	3.81	40.21	20.20	0.06	1.71	1.54
Treatment Alternative	0.69	6.69	4.55	0.01	0.34	0.31
	2022					
Lower San Felipe Intake Alternative						
Tunnel Option	4.25	40.64	24.30	0.08	1.74	1.56
Pipeline Option	3.30	32.89	19.15	0.06	1.42	1.27
Treatment Alternative	0.61	5.89	4.39	0.01	0.30	0.27
	2023					
Lower San Felipe Intake Alternative						
Tunnel Option	3.96	36.19	23.60	0.08	1.55	1.39
Pipeline Option	-	-	-	-	-	-
Treatment Alternative	-	-	-	-	-	-
	Annual Maximum					
Lower San Felipe Intake Alternative						
Tunnel Option	4.98	52.15	25.48	0.08	2.18	1.97
Pipeline Option	3.91	41.77	20.40	0.06	1.79	1.61
Treatment Alternative	0.73	7.03	4.57	0.01	0.36	0.33

Lower San Felipe Intake Alternative - Tunnel Option

Table A-27. Equipment List

Equipment	Quantity	Mobilization	Site Improvements	Construct Vertical Shaft	Set up TBM	Tunneling and Spreading of Soils	Cofferdam and TBM Out	Connect to Existing Intake	Fabricate Inlet	Set Inlet and Flood Tunnel	Construct Aeration Facility	Fab and Set Air Tubing	Final Work and Testing	Demobilization
Bulldozer	2	X	X											
Concrete Pumpers	2			X				X	X		X			
Cranes	4			X	X		X		X	X	X			
Drill Rig	1			X										
Excavator	1		X	X							X			
Flatbed Trucks (on site)	3	X	X	X	X	X	X	X	X	X	X	X	X	X
Grader	2		X			X					X			X
Loaders	2	X	X								X			
Portable Diesel Generators	7	X	X	X	X	X	X	X	X	X	X	X	X	X
Scraper	1		X			X					X			
Water Truck	2	X	X			X					X			X

Source: Equipment Tables_08012012.docx; EngineeringDataNeeds_July30_2012.xlsx

Table A-28. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Mobilization	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	5.85	62.28	30.73	0.04	3.03	2.79
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.78	20.74	8.18	0.03	0.69	0.63
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.33	115.86	56.56	0.25	4.44	4.09
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.23	0.64	0.02	0.19	0.09
Mobilization Subtotal							**21.08**	**199.45**	**97.08**	**0.36**	**8.63**	**7.74**
Site Improvements	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	5.85	62.28	30.73	0.04	3.03	2.79
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.62	6.09	8.22	0.01	0.30	0.27
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	2	20	188		2.33	29.11	9.37	0.03	0.97	0.89
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.78	20.74	8.18	0.03	0.69	0.63
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.33	115.86	56.56	0.25	4.44	4.09
	Scraper	ConstMin - Scrapers	1	20	367		2.31	27.21	16.56	0.04	1.04	0.95
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.23	0.64	0.02	0.19	0.09
Site Improvements Subtotal							**26.34**	**261.87**	**131.23**	**0.44**	**10.93**	**9.85**

Table A-28. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Construct Vertical Shaft	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.73	5.36	3.62	0.01	0.26	0.24
	Cranes	ConstMin - Cranes	4	20	231		4.40	52.85	20.67	0.06	2.16	1.99
	Drill Rig	ConstMin - Bore/Drill Rigs	1	20	221		0.71	9.01	5.28	0.02	0.26	0.24
	Excavator	ConstMin - Excavators	1	20	158		0.62	6.09	8.22	0.01	0.30	0.27
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.33	115.86	56.56	0.25	4.44	4.09
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Construct Vertical Shaft Subtotal							**19.87**	**189.52**	**95.32**	**0.37**	**7.71**	**6.97**
Set Up TBM	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		4.18	49.59	20.78	0.06	2.01	1.85
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.50	119.49	57.17	0.25	4.51	4.15
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Set Up TBM Subtotal							**17.75**	**169.39**	**78.89**	**0.33**	**6.79**	**6.13**
Tunneling and Spreading of Soils	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	2	20	188		2.24	27.39	9.11	0.03	0.90	0.83
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.50	119.49	57.17	0.25	4.51	4.15
	Scraper	ConstMin - Scrapers	1	20	367		2.17	24.77	15.60	0.04	0.94	0.87
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.20	0.62	0.02	0.19	0.09
Tunneling and Spreading of Soils Subtotal							**18.02**	**172.16**	**83.44**	**0.36**	**6.82**	**6.07**
Cofferdam and TBM Out	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		3.69	40.63	21.17	0.06	1.70	1.57
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Cofferdam and TBM Out Subtotal							**14.95**	**113.51**	**80.48**	**0.33**	**5.03**	**4.50**

Table A-28. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Connect to Existing Intake	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.69	5.19	3.56	0.01	0.23	0.21
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Connect to Existing Intake Subtotal							**11.95**	**78.06**	**62.87**	**0.29**	**3.55**	**3.15**
Fabricate Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.69	5.19	3.56	0.01	0.23	0.21
	Cranes	ConstMin - Cranes	4	20	231		3.69	40.63	21.17	0.06	1.70	1.57
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fabricate Inlet Subtotal							**15.64**	**118.70**	**84.04**	**0.34**	**5.26**	**4.71**
Set Inlet and Flood Tunnel	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		3.69	40.63	21.17	0.06	1.70	1.57
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Set Inlet and Flood Tunnel Subtotal							**14.95**	**113.51**	**80.48**	**0.33**	**5.03**	**4.50**
Construct Aeration Facility	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.72	5.28	3.60	0.01	0.25	0.23
	Cranes	ConstMin - Cranes	4	20	231		4.18	49.59	20.78	0.06	2.01	1.85
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.58	5.44	8.23	0.01	0.27	0.24
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	2	20	188		2.24	27.39	9.11	0.03	0.90	0.83
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.74	19.55	8.37	0.03	0.65	0.60
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.50	119.49	57.17	0.25	4.51	4.15
	Scraper	ConstMin - Scrapers	1	20	367		2.17	24.77	15.60	0.04	0.94	0.87
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.20	0.62	0.02	0.19	0.09
Construct Aeration Facility Subtotal							**25.24**	**252.03**	**124.42**	**0.47**	**9.99**	**8.99**

Table A-28. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Fab and Set Air Tubing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		13.50	119.49	57.17	0.25	4.51	4.15
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fab and Set Air Tubing Subtotal							**13.57**	**119.80**	**58.11**	**0.27**	**4.79**	**4.28**
Final Work and Testing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Final Work and Testing Subtotal							**11.26**	**72.88**	**59.31**	**0.28**	**3.33**	**2.94**
Demobilization	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.24	0.89	0.02	0.27	0.13
	Grader	ConstMin - Graders	2	20	188		1.93	21.93	8.73	0.03	0.73	0.67
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		11.20	72.64	58.43	0.25	3.06	2.81
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.04	0.16	0.59	0.01	0.18	0.08
Demobilization Subtotal							**13.23**	**94.97**	**68.63**	**0.32**	**4.24**	**3.70**

Peak Day Analysis (Overlapping Phases)						
Mobilization + Site Improvements	26.34	261.87	131.23	0.44	10.93	9.85
Tunneling and Spreading of Soils + Construct Aeration Facility	25.24	252.03	124.42	0.47	9.99	8.99
Tunneling and Spreading of Soils + Construct Aeration Facility + Fab and Set Air Tubing	25.24	252.03	124.42	0.47	9.99	8.99
Cofferdam and TBM Out + Connect to Existing Intake + Fabricate Inlet	15.64	118.70	84.04	0.34	5.26	4.71
Maximum Daily Emissions (lbs/day)	**26.34**	**261.87**	**131.23**	**0.47**	**10.93**	**9.85**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Peak daily emissions based on construction start year because that would represent worst-case (highest) emissions. Emissions typically decrease in future years with improvements in engine technology and as older vehicles are rotated out of service.

Onroad Vehicle Speed
40 mph

Air Basin
San Joaquin Valley

Conversions
453.6 grams per pound

Lower San Felipe Intake Alternative - Pipeline Option

Table A-29. Annual Emissions from Construction Equipment

Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Annual Emissions - 2020 (tons per year)					
					VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	1.05	11.21	5.53	0.01	0.55	0.50
Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18	0.13	0.97	0.65	0.00	0.05	0.04
Cranes	ConstMin - Cranes	4	20	231	0.79	9.51	3.72	0.01	0.39	0.36
Drill Rig	ConstMin - Bore/Drill Rigs	1	20	221	0.13	1.62	0.95	0.00	0.05	0.04
Excavator	ConstMin - Excavators	1	20	158	0.11	1.10	1.48	0.00	0.05	0.05
Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a	0.01	0.06	0.17	0.00	0.05	0.02
Grader	ConstMin - Graders	2	20	188	0.42	5.24	1.69	0.01	0.17	0.16
Loaders	ConstMin - Rubber Tired Loaders	2	20	202	0.32	3.73	1.47	0.01	0.12	0.11
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	369	1.58	13.77	6.72	0.03	0.53	0.49
Scraper	ConstMin - Scrapers	1	20	367	0.42	4.90	2.98	0.01	0.19	0.17
Water Truck	N/A - Onroad engine	2	20	n/a	0.01	0.04	0.12	0.00	0.03	0.02
			Grand Total (tons per year)		**4.98**	**52.15**	**25.48**	**0.08**	**2.18**	**1.97**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given time, regardless of the phase.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound
2,000 pounds per ton
7 days per week
30 days per month

Lower San Felipe Intake Alternative - Pipeline Option

Table A-29. Annual Emissions from Construction Equipment

Equipment	OFFROAD Description	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)						Annual Emissions - 2023 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	1.03	10.94	5.48	0.01	0.53	0.49	0.83	9.22	4.73	0.01	0.42	0.39	0.71	7.71	4.10	0.01	0.34	0.32
Concrete Pumpers	OFF - Light Commercial - Pumps	0.13	0.95	0.65	0.00	0.04	0.04	0.13	0.94	0.64	0.00	0.04	0.04	0.13	0.93	0.64	0.00	0.04	0.04
Cranes	ConstMin - Cranes	0.75	8.93	3.74	0.01	0.36	0.33	0.69	7.89	3.81	0.01	0.33	0.30	0.66	7.31	3.81	0.01	0.31	0.28
Drill Rig	ConstMin - Bore/Drill Rigs	0.12	1.41	0.94	0.00	0.04	0.04	0.11	1.11	0.94	0.00	0.04	0.03	0.10	1.05	0.93	0.00	0.03	0.03
Excavator	ConstMin - Excavators	0.10	0.98	1.48	0.00	0.05	0.04	0.09	0.81	1.47	0.00	0.04	0.04	0.09	0.71	1.47	0.00	0.03	0.03
Flatbed Trucks (on site)	N/A - Onroad engine	0.01	0.06	0.17	0.00	0.05	0.02	0.01	0.05	0.16	0.00	0.05	0.02	0.01	0.04	0.16	0.00	0.05	0.02
Grader	ConstMin - Graders	0.40	4.93	1.64	0.01	0.16	0.15	0.37	4.39	1.59	0.01	0.15	0.13	0.35	3.95	1.57	0.01	0.13	0.12
Loaders	ConstMin - Rubber Tired Loaders	0.31	3.52	1.51	0.01	0.12	0.11	0.26	2.69	1.43	0.01	0.09	0.08	0.24	2.35	1.39	0.01	0.08	0.07
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	1.60	14.20	6.79	0.03	0.54	0.49	1.39	9.79	6.87	0.03	0.41	0.38	1.33	8.63	6.94	0.03	0.36	0.33
Scraper	ConstMin - Scrapers	0.39	4.46	2.81	0.01	0.17	0.16	0.34	3.72	2.55	0.01	0.14	0.13	0.33	3.48	2.47	0.01	0.13	0.12
Water Truck	N/A - Onroad engine	0.01	0.04	0.11	0.00	0.03	0.02	0.01	0.03	0.11	0.00	0.03	0.02	0.01	0.03	0.11	0.00	0.03	0.02
		4.87	**50.41**	**25.32**	**0.08**	**2.10**	**1.89**	**4.25**	**40.64**	**24.30**	**0.08**	**1.74**	**1.56**	**3.96**	**36.19**	**23.60**	**0.08**	**1.55**	**1.39**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of gram
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a gi

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound
2,000 pounds per ton
7 days per week
30 days per month

Lower San Felipe Intake Alternative - Pipeline Option

Table A-30. Equipment List

Equipment	Quantity	Mobilization	Site Improvements	Fabricate Inlet	Build Cofferdam and Set Lower Inlet	Lay Pipe	Connect to Existing Intake	Construct Aeration Facility	Fab and Set Air Tubing	Final Work and Testing	Demobilization
Bulldozer	2	X	X								
Concrete Pumpers	1		X					X			
Cranes	3			X	X	X	X	X			
Excavator	1		X					X			
Flatbed Trucks (on site)	3	X	X	X	X	X	X	X	X	X	X
Grader	2	X	X					X			X
Loaders	2	X	X					X			
Portable Diesel Generators	4	X	X	X	X	X	X	X	X	X	X
Scraper	1		X					X			
Water Truck	2	X	X					X			X

Source: Equipment Tables_08012012.docx; EngineeringDataNeeds_July30_2012.xlsx

Table A-31. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Mobilization	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	5.85	62.28	30.73	0.04	3.03	2.79
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	2	20	188		2.33	29.11	9.37	0.03	0.97	0.89
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.78	20.74	8.18	0.03	0.69	0.63
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.03	43.70	21.33	0.09	1.68	1.54
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.23	0.64	0.02	0.19	0.09
Mobilization Subtotal							**15.11**	**156.41**	**71.22**	**0.24**	**6.83**	**6.08**
Site Improvements	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	5.85	62.28	30.73	0.04	3.03	2.79
	Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18		0.37	2.68	1.81	0.00	0.13	0.12
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.62	6.09	8.22	0.01	0.30	0.27
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	2	20	188		2.33	29.11	9.37	0.03	0.97	0.89
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.78	20.74	8.18	0.03	0.69	0.63
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.03	43.70	21.33	0.09	1.68	1.54
	Scraper	ConstMin - Scrapers	1	20	367		2.31	27.21	16.56	0.04	1.04	0.95
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.23	0.64	0.02	0.19	0.09
Site Improvements Subtotal							**18.41**	**192.39**	**97.81**	**0.29**	**8.30**	**7.43**
Fabricate Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		3.30	39.64	15.50	0.04	1.62	1.49
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.03	43.70	21.33	0.09	1.68	1.54
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fabricate Inlet Subtotal							**8.41**	**83.69**	**37.80**	**0.16**	**3.58**	**3.17**

Table A-31. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Build Cofferdam and Set Lower Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		3.30	39.64	15.50	0.04	1.62	1.49
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.08	0.34	0.96	0.02	0.28	0.14
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.03	43.70	21.33	0.09	1.68	1.54
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Build Cofferdam and Set Lower Inlet Subtotal							**8.41**	**83.69**	**37.80**	**0.16**	**3.58**	**3.17**
Lay Pipe	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		3.14	37.19	15.59	0.04	1.51	1.38
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.09	45.07	21.57	0.09	1.70	1.56
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Lay Pipe Subtotal							**8.30**	**82.57**	**38.09**	**0.16**	**3.48**	**3.08**
Connect to Existing Intake	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		2.90	32.88	15.88	0.04	1.36	1.25
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.27	0.91	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		4.43	31.08	21.80	0.09	1.31	1.20
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Connect to Existing Intake Subtotal							**7.39**	**64.23**	**38.59**	**0.16**	**2.94**	**2.58**
Construct Aeration Facility	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18		0.36	2.64	1.80	0.00	0.12	0.11
	Cranes	ConstMin - Cranes	3	20	231		3.14	37.19	15.59	0.04	1.51	1.38
	Excavator	ConstMin - Excavators	1	20	158		0.58	5.44	8.23	0.01	0.27	0.24
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	2	20	188		2.24	27.39	9.11	0.03	0.90	0.83
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		1.74	19.55	8.37	0.03	0.65	0.60
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.09	45.07	21.57	0.09	1.70	1.56
	Scraper	ConstMin - Scrapers	1	20	367		2.17	24.77	15.60	0.04	0.94	0.87
	Water Truck	N/A - Onroad engine	2	20	n/a		0.05	0.20	0.62	0.02	0.19	0.09
Construct Aeration Facility Subtotal							**15.43**	**162.57**	**81.81**	**0.29**	**6.56**	**5.83**
Fab and Set Air Tubing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.07	0.31	0.94	0.02	0.28	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		5.09	45.07	21.57	0.09	1.70	1.56
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fab and Set Air Tubing Subtotal							**5.16**	**45.38**	**22.50**	**0.12**	**1.98**	**1.70**

Table A-31. Peak Daily Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day) VOC	NOx	CO	SO2	PM10	PM2.5
Final Work and Testing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.27	0.91	0.02	0.27	0.13
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		4.43	31.08	21.80	0.09	1.31	1.20
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Final Work and Testing Subtotal							**4.49**	**31.35**	**22.71**	**0.12**	**1.58**	**1.33**
Demobilization	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.06	0.27	0.91	0.02	0.27	0.13
	Grader	ConstMin - Graders	2	20	188		2.07	24.37	8.82	0.03	0.81	0.74
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		4.43	31.08	21.80	0.09	1.31	1.20
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.04	0.18	0.61	0.01	0.18	0.09
Demobilization Subtotal							**6.60**	**55.91**	**32.14**	**0.16**	**2.57**	**2.16**

Peak Day Analysis (Overlapping Phases)						
Mobilization + Site Improvements	18.41	192.39	97.81	0.29	8.30	7.43
Site Improvements + Fabricate Inlet	21.71	232.03	113.32	0.34	9.92	8.92
Fabricate Inlet + Build Cofferdam and Set Lower Inlet	8.41	83.69	37.80	0.16	3.58	3.17
Lay Pipe + Construct Aeration Facility	23.73	245.14	119.90	0.45	10.04	8.91
Lay Pipe + Construct Aeration Facility + Fab and Set Air Tubing	23.73	245.14	119.90	0.45	10.04	8.91
Maximum Daily Emissions (lbs/day)	**23.73**	**245.14**	**119.90**	**0.45**	**10.04**	**8.92**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Peak daily emissions based on construction start year because that would represent worst-case (highest) emissions. Emissions typically decrease in future years with improvements in engine technology and as older vehicles are rotated out of service.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound

Lower San Felipe Intake Alternative - Tunnel Option

Table A-32. Annual Emissions from Construction Equipment

Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Annual Emissions - 2020 (tons per year)					
					VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	1.05	11.21	5.53	0.01	0.55	0.50
Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18	0.07	0.48	0.33	0.00	0.02	0.02
Cranes	ConstMin - Cranes	3	20	231	0.59	7.13	2.79	0.01	0.29	0.27
Excavator	ConstMin - Excavators	1	20	158	0.11	1.10	1.48	0.00	0.05	0.05
Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a	0.01	0.06	0.17	0.00	0.05	0.02
Grader	ConstMin - Graders	2	20	188	0.42	5.24	1.69	0.01	0.17	0.16
Loaders	ConstMin - Rubber Tired Loaders	2	20	202	0.32	3.73	1.47	0.01	0.12	0.11
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369	0.90	7.87	3.84	0.02	0.30	0.28
Scraper	ConstMin - Scrapers	1	20	367	0.42	4.90	2.98	0.01	0.19	0.17
Water Truck	N/A - Onroad engine	2	20	n/a	0.01	0.04	0.12	0.00	0.03	0.02
			Grand Total (tons per year)		**3.91**	**41.77**	**20.40**	**0.06**	**1.79**	**1.61**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given time, regardless of the phase.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6	grams per pound
2,000	pounds per ton
7	days per week
30	days per month

Lower San Felipe Intake Alternative - Tunnel Option

Table A-32. Annual Emissions from Construction Equipment

Equipment	OFFROAD Description	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	1.03	10.94	5.48	0.01	0.53	0.49	0.83	9.22	4.73	0.01	0.42	0.39
Concrete Pumpers	OFF - Light Commercial - Pumps	0.06	0.48	0.32	0.00	0.02	0.02	0.06	0.47	0.32	0.00	0.02	0.02
Cranes	ConstMin - Cranes	0.56	6.69	2.81	0.01	0.27	0.25	0.52	5.92	2.86	0.01	0.25	0.23
Excavator	ConstMin - Excavators	0.10	0.98	1.48	0.00	0.05	0.04	0.09	0.81	1.47	0.00	0.04	0.04
Flatbed Trucks (on site)	N/A - Onroad engine	0.01	0.06	0.17	0.00	0.05	0.02	0.01	0.05	0.16	0.00	0.05	0.02
Grader	ConstMin - Graders	0.40	4.93	1.64	0.01	0.16	0.15	0.37	4.39	1.59	0.01	0.15	0.13
Loaders	ConstMin - Rubber Tired Loaders	0.31	3.52	1.51	0.01	0.12	0.11	0.26	2.69	1.43	0.01	0.09	0.08
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	0.92	8.11	3.88	0.02	0.31	0.28	0.80	5.59	3.92	0.02	0.24	0.22
Scraper	ConstMin - Scrapers	0.39	4.46	2.81	0.01	0.17	0.16	0.34	3.72	2.55	0.01	0.14	0.13
Water Truck	N/A - Onroad engine	0.01	0.04	0.11	0.00	0.03	0.02	0.01	0.03	0.11	0.00	0.03	0.02
		3.81	**40.21**	**20.20**	**0.06**	**1.71**	**1.54**	**3.30**	**32.89**	**19.15**	**0.06**	**1.42**	**1.27**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per h
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given tim

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6	grams per pound
2,000	pounds per ton
7	days per week
30	days per month

Treatment Alternative

Table A-33. Equipment List (Santa Teresa WTP)

Equipment	Quantity	Mobilization and Site Improvements	Retrofit Existing Facilities	Starting and Testing	Demobilization
Bulldozer	1	X			
Concrete Pumpers	2		X		
Concrete Saw Cutters	2		X		
Cranes	2		X		
Excavator	1		X		
Flatbed Trucks (on site)	4	X	X		X
Loaders	1	X	X		
Water Truck	2	X	X		
Wheel Trencher	2		X		

Table A-34. Peak Daily Emissions from Construction Equipment (Santa Teresa WTP)

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Mobilization and Site Improvements	Bulldozer	ConstMin - Rubber Tired Dozers	1	10	249	2020	1.46	15.57	7.68	0.01	0.76	0.70
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	10	18		-	-	-	-	-	-
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	-	10	31		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	10	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	10	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	4	10	n/a		0.10	0.13	1.80	0.01	0.07	0.04
	Loaders	ConstMin - Rubber Tired Loaders	1	10	202		0.45	5.18	2.05	0.01	0.17	0.16
	Water Truck	N/A - Onroad engine	2	10	n/a		0.05	0.06	0.90	0.00	0.04	0.02
	Wheel Trencher	ConstMin - Trenchers	-	10	79		-	-	-	-	-	-
Mobilization and Site Improvements Subtotal							**2.06**	**20.94**	**12.42**	**0.03**	**1.04**	**0.91**
Retrofit Existing Facilities (1)	Bulldozer	ConstMin - Rubber Tired Dozers	-	10	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	10	18		0.36	2.65	1.80	0.00	0.13	0.12
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	2	10	31		0.66	4.20	4.56	0.01	0.21	0.20
	Cranes	ConstMin - Cranes	2	10	231		1.10	13.21	5.17	0.01	0.54	0.50
	Excavator	ConstMin - Excavators	1	10	158		0.31	3.05	4.11	0.01	0.15	0.14
	Flatbed Trucks (on site)	N/A - Onroad engine	4	10	n/a		0.10	0.13	1.80	0.01	0.07	0.04
	Loaders	ConstMin - Rubber Tired Loaders	1	10	202		0.45	5.18	2.05	0.01	0.17	0.16
	Water Truck	N/A - Onroad engine	2	10	n/a		0.05	0.06	0.90	0.00	0.04	0.02
	Wheel Trencher	ConstMin - Trenchers	2	10	79		1.00	9.18	6.55	0.01	0.70	0.64
Retrofit Existing Facilities (1) Subtotal							**4.03**	**37.66**	**26.92**	**0.06**	**2.01**	**1.80**
Retrofit Existing Facilities (2)	Bulldozer	ConstMin - Rubber Tired Dozers	-	10	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	10	18		0.35	2.61	1.79	0.00	0.12	0.11
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	2	10	31		0.60	4.07	4.49	0.01	0.18	0.17
	Cranes	ConstMin - Cranes	2	10	231		1.05	12.40	5.20	0.01	0.50	0.46
	Excavator	ConstMin - Excavators	1	10	158		0.29	2.72	4.11	0.01	0.13	0.12
	Flatbed Trucks (on site)	N/A - Onroad engine	4	10	n/a		0.10	0.11	1.76	0.01	0.07	0.04
	Loaders	ConstMin - Rubber Tired Loaders	1	10	202		0.44	4.89	2.09	0.01	0.16	0.15
	Water Truck	N/A - Onroad engine	2	10	n/a		0.05	0.06	0.88	0.00	0.04	0.02
	Wheel Trencher	ConstMin - Trenchers	2	10	79		0.92	8.58	6.51	0.01	0.63	0.58
Retrofit Existing Facilities (2) Subtotal							**3.79**	**35.44**	**26.83**	**0.06**	**1.84**	**1.65**
Starting and Testing (1)	Bulldozer	ConstMin - Rubber Tired Dozers	-	10	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	10	18		-	-	-	-	-	-
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	-	10	31		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	10	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	10	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	-	10	n/a		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	10	202		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	10	n/a		-	-	-	-	-	-
	Wheel Trencher	ConstMin - Trenchers	-	10	79		-	-	-	-	-	-
Starting and Testing (1) Subtotal							**-**	**-**	**-**	**-**	**-**	**-**

Table A-34. Peak Daily Emissions from Construction Equipment (Santa Teresa WTP)

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Starting and Testing (2)	Bulldozer	ConstMin - Rubber Tired Dozers	-	10	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	10	18		-	-	-	-	-	-
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	-	10	31		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	10	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	10	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	-	10	n/a		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	10	202		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	10	n/a		-	-	-	-	-	-
	Wheel Trencher	ConstMin - Trenchers	-	10	79		-	-	-	-	-	-
Starting and Testing (2) Subtotal							**-**	**-**	**-**	**-**	**-**	**-**
Demobilization	Bulldozer	ConstMin - Rubber Tired Dozers	-	10	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	10	18		-	-	-	-	-	-
	Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	-	10	31		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	10	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	10	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	4	10	n/a		0.09	0.10	1.73	0.01	0.07	0.04
	Loaders	ConstMin - Rubber Tired Loaders	-	10	202		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	10	n/a		-	-	-	-	-	-
	Wheel Trencher	ConstMin - Trenchers	-	10	79		-	-	-	-	-	-
Demobilization Subtotal							**0.09**	**0.10**	**1.73**	**0.01**	**0.07**	**0.04**

Notes:
Emission factors for onroad engines (flatbed trucks and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Francisco Bay Area Air Basin.
Peak daily emissions based on construction start year because that would represent worst-case (highest) emissions. Emissions typically decrease in future years with improvements in engine technology and as older vehicles are rotated out of service.

Peak Day Analysis (Overlapping Phases)						
Starting and Testing (2) + Demobilization	0.09	0.10	1.73	0.01	0.07	0.04
Maximum Daily Emissions (lbs/day)	**4.03**	**37.66**	**26.92**	**0.06**	**2.01**	**1.80**

Onroad Vehicle Speed
15 mph

Air Basin
San Francisco Bay Area

Conversions
453.6 grams per pound

Treatment Alternative

Table A-35. Annual Emissions from Construction Equipment (Santa Teresa WTP)

Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Annual Emissions - 2020 (tons per year)						Annual Emissions - 2021 (tons per year)					
					VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	1	10	249	0.19	2.06	1.01	0.00	0.10	0.09	0.19	2.01	1.00	0.00	0.10	0.09
Concrete Pumpers	OFF - Light Commercial - Pumps	2	10	18	0.05	0.35	0.24	0.00	0.02	0.02	0.05	0.35	0.24	0.00	0.02	0.01
Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	2	10	31	0.09	0.55	0.60	0.00	0.03	0.03	0.08	0.54	0.59	0.00	0.02	0.02
Cranes	ConstMin - Cranes	2	10	231	0.15	1.74	0.68	0.00	0.07	0.07	0.14	1.64	0.69	0.00	0.07	0.06
Excavator	ConstMin - Excavators	1	10	158	0.04	0.40	0.54	0.00	0.02	0.02	0.04	0.36	0.54	0.00	0.02	0.02
Flatbed Trucks (on site)	N/A - Onroad engine	4	10	n/a	0.01	0.02	0.24	0.00	0.01	0.01	0.01	0.02	0.23	0.00	0.01	0.00
Loaders	ConstMin - Rubber Tired Loaders	1	10	202	0.06	0.68	0.27	0.00	0.02	0.02	0.06	0.65	0.28	0.00	0.02	0.02
Water Truck	N/A - Onroad engine	2	10	n/a	0.01	0.01	0.12	0.00	0.00	0.00	0.01	0.01	0.12	0.00	0.00	0.00
Wheel Trencher	ConstMin - Trenchers	2	10	79	0.13	1.21	0.86	0.00	0.09	0.08	0.12	1.13	0.86	0.00	0.08	0.08
				Grand Total	**0.73**	**7.03**	**4.57**	**0.01**	**0.36**	**0.33**	**0.69**	**6.69**	**4.55**	**0.01**	**0.34**	**0.31**

Notes:
Emission factors for onroad engines (flatbed trucks and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Francisco Bay Area Air Basin
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given time, regardless of the phase.

Onroad Vehicle Speed

15 mph

Air Basin
San Francisco Bay Area

Conversions

453.6 grams per pound
2,000 pounds per ton
5 days per week
22 days per month

Treatment Alternative

Table A-35. Annual Emissions from Construction Equipment (Santa Teresa WTP)

Equipment	OFFROAD Description	Annual Emissions - 2022 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	0.15	1.69	0.87	0.00	0.08	0.07
Concrete Pumpers	OFF - Light Commercial - Pumps	0.05	0.34	0.24	0.00	0.02	0.01
Concrete Saw Cutters	OFF - ConstMin - Concrete/Industrial Saws	0.07	0.52	0.58	0.00	0.02	0.02
Cranes	ConstMin - Cranes	0.13	1.45	0.70	0.00	0.06	0.06
Excavator	ConstMin - Excavators	0.03	0.30	0.54	0.00	0.01	0.01
Flatbed Trucks (on site)	N/A - Onroad engine	0.01	0.01	0.23	0.00	0.01	0.00
Loaders	ConstMin - Rubber Tired Loaders	0.05	0.49	0.26	0.00	0.02	0.02
Water Truck	N/A - Onroad engine	0.01	0.01	0.11	0.00	0.00	0.00
Wheel Trencher	ConstMin - Trenchers	0.12	1.09	0.86	0.00	0.08	0.07
		0.61	**5.89**	**4.39**	**0.01**	**0.30**	**0.27**

Notes:
Emission factors for onroad engines (flatbed trucks and water trucks) shown in units of grams per hour (g/hr).
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given tim

Onroad Vehicle Speed

15 mph

Air Basin
San Francisco Bay Area

Conversions

453.6 grams per pound
2,000 pounds per ton
5 days per week
22 days per month

Tunnel Option Start Date 1/1/2020
Pipeline Option Start Date 1/1/2020

Table A-36. Lower San Felipe Intake Alternative Schedule

	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Tunnel Option																																																
Mobilization	6																																															
Site Improvements	6																																															
Construct Vertical Shaft	6																																														
Set Up TBM	2																																														
Tunneling and Spreading of Soils	20																																														
Cofferdam and TBM Out	3																																														
Connect to Existing Intake	3																																														
Fabricate Inlet	3																																														
Set Inlet and Flood Tunnel	1																																														
Construct Aeration Facility	10																																														
Fab and Set Air Tubing	6																																														
Final Work and Testing	4																																														
Demobilization	2																																														
Pipeline Option																																															
Mobilization	6																																															
Site Improvements	6																																															
Fabricate Inlet	3																																														
Build Cofferdam and Set Lower Inlet	4																																														
Lay Pipe	12																																														
Connect to Existing Intake	2																																														
Construct Aeration Facility	10																																														
Fab and Set Air Tubing	6																																														
Final Work and Testing	4																																														
Demobilization	2																																														

Source: SLLPIP_PD_06082012.pdf

Tunnel Option Start Date 1/1/2020
Pipeline Option Start Date 1/1/2020

Table A-36. Lower San Felipe Intake Alternative

	Months	Dates		Year		Months by Year				
Tunnel Option		**Start**	**End**	**Start**	**End**	**2020**	**2021**	**2022**	**2023**	**Total**
Mobilization	6	1/1/2020	6/30/2020	2020	2020	6	0	0	0	6
Site Improvements	6	4/1/2020	9/30/2020	2020	2020	6	0	0	0	6
Construct Vertical Shaft	6	10/1/2020	3/31/2021	2020	2021	3	3	0	0	6
Set Up TBM	2	4/1/2021	5/31/2021	2021	2021	0	2	0	0	2
Tunneling and Spreading of Soils	20	6/1/2021	1/31/2023	2021	2023	0	7	12	1	20
Cofferdam and TBM Out	3	2/1/2023	4/30/2023	2023	2023	0	0	0	3	3
Connect to Existing Intake	3	2/1/2023	4/30/2023	2023	2023	0	0	0	3	3
Fabricate Inlet	3	2/1/2023	4/30/2023	2023	2023	0	0	0	3	3
Set Inlet and Flood Tunnel	1	5/1/2023	5/31/2023	2023	2023	0	0	0	1	1
Construct Aeration Facility	10	6/1/2021	3/31/2022	2021	2022	0	7	3	0	10
Fab and Set Air Tubing	6	10/1/2021	3/31/2022	2021	2022	0	3	3	0	6
Final Work and Testing	4	6/1/2023	9/30/2023	2023	2023	0	0	0	4	4
Demobilization	2	10/1/2023	11/30/2023	2023	2023	0	0	0	2	2
Pipeline Option										
Mobilization	6	1/1/2020	6/30/2020	2020	2020	6	0	0	0	6
Site Improvements	6	4/1/2020	9/30/2020	2020	2020	6	0	0	0	6
Fabricate Inlet	3	8/1/2020	10/31/2020	2020	2020	3	0	0	0	3
Build Cofferdam and Set Lower Inlet	4	10/1/2020	1/31/2021	2020	2021	3	1	0	0	4
Lay Pipe	12	2/1/2021	1/31/2022	2021	2022	0	11	1	0	12
Connect to Existing Intake	2	2/1/2022	3/31/2022	2022	2022	0	0	2	0	2
Construct Aeration Facility	10	2/1/2021	11/30/2021	2021	2021	0	10	0	0	10
Fab and Set Air Tubing	6	6/1/2021	11/30/2021	2021	2021	0	6	0	0	6
Final Work and Testing	4	4/1/2022	7/31/2022	2022	2022	0	0	4	0	4
Demobilization	2	8/1/2022	9/30/2022	2022	2022	0	0	2	0	2

Source: SLLPIP_PD_06082012.pdf

Table A-37. Santa Teresa WTP - Construction Schedule

	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Dates		Year		Months by Year		
																																						Start	End	Start	End	2020	2021	2022
Mobilization and Site Improvements	2																																					1/1/2020	2/29/2020	2020	2020	2	0	0
Retrofit Existing Facilities (1)	14																																					3/1/2020	4/30/2021	2020	2021	10	4	0
Retrofit Existing Facilities (2)	14																																					7/1/2021	8/31/2022	2021	2022	0	6	8
Starting and Testing (1)	2																																					5/1/2021	6/30/2021	2021	2021	0	2	0
Starting and Testing (2)	2																																					9/1/2022	10/31/2022	2022	2022	0	0	2
Demobilization	2																																					11/1/2022	12/31/2022	2022	2022	0	0	2
																																								Total	12	12	12

Source: Equipment Tables_08012012.docx

Note: Construction duration originally estimated to be 15 months; however, schedule updated to 36 months after completion of Feasibility Report. Therefore, current schedule scaled up to reflect 36-month construction schedule.

OFFROAD2017 Emission Factor Summary

Table A-38. In-Use Off-Road Construction Equipment Emission Factors (San Joaquin Valley Air Basin)

Equipment Type	Average HP	Emission Factors - 2020 (g/bhp-hr)						Emission Factors - 2021 (g/bhp-hr)						Emission Factors - 2022 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0729	0.9242	0.5423	0.0024	0.0269	0.0247	0.0681	0.8037	0.5381	0.0024	0.0245	0.0225	0.0611	0.6313	0.5342	0.0024	0.0206	0.0190
ConstMin - Cranes	231	0.1081	1.2973	0.5074	0.0014	0.0530	0.0488	0.1027	1.2171	0.5101	0.0014	0.0493	0.0453	0.0948	1.0761	0.5198	0.0014	0.0446	0.0410
ConstMin - Crawler Tractors	212	0.1786	2.2157	0.9385	0.0021	0.0889	0.0818	0.1676	2.0551	0.8820	0.0021	0.0820	0.0754	0.1518	1.8029	0.8403	0.0021	0.0725	0.0667
ConstMin - Excavators	158	0.0890	0.8749	1.1795	0.0019	0.0425	0.0391	0.0833	0.7814	1.1807	0.0019	0.0380	0.0350	0.0736	0.6459	1.1748	0.0019	0.0314	0.0289
ConstMin - Graders	188	0.1404	1.7558	0.5651	0.0020	0.0582	0.0536	0.1350	1.6520	0.5495	0.0020	0.0545	0.0501	0.1248	1.4702	0.5320	0.0020	0.0487	0.0448
ConstMin - Off-Highway Tractors	124	0.1177	1.2557	1.3968	0.0021	0.0609	0.0560	0.1138	1.1662	1.4018	0.0021	0.0567	0.0522	0.1019	0.9840	1.3876	0.0021	0.0475	0.0437
ConstMin - Off-Highway Trucks	403	0.0941	0.9032	0.5454	0.0019	0.0330	0.0303	0.0861	0.7535	0.5150	0.0019	0.0277	0.0255	0.0744	0.5687	0.4711	0.0019	0.0206	0.0189
ConstMin - Other Construction Equipment	172	0.1618	1.7137	1.3459	0.0020	0.0906	0.0833	0.1377	1.4348	1.3247	0.0020	0.0752	0.0692	0.1234	1.2503	1.3134	0.0020	0.0654	0.0601
ConstMin - Pavers	129	0.1160	1.2319	1.2545	0.0020	0.0608	0.0559	0.1084	1.1356	1.2564	0.0020	0.0556	0.0511	0.0909	0.9181	1.2469	0.0020	0.0441	0.0406
ConstMin - Paving Equipment	131	0.0980	0.9774	1.0956	0.0017	0.0527	0.0485	0.0857	0.8624	1.0908	0.0017	0.0431	0.0397	0.0857	0.8125	1.0998	0.0017	0.0430	0.0396
ConstMin - Rollers	80	0.1420	1.4269	1.3144	0.0018	0.0908	0.0835	0.1291	1.3187	1.3059	0.0018	0.0803	0.0739	0.1120	1.1729	1.2896	0.0018	0.0671	0.0617
ConstMin - Rough Terrain Forklifts	100	0.0605	0.8975	1.2949	0.0020	0.0298	0.0274	0.0565	0.8394	1.2940	0.0020	0.0255	0.0235	0.0522	0.7751	1.2921	0.0020	0.0208	0.0192
ConstMin - Rubber Tired Dozers	249	0.2663	2.8364	1.3995	0.0019	0.1381	0.1271	0.2601	2.7691	1.3859	0.0019	0.1338	0.1231	0.2111	2.3322	1.1964	0.0019	0.1067	0.0982
ConstMin - Rubber Tired Loaders	202	0.1001	1.1642	0.4594	0.0018	0.0387	0.0356	0.0979	1.0975	0.4698	0.0018	0.0368	0.0338	0.0814	0.8385	0.4466	0.0018	0.0283	0.0260
ConstMin - Scrapers	367	0.1426	1.6817	1.0236	0.0024	0.0641	0.0590	0.1339	1.5308	0.9638	0.0024	0.0583	0.0537	0.1180	1.2781	0.8743	0.0024	0.0488	0.0449
ConstMin - Skid Steer Loaders	65	0.0693	0.9185	1.2065	0.0018	0.0392	0.0361	0.0654	0.8670	1.2065	0.0018	0.0348	0.0320	0.0601	0.8006	1.2030	0.0018	0.0293	0.0269
ConstMin - Surfacing Equipment	263	0.0684	1.0334	0.4306	0.0015	0.0334	0.0307	0.0673	0.9777	0.4316	0.0015	0.0322	0.0296	0.0628	0.8783	0.4031	0.0015	0.0290	0.0267
ConstMin - Sweepers/Scrubbers	64	0.3153	2.5963	1.8350	0.0022	0.2092	0.1924	0.2431	2.1422	1.7523	0.0022	0.1519	0.1398	0.2314	1.9740	1.7375	0.0022	0.1449	0.1333
ConstMin - Tractors/Loaders/Backhoes	98	0.1167	1.1857	1.3147	0.0018	0.0742	0.0683	0.1042	1.0668	1.3039	0.0018	0.0620	0.0571	0.0909	0.9372	1.2904	0.0018	0.0492	0.0453
ConstMin - Trenchers	79	0.2876	2.6346	1.8809	0.0024	0.1998	0.1838	0.2652	2.4637	1.8683	0.0025	0.1805	0.1660	0.2505	2.3614	1.8617	0.0024	0.1685	0.1550
Industrial - Aerial Lifts	63	0.0360	0.5560	0.9793	0.0015	0.0153	0.0140	0.0328	0.5032	0.9761	0.0015	0.0115	0.0105	0.0329	0.5102	0.9811	0.0015	0.0093	0.0085
Industrial - Forklifts	89	0.0904	0.8175	0.7529	0.0010	0.0607	0.0559	0.0808	0.7403	0.7445	0.0010	0.0524	0.0482	0.0707	0.6603	0.7356	0.0010	0.0435	0.0400
Industrial - Other General Industrial Equipment	88	0.2996	2.2541	1.4409	0.0017	0.2078	0.1912	0.2969	2.2308	1.4498	0.0017	0.2036	0.1873	0.2628	2.0725	1.4380	0.0017	0.1788	0.1645
Industrial - Other Material Handling Equipment	167	0.1379	1.1713	1.3122	0.0019	0.0797	0.0733	0.1288	1.0935	1.3213	0.0019	0.0712	0.0655	0.1108	0.9004	1.2990	0.0019	0.0583	0.0536
OFF - ConstMin - Bore/Drill Rigs	15	0.4244	3.2402	1.9149	0.0057	0.1220	0.1122	0.4238	3.2355	1.9121	0.0056	0.1218	0.1121	0.4248	3.2431	1.9166	0.0057	0.1221	0.1124
OFF - ConstMin - Cement and Mortar Mixers	10	0.3135	2.3657	1.8325	0.0048	0.0940	0.0865	0.3126	2.3634	1.8309	0.0048	0.0931	0.0857	0.3114	2.3584	1.8272	0.0048	0.0926	0.0852
OFF - ConstMin - Concrete/Industrial Saws	31	0.4887	3.1112	3.3745	0.0054	0.1571	0.1446	0.4419	3.0124	3.3213	0.0054	0.1365	0.1256	0.4016	2.9004	3.2578	0.0054	0.1168	0.1075
OFF - ConstMin - Dumpers/Tenders	16	0.2165	1.6560	0.8936	0.0028	0.0631	0.0581	0.2164	1.6551	0.8937	0.0028	0.0626	0.0576	0.2156	1.6486	0.8904	0.0027	0.0620	0.0570
OFF - ConstMin - Excavators	23	0.3226	2.4669	1.3324	0.0041	0.0922	0.0848	0.3234	2.4731	1.3358	0.0041	0.0924	0.0850	0.3229	2.4688	1.3335	0.0041	0.0922	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3414	2.5916	2.0259	0.0053	0.1004	0.0924	0.3414	2.5910	2.0254	0.0053	0.1004	0.0924	0.3414	2.5917	2.0260	0.0053	0.1004	0.0924
OFF - ConstMin - Pavers	24	0.3599	2.7562	1.4841	0.0046	0.1064	0.0979	0.3591	2.7479	1.4818	0.0046	0.1052	0.0967	0.3593	2.7483	1.4833	0.0046	0.1043	0.0960
OFF - ConstMin - Paving Equipment	19	0.3042	2.3257	1.2562	0.0039	0.0869	0.0799	0.3031	2.3174	1.2517	0.0039	0.0866	0.0797	0.3012	2.3029	1.2438	0.0038	0.0860	0.0792
OFF - ConstMin - Plate Compactors	8	0.2350	1.7807	1.4915	0.0038	0.0696	0.0640	0.2350	1.7809	1.4917	0.0038	0.0696	0.0640	0.2352	1.7819	1.4925	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3113	2.3690	1.6460	0.0045	0.0906	0.0834	0.3114	2.3697	1.6465	0.0045	0.0906	0.0834	0.3115	2.3704	1.6469	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3069	2.3463	1.2673	0.0039	0.0877	0.0807	0.3090	2.3627	1.2762	0.0039	0.0883	0.0812	0.3090	2.3625	1.2760	0.0039	0.0883	0.0812
OFF - ConstMin - Signal Boards	6	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3970	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3206	2.4241	1.3023	0.0040	0.0986	0.0907	0.3174	2.4139	1.2963	0.0040	0.0962	0.0885	0.3152	2.4060	1.2922	0.0040	0.0946	0.0871
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3116	2.3823	1.2867	0.0040	0.0897	0.0825	0.3117	2.3832	1.2872	0.0040	0.0892	0.0821	0.3116	2.3829	1.2871	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4226	3.2258	1.9239	0.0057	0.1216	0.1119	0.4221	3.2222	1.9218	0.0056	0.1214	0.1117	0.4224	3.2243	1.9231	0.0057	0.1215	0.1118
OFF - Industrial - Aerial Lifts	17	0.2649	1.9941	1.2588	0.0036	0.0808	0.0744	0.2623	1.9867	1.2539	0.0036	0.0791	0.0728	0.2604	1.9803	1.2501	0.0036	0.0780	0.0718
OFF - Industrial - Other General Industrial Equipment	18	0.2792	2.1852	1.3293	0.0039	0.0825	0.0759	0.2791	2.1846	1.3289	0.0039	0.0825	0.0759	0.2792	2.1852	1.3292	0.0039	0.0825	0.0759
OFF - Industrial - Sweepers/Scrubbers	18	0.3671	2.9152	1.8936	0.0054	0.1108	0.1019	0.3674	2.9177	1.8952	0.0054	0.1109	0.1020	0.3653	2.9013	1.8846	0.0053	0.1102	0.1014
OFF - Light Commercial - Air Compressors	35	0.4153	2.1321	2.5113	0.0035	0.1260	0.1159	0.3667	2.0431	2.4351	0.0035	0.1065	0.0979	0.3364	1.9808	2.4033	0.0035	0.0919	0.0846
OFF - Light Commercial - Generator Sets	21	0.4230	3.3680	2.1882	0.0059	0.1569	0.1444	0.4164	3.3233	2.1711	0.0059	0.1490	0.1371	0.4119	3.2939	2.1576	0.0059	0.1430	0.1315
OFF - Light Commercial - Pressure Washers	21	0.1723	1.4166	1.0221	0.0026	0.0668	0.0614	0.1698	1.3997	1.0200	0.0026	0.0635	0.0584	0.1677	1.3843	1.0147	0.0026	0.0609	0.0560
OFF - Light Commercial - Pumps	18	0.4613	3.3778	2.2813	0.0060	0.1664	0.1531	0.4515	3.3293	2.2661	0.0060	0.1569	0.1444	0.4441	3.2956	2.2532	0.0060	0.1496	0.1376
OFF - Light Commercial - Welders	33	0.3655	1.9573	2.2095	0.0033	0.1126	0.1036	0.3223	1.8756	2.1429	0.0033	0.0956	0.0879	0.2946	1.8185	2.1130	0.0033	0.0829	0.0763
Portable Equipment - Non-Rental Compressor	210	0.0454	0.6882	0.2996	0.0014	0.0229	0.0211	0.0436	0.6262	0.3029	0.0014	0.0211	0.0194	0.0377	0.4444	0.3062	0.0015	0.0154	0.0142
Portable Equipment - Non-Rental Generator	559	0.0772	0.6715	0.3278	0.0014	0.0257	0.0237	0.0782	0.6926	0.3314	0.0014	0.0261	0.0240	0.0680	0.4775	0.3350	0.0015	0.0201	0.0185
Portable Equipment - Non-Rental Other Portable Equipment	382	0.0387	0.5085	0.2911	0.0014	0.0177	0.0163	0.0382	0.4829	0.2943	0.0014	0.0173	0.0159	0.0307	0.2294	0.2975	0.0015	0.0095	0.0087
Portable Equipment - Non-Rental Pump	593	0.0368	0.5472	0.2858	0.0014	0.0205	0.0188	0.0355	0.5025	0.2889	0.0014	0.0192	0.0177	0.0319	0.3820	0.2920	0.0015	0.0154	0.0142
Portable Equipment - Rental Compressor	233	0.0371	0.3732	0.2991	0.0014	0.0143	0.0132	0.0375	0.3772	0.3024	0.0014	0.0145	0.0133	0.0355	0.3131	0.3057	0.0015	0.0122	0.0113
Portable Equipment - Rental Generator	232	0.0644	0.4404	0.3469	0.0014	0.0174	0.0160	0.0573	0.2601	0.3507	0.0014	0.0114	0.0105	0.0552	0.2024	0.3545	0.0015	0.0095	0.0087
Portable Equipment - Rental Other Portable Equipment	169	0.0731	0.6709	0.9868	0.0014	0.0387	0.0356	0.0711	0.6281	0.9976	0.0014	0.0341	0.0314	0.0640	0.4928	1.0085	0.0015	0.0255	0.0234
Portable Equipment - Rental Pump	212	0.0518	0.4949	0.3185	0.0014	0.0178	0.0164	0.0519	0.4838	0.3232	0.0014	0.0175	0.0161	0.0504	0.4320	0.3267	0.0015	0.0161	0.0148

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Database. Available online at https://www.arb.ca.gov/orion/ [Accessesd October 17, 2018].
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "Horsepower_Hours_hhpy" divided by "Total_Activity_hpy.")

OFFROAD2017 Emission Factor Summary

Table A-38. In-Use Off-Road Construction Equipment Emission Factors

Equipment Type	Average HP	Emission Factors - 2023 (g/bhp-hr)						Emission Factors - 2024 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0592	0.5975	0.5298	0.0024	0.0191	0.0176	0.0582	0.5618	0.5316	0.0024	0.0182	0.0168
ConstMin - Cranes	231	0.0906	0.9974	0.5197	0.0014	0.0418	0.0385	0.0847	0.9076	0.4853	0.0014	0.0379	0.0348
ConstMin - Crawler Tractors	212	0.1394	1.5759	0.8203	0.0021	0.0653	0.0601	0.1319	1.4539	0.7805	0.0021	0.0602	0.0554
ConstMin - Excavators	158	0.0687	0.5637	1.1758	0.0019	0.0277	0.0255	0.0656	0.5109	1.1778	0.0019	0.0253	0.0233
ConstMin - Graders	188	0.1166	1.3229	0.5265	0.0020	0.0442	0.0407	0.1089	1.1890	0.5160	0.0020	0.0397	0.0365
ConstMin - Off-Highway Tractors	124	0.0873	0.7750	1.3650	0.0021	0.0371	0.0341	0.0779	0.6344	1.3567	0.0021	0.0302	0.0278
ConstMin - Off-Highway Trucks	403	0.0711	0.5061	0.4624	0.0019	0.0182	0.0168	0.0701	0.4719	0.4563	0.0019	0.0169	0.0156
ConstMin - Other Construction Equipment	172	0.1144	1.1275	1.3078	0.0020	0.0588	0.0541	0.1095	1.0570	1.3119	0.0020	0.0548	0.0505
ConstMin - Pavers	129	0.0845	0.8254	1.2468	0.0020	0.0393	0.0362	0.0816	0.7701	1.2523	0.0020	0.0366	0.0337
ConstMin - Paving Equipment	131	0.0812	0.7491	1.1022	0.0017	0.0391	0.0359	0.0798	0.7121	1.1092	0.0017	0.0374	0.0345
ConstMin - Rollers	80	0.1032	1.0919	1.2843	0.0018	0.0595	0.0547	0.0975	1.0316	1.2827	0.0018	0.0539	0.0496
ConstMin - Rough Terrain Forklifts	100	0.0502	0.7380	1.2932	0.0020	0.0181	0.0166	0.0503	0.7212	1.2962	0.0020	0.0173	0.0160
ConstMin - Rubber Tired Dozers	249	0.1789	1.9495	1.0377	0.0019	0.0871	0.0802	0.2077	2.2834	1.4959	0.0019	0.1017	0.0936
ConstMin - Rubber Tired Loaders	202	0.0753	0.7330	0.4335	0.0018	0.0246	0.0226	0.0698	0.6454	0.4227	0.0018	0.0214	0.0197
ConstMin - Scrapers	367	0.1141	1.1936	0.8495	0.0024	0.0457	0.0421	0.1103	1.1055	0.8253	0.0024	0.0427	0.0393
ConstMin - Skid Steer Loaders	65	0.0562	0.7484	1.2013	0.0018	0.0253	0.0232	0.0524	0.7069	1.1996	0.0018	0.0218	0.0201
ConstMin - Surfacing Equipment	263	0.0619	0.8295	0.4064	0.0015	0.0281	0.0258	0.0581	0.7636	0.3980	0.0015	0.0254	0.0234
ConstMin - Sweepers/Scrubbers	64	0.3579	2.7606	1.9205	0.0022	0.2396	0.2204	0.4344	3.1850	1.9920	0.0022	0.2867	0.2638
ConstMin - Tractors/Loaders/Backhoes	98	0.0829	0.8540	1.2851	0.0018	0.0408	0.0375	0.0792	0.8076	1.2879	0.0018	0.0358	0.0329
ConstMin - Trenchers	79	0.2381	2.2557	1.8580	0.0025	0.1574	0.1448	0.2187	2.0737	1.8404	0.0025	0.1399	0.1287
Industrial - Aerial Lifts	63	0.0335	0.5217	0.9713	0.0015	0.0116	0.0107	0.0339	0.5060	0.9759	0.0015	0.0113	0.0104
Industrial - Forklifts	89	0.0636	0.5991	0.7297	0.0010	0.0367	0.0337	0.0586	0.5529	0.7265	0.0010	0.0316	0.0291
Industrial - Other General Industrial Equipment	88	0.1873	1.5512	1.3363	0.0017	0.1152	0.1060	0.1485	1.2511	1.2787	0.0017	0.0873	0.0803
Industrial - Other Material Handling Equipment	167	0.1017	0.8359	1.2986	0.0019	0.0476	0.0438	0.0969	0.7765	1.3122	0.0019	0.0423	0.0389
OFF - ConstMin - Bore/Drill Rigs	15	0.4218	3.2198	1.9029	0.0056	0.1213	0.1116	0.4229	3.2286	1.9080	0.0056	0.1216	0.1119
OFF - ConstMin - Cement and Mortar Mixers	10	0.3105	2.3540	1.8241	0.0048	0.0921	0.0848	0.3105	2.3559	1.8259	0.0048	0.0920	0.0846
OFF - ConstMin - Concrete/Industrial Saws	31	0.3700	2.8194	3.2304	0.0054	0.0996	0.0916	0.3419	2.7268	3.1904	0.0054	0.0853	0.0785
OFF - ConstMin - Dumpers/Tenders	16	0.2157	1.6489	0.8906	0.0027	0.0617	0.0568	0.2165	1.6555	0.8942	0.0028	0.0619	0.0569
OFF - ConstMin - Excavators	23	0.3241	2.4778	1.3383	0.0041	0.0926	0.0852	0.3233	2.4722	1.3353	0.0041	0.0924	0.0850
OFF - ConstMin - Other Construction Equipment	14	0.3413	2.5909	2.0253	0.0053	0.1004	0.0924	0.3412	2.5901	2.0247	0.0053	0.1004	0.0923
OFF - ConstMin - Pavers	24	0.3605	2.7565	1.4886	0.0046	0.1039	0.0956	0.3599	2.7517	1.4863	0.0046	0.1033	0.0950
OFF - ConstMin - Paving Equipment	19	0.3010	2.3017	1.2432	0.0038	0.0860	0.0791	0.3013	2.3037	1.2443	0.0038	0.0861	0.0792
OFF - ConstMin - Plate Compactors	8	0.2351	1.7812	1.4920	0.0038	0.0696	0.0640	0.2352	1.7819	1.4926	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3116	2.3711	1.6474	0.0045	0.0907	0.0834	0.3114	2.3702	1.6468	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3055	2.3356	1.2615	0.0039	0.0873	0.0803	0.3062	2.3409	1.2644	0.0039	0.0875	0.0805
OFF - ConstMin - Signal Boards	6	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3135	2.3987	1.2891	0.0040	0.0933	0.0859	0.3126	2.3940	1.2877	0.0040	0.0922	0.0849
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3114	2.3813	1.2862	0.0040	0.0889	0.0818	0.3117	2.3830	1.2871	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4225	3.2248	1.9234	0.0057	0.1215	0.1118	0.4228	3.2273	1.9248	0.0057	0.1216	0.1119
OFF - Industrial - Aerial Lifts	17	0.2590	1.9742	1.2469	0.0036	0.0771	0.0709	0.2580	1.9692	1.2446	0.0036	0.0763	0.0702
OFF - Industrial - Other General Industrial Equipment	18	0.2793	2.1864	1.3300	0.0039	0.0826	0.0759	0.2791	2.1848	1.3290	0.0039	0.0825	0.0759
OFF - Industrial - Sweepers/Scrubbers	18	0.3661	2.9071	1.8883	0.0053	0.1105	0.1016	0.3657	2.9041	1.8864	0.0053	0.1103	0.1015
OFF - Light Commercial - Air Compressors	35	0.3107	1.9228	2.3795	0.0035	0.0789	0.0726	0.2894	1.8692	2.3631	0.0035	0.0684	0.0629
OFF - Light Commercial - Generator Sets	21	0.4082	3.2684	2.1457	0.0059	0.1378	0.1268	0.4048	3.2450	2.1350	0.0059	0.1344	0.1236
OFF - Light Commercial - Pressure Washers	21	0.1658	1.3703	1.0098	0.0026	0.0585	0.0539	0.1631	1.3489	0.9988	0.0026	0.0566	0.0521
OFF - Light Commercial - Pumps	18	0.4376	3.2668	2.2422	0.0060	0.1431	0.1317	0.4316	3.2394	2.2316	0.0060	0.1386	0.1275
OFF - Light Commercial - Welders	33	0.2708	1.7654	2.0894	0.0033	0.0713	0.0656	0.2505	1.7155	2.0709	0.0033	0.0619	0.0569
Portable Equipment - Non-Rental Compressor	210	0.0375	0.4328	0.3096	0.0015	0.0150	0.0138	0.0347	0.3492	0.3129	0.0015	0.0122	0.0112
Portable Equipment - Non-Rental Generator	559	0.0649	0.4210	0.3386	0.0015	0.0177	0.0163	0.0663	0.4377	0.3423	0.0015	0.0186	0.0171
Portable Equipment - Non-Rental Other Portable Equipment	382	0.0302	0.2119	0.3007	0.0015	0.0088	0.0081	0.0307	0.2149	0.3040	0.0015	0.0089	0.0082
Portable Equipment - Non-Rental Pump	593	0.0318	0.3737	0.2952	0.0015	0.0152	0.0140	0.0310	0.3421	0.2984	0.0015	0.0141	0.0129
Portable Equipment - Rental Compressor	233	0.0303	0.1708	0.3090	0.0015	0.0072	0.0066	0.0306	0.1727	0.3124	0.0015	0.0073	0.0067
Portable Equipment - Rental Generator	232	0.0541	0.1748	0.3584	0.0015	0.0084	0.0077	0.0522	0.1381	0.3623	0.0015	0.0068	0.0062
Portable Equipment - Rental Other Portable Equipment	169	0.0614	0.4463	1.0195	0.0015	0.0227	0.0209	0.0571	0.3718	1.0306	0.0015	0.0185	0.0170
Portable Equipment - Rental Pump	212	0.0480	0.3582	0.3303	0.0015	0.0141	0.0130	0.0459	0.3105	0.3339	0.0015	0.0124	0.0114

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Databa
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "H

Table A-39. In-Use Off-Road Construction Equipment Emission Factors (San Francisco Bay Area Air Basin)

Equipment Type	Average HP	Emission Factors - 2020 (g/bhp-hr)						Emission Factors - 2021 (g/bhp-hr)						Emission Factors - 2022 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0729	0.9242	0.5423	0.0024	0.0269	0.0247	0.0681	0.8037	0.5381	0.0024	0.0245	0.0225	0.0611	0.6313	0.5342	0.0024	0.0206	0.0190
ConstMin - Cranes	231	0.1081	1.2973	0.5074	0.0014	0.0530	0.0488	0.1027	1.2171	0.5101	0.0014	0.0493	0.0453	0.0948	1.0761	0.5198	0.0014	0.0446	0.0410
ConstMin - Crawler Tractors	212	0.1786	2.2157	0.9385	0.0021	0.0889	0.0818	0.1676	2.0551	0.8820	0.0021	0.0820	0.0754	0.1518	1.8029	0.8403	0.0021	0.0725	0.0667
ConstMin - Excavators	158	0.0890	0.8749	1.1795	0.0019	0.0425	0.0391	0.0833	0.7814	1.1807	0.0019	0.0380	0.0350	0.0736	0.6459	1.1748	0.0019	0.0314	0.0289
ConstMin - Graders	188	0.1404	1.7558	0.5651	0.0020	0.0582	0.0536	0.1350	1.6520	0.5495	0.0020	0.0545	0.0501	0.1248	1.4702	0.5320	0.0020	0.0487	0.0448
ConstMin - Off-Highway Tractors	124	0.1177	1.2557	1.3968	0.0021	0.0609	0.0560	0.1138	1.1662	1.4018	0.0021	0.0567	0.0522	0.1019	0.9840	1.3876	0.0021	0.0475	0.0437
ConstMin - Off-Highway Trucks	403	0.0941	0.9032	0.5454	0.0019	0.0330	0.0303	0.0861	0.7535	0.5150	0.0019	0.0277	0.0255	0.0744	0.5687	0.4711	0.0019	0.0206	0.0189
ConstMin - Other Construction Equipment	172	0.1618	1.7137	1.3459	0.0020	0.0906	0.0833	0.1377	1.4348	1.3247	0.0020	0.0752	0.0692	0.1234	1.2503	1.3134	0.0020	0.0654	0.0601
ConstMin - Pavers	129	0.1160	1.2319	1.2545	0.0020	0.0608	0.0559	0.1084	1.1356	1.2564	0.0020	0.0556	0.0511	0.0909	0.9181	1.2469	0.0020	0.0441	0.0406
ConstMin - Paving Equipment	131	0.0980	0.9774	1.0956	0.0017	0.0527	0.0485	0.0857	0.8624	1.0908	0.0017	0.0431	0.0397	0.0857	0.8125	1.0998	0.0017	0.0430	0.0396
ConstMin - Rollers	80	0.1420	1.4269	1.3144	0.0018	0.0908	0.0835	0.1291	1.3187	1.3059	0.0018	0.0803	0.0739	0.1120	1.1729	1.2896	0.0018	0.0671	0.0617
ConstMin - Rough Terrain Forklifts	100	0.0605	0.8975	1.2949	0.0020	0.0298	0.0274	0.0565	0.8394	1.2940	0.0020	0.0255	0.0235	0.0522	0.7751	1.2921	0.0020	0.0208	0.0192
ConstMin - Rubber Tired Dozers	249	0.2663	2.8364	1.3995	0.0019	0.1381	0.1271	0.2601	2.7691	1.3859	0.0019	0.1338	0.1231	0.2111	2.3322	1.1964	0.0019	0.1067	0.0982
ConstMin - Rubber Tired Loaders	202	0.1001	1.1642	0.4594	0.0018	0.0387	0.0356	0.0979	1.0975	0.4698	0.0018	0.0368	0.0338	0.0814	0.8385	0.4466	0.0018	0.0283	0.0260
ConstMin - Scrapers	367	0.1426	1.6817	1.0236	0.0024	0.0641	0.0590	0.1339	1.5308	0.9638	0.0024	0.0583	0.0537	0.1180	1.2781	0.8743	0.0024	0.0488	0.0449
ConstMin - Skid Steer Loaders	65	0.0693	0.9185	1.2065	0.0018	0.0392	0.0361	0.0654	0.8670	1.2065	0.0018	0.0348	0.0320	0.0601	0.8006	1.2030	0.0018	0.0293	0.0269
ConstMin - Surfacing Equipment	263	0.0684	1.0334	0.4306	0.0015	0.0334	0.0307	0.0673	0.9777	0.4316	0.0015	0.0322	0.0296	0.0628	0.8783	0.4031	0.0015	0.0290	0.0267
ConstMin - Sweepers/Scrubbers	64	0.3153	2.5963	1.8350	0.0022	0.2092	0.1924	0.2431	2.1422	1.7523	0.0022	0.1519	0.1398	0.2314	1.9740	1.7375	0.0022	0.1449	0.1333
ConstMin - Tractors/Loaders/Backhoes	98	0.1167	1.1857	1.3147	0.0018	0.0742	0.0683	0.1042	1.0668	1.3039	0.0018	0.0620	0.0571	0.0909	0.9372	1.2904	0.0018	0.0492	0.0453
ConstMin - Trenchers	79	0.2876	2.6346	1.8809	0.0024	0.1998	0.1838	0.2652	2.4637	1.8683	0.0025	0.1805	0.1660	0.2505	2.3614	1.8617	0.0024	0.1685	0.1550
Industrial - Aerial Lifts	63	0.0360	0.5560	0.9793	0.0015	0.0153	0.0140	0.0328	0.5032	0.9761	0.0015	0.0115	0.0105	0.0329	0.5102	0.9811	0.0015	0.0093	0.0085
Industrial - Forklifts	89	0.0904	0.8175	0.7529	0.0010	0.0607	0.0559	0.0808	0.7403	0.7445	0.0010	0.0524	0.0482	0.0707	0.6603	0.7356	0.0010	0.0435	0.0400
Industrial - Other General Industrial Equipment	88	0.2996	2.2541	1.4409	0.0017	0.2078	0.1912	0.2969	2.2308	1.4498	0.0017	0.2036	0.1873	0.2628	2.0725	1.4380	0.0017	0.1788	0.1645
Industrial - Other Material Handling Equipment	167	0.1379	1.1713	1.3122	0.0019	0.0797	0.0733	0.1288	1.0935	1.3213	0.0019	0.0712	0.0655	0.1108	0.9004	1.2990	0.0019	0.0583	0.0536
OFF - ConstMin - Bore/Drill Rigs	16	0.4222	3.2236	1.9051	0.0056	0.1213	0.1116	0.4222	3.2233	1.9049	0.0056	0.1214	0.1117	0.4230	3.2296	1.9087	0.0056	0.1216	0.1119
OFF - ConstMin - Cement and Mortar Mixers	10	0.3120	2.3544	1.8238	0.0048	0.0936	0.0861	0.3113	2.3536	1.8233	0.0048	0.0927	0.0853	0.3108	2.3532	1.8232	0.0048	0.0924	0.0850
OFF - ConstMin - Concrete/Industrial Saws	31	0.4828	3.0734	3.3337	0.0054	0.1553	0.1428	0.4370	2.9780	3.2835	0.0054	0.1350	0.1242	0.3991	2.8818	3.2370	0.0054	0.1161	0.1068
OFF - ConstMin - Dumpers/Tenders	16	0.2151	1.6459	0.8881	0.0027	0.0627	0.0577	0.2157	1.6495	0.8907	0.0027	0.0624	0.0574	0.2164	1.6549	0.8939	0.0028	0.0622	0.0572
OFF - ConstMin - Excavators	23	0.3230	2.4696	1.3339	0.0041	0.0923	0.0849	0.3228	2.4682	1.3332	0.0041	0.0922	0.0848	0.3230	2.4696	1.3339	0.0041	0.0923	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3412	2.5898	2.0245	0.0053	0.1004	0.0923	0.3413	2.5904	2.0250	0.0053	0.1004	0.0924	0.3412	2.5898	2.0245	0.0053	0.1004	0.0923
OFF - ConstMin - Pavers	24	0.3522	2.6976	1.4526	0.0045	0.1041	0.0958	0.3522	2.6953	1.4535	0.0045	0.1031	0.0949	0.3529	2.6996	1.4571	0.0045	0.1025	0.0943
OFF - ConstMin - Paving Equipment	19	0.3005	2.2980	1.2412	0.0038	0.0858	0.0790	0.3011	2.3025	1.2437	0.0038	0.0860	0.0791	0.3009	2.3008	1.2427	0.0038	0.0860	0.0791
OFF - ConstMin - Plate Compactors	8	0.2351	1.7816	1.4922	0.0038	0.0696	0.0640	0.2351	1.7817	1.4923	0.0038	0.0696	0.0641	0.2351	1.7817	1.4923	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3114	2.3695	1.6463	0.0045	0.0906	0.0834	0.3114	2.3696	1.6464	0.0045	0.0906	0.0834	0.3114	2.3698	1.6465	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3059	2.3391	1.2634	0.0039	0.0874	0.0804	0.3067	2.3452	1.2667	0.0039	0.0876	0.0806	0.3064	2.3430	1.2655	0.0039	0.0875	0.0805
OFF - ConstMin - Signal Boards	6	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3206	2.4241	1.3023	0.0040	0.0986	0.0907	0.3174	2.4136	1.2961	0.0040	0.0962	0.0885	0.3152	2.4058	1.2921	0.0040	0.0946	0.0870
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3116	2.3823	1.2867	0.0040	0.0897	0.0825	0.3117	2.3833	1.2872	0.0040	0.0892	0.0821	0.3117	2.3830	1.2871	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4220	3.2216	1.9214	0.0056	0.1214	0.1117	0.4222	3.2228	1.9221	0.0057	0.1215	0.1117	0.4217	3.2192	1.9200	0.0056	0.1213	0.1116
OFF - Industrial - Aerial Lifts	17	0.2638	1.9897	1.2567	0.0036	0.0799	0.0735	0.2615	1.9832	1.2524	0.0036	0.0784	0.0722	0.2600	1.9782	1.2496	0.0036	0.0775	0.0713
OFF - Industrial - Other General Industrial Equipment	18	0.2794	2.1867	1.3302	0.0039	0.0826	0.0760	0.2793	2.1864	1.3300	0.0039	0.0826	0.0759	0.2794	2.1867	1.3302	0.0039	0.0826	0.0760
OFF - Industrial - Sweepers/Scrubbers	18	0.3646	2.8955	1.8809	0.0053	0.1100	0.1012	0.3648	2.8970	1.8818	0.0053	0.1101	0.1013	0.3647	2.8960	1.8811	0.0053	0.1100	0.1012
OFF - Light Commercial - Air Compressors	35	0.3682	2.0698	2.4193	0.0035	0.1111	0.1022	0.3329	2.0034	2.3790	0.0035	0.0959	0.0882	0.3056	1.9427	2.3507	0.0035	0.0824	0.0758
OFF - Light Commercial - Generator Sets	21	0.4175	3.3275	2.1715	0.0059	0.1509	0.1389	0.4123	3.2924	2.1583	0.0059	0.1446	0.1331	0.4085	3.2665	2.1467	0.0059	0.1392	0.1281
OFF - Light Commercial - Pressure Washers	21	0.1644	1.3529	0.9845	0.0025	0.0621	0.0572	0.1624	1.3388	0.9821	0.0025	0.0596	0.0548	0.1604	1.3245	0.9769	0.0025	0.0572	0.0526
OFF - Light Commercial - Pumps	18	0.4520	3.3331	2.2663	0.0060	0.1587	0.1460	0.4442	3.2940	2.2539	0.0060	0.1511	0.1390	0.4379	3.2650	2.2432	0.0060	0.1445	0.1330
OFF - Light Commercial - Welders	33	0.3218	1.8990	2.1241	0.0033	0.0991	0.0911	0.2903	1.8382	2.0880	0.0033	0.0858	0.0790	0.2654	1.7824	2.0610	0.0033	0.0740	0.0680
Portable Equipment - Non-Rental Compressor	167	0.0411	0.5402	0.8851	0.0014	0.0213	0.0196	0.0410	0.5264	0.8948	0.0014	0.0210	0.0193	0.0371	0.4165	0.9045	0.0015	0.0159	0.0146
Portable Equipment - Non-Rental Generator	369	0.0755	0.6484	0.3566	0.0014	0.0265	0.0243	0.0745	0.6317	0.3539	0.0014	0.0257	0.0236	0.0626	0.3928	0.3578	0.0015	0.0173	0.0159
Portable Equipment - Non-Rental Other Portable Equipment	407	0.0427	0.4955	0.3361	0.0014	0.0189	0.0174	0.0413	0.5146	0.3018	0.0014	0.0188	0.0173	0.0379	0.4260	0.3051	0.0015	0.0161	0.0148
Portable Equipment - Non-Rental Pump	197	0.0344	0.4188	0.2944	0.0014	0.0147	0.0135	0.0340	0.4005	0.2977	0.0014	0.0139	0.0128	0.0309	0.2942	0.3009	0.0015	0.0105	0.0096
Portable Equipment - Rental Compressor	361	0.0261	0.1638	0.2881	0.0014	0.0077	0.0071	0.0257	0.1477	0.2913	0.0014	0.0070	0.0065	0.0255	0.1325	0.2944	0.0015	0.0064	0.0059
Portable Equipment - Rental Generator	406	0.0593	0.4314	0.3174	0.0014	0.0186	0.0171	0.0547	0.3480	0.3208	0.0014	0.0150	0.0138	0.0501	0.2471	0.3243	0.0015	0.0110	0.0101
Portable Equipment - Rental Other Portable Equipment	657	0.0700	0.4722	0.3328	0.0014	0.0201	0.0185	0.0599	0.2194	0.3365	0.0014	0.0139	0.0127	0.0494	0.0508	0.3401	0.0015	0.0051	0.0047
Portable Equipment - Rental Pump	165	0.0451	0.4339	0.9448	0.0014	0.0156	0.0144	0.0447	0.4161	0.9551	0.0014	0.0148	0.0136	0.0426	0.3373	0.9655	0.0015	0.0119	0.0109

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Database. Available online at https://www.arb.ca.gov/orion/ [Accessesd October 17, 2018].
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "Horsepower_Hours_hhpy" divided by "Total_Activity_hpy.")

Table A-39. In-Use Off-Road Construction Equipment Emission Factors

Equipment Type	Average HP	Emission Factors - 2023 (g/bhp-hr)						Emission Factors - 2024 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0592	0.5975	0.5298	0.0024	0.0191	0.0176	0.0582	0.5618	0.5316	0.0024	0.0182	0.0168
ConstMin - Cranes	231	0.0906	0.9974	0.5197	0.0014	0.0418	0.0385	0.0847	0.9076	0.4853	0.0014	0.0379	0.0348
ConstMin - Crawler Tractors	212	0.1394	1.5759	0.8203	0.0021	0.0653	0.0601	0.1319	1.4539	0.7805	0.0021	0.0602	0.0554
ConstMin - Excavators	158	0.0687	0.5637	1.1758	0.0019	0.0277	0.0255	0.0656	0.5109	1.1778	0.0019	0.0253	0.0233
ConstMin - Graders	188	0.1166	1.3229	0.5265	0.0020	0.0442	0.0407	0.1089	1.1890	0.5160	0.0020	0.0397	0.0365
ConstMin - Off-Highway Tractors	124	0.0873	0.7750	1.3650	0.0021	0.0371	0.0341	0.0779	0.6344	1.3567	0.0021	0.0302	0.0278
ConstMin - Off-Highway Trucks	403	0.0711	0.5061	0.4624	0.0019	0.0182	0.0168	0.0701	0.4719	0.4563	0.0019	0.0169	0.0156
ConstMin - Other Construction Equipment	172	0.1144	1.1275	1.3078	0.0020	0.0588	0.0541	0.1095	1.0570	1.3119	0.0020	0.0548	0.0505
ConstMin - Pavers	129	0.0845	0.8254	1.2468	0.0020	0.0393	0.0362	0.0816	0.7701	1.2523	0.0020	0.0366	0.0337
ConstMin - Paving Equipment	131	0.0812	0.7491	1.1022	0.0017	0.0391	0.0359	0.0798	0.7121	1.1092	0.0017	0.0374	0.0345
ConstMin - Rollers	80	0.1032	1.0919	1.2843	0.0018	0.0595	0.0547	0.0975	1.0316	1.2827	0.0018	0.0539	0.0496
ConstMin - Rough Terrain Forklifts	100	0.0502	0.7380	1.2932	0.0020	0.0181	0.0166	0.0503	0.7212	1.2962	0.0020	0.0173	0.0160
ConstMin - Rubber Tired Dozers	249	0.1789	1.9495	1.0377	0.0019	0.0871	0.0802	0.2077	2.2834	1.4959	0.0019	0.1017	0.0936
ConstMin - Rubber Tired Loaders	202	0.0753	0.7330	0.4335	0.0018	0.0246	0.0226	0.0698	0.6454	0.4227	0.0018	0.0214	0.0197
ConstMin - Scrapers	367	0.1141	1.1936	0.8495	0.0024	0.0457	0.0421	0.1103	1.1055	0.8253	0.0024	0.0427	0.0393
ConstMin - Skid Steer Loaders	65	0.0562	0.7484	1.2013	0.0018	0.0253	0.0232	0.0524	0.7069	1.1996	0.0018	0.0218	0.0201
ConstMin - Surfacing Equipment	263	0.0619	0.8295	0.4064	0.0015	0.0281	0.0258	0.0581	0.7636	0.3980	0.0015	0.0254	0.0234
ConstMin - Sweepers/Scrubbers	64	0.3579	2.7606	1.9205	0.0022	0.2396	0.2204	0.4344	3.1850	1.9920	0.0022	0.2867	0.2638
ConstMin - Tractors/Loaders/Backhoes	98	0.0829	0.8540	1.2851	0.0018	0.0408	0.0375	0.0792	0.8076	1.2879	0.0018	0.0358	0.0329
ConstMin - Trenchers	79	0.2381	2.2557	1.8580	0.0025	0.1574	0.1448	0.2187	2.0737	1.8404	0.0025	0.1399	0.1287
Industrial - Aerial Lifts	63	0.0335	0.5217	0.9713	0.0015	0.0116	0.0107	0.0339	0.5060	0.9759	0.0015	0.0113	0.0104
Industrial - Forklifts	89	0.0636	0.5991	0.7297	0.0010	0.0367	0.0337	0.0586	0.5529	0.7265	0.0010	0.0316	0.0291
Industrial - Other General Industrial Equipment	88	0.1873	1.5512	1.3363	0.0017	0.1152	0.1060	0.1485	1.2511	1.2787	0.0017	0.0873	0.0803
Industrial - Other Material Handling Equipment	167	0.1017	0.8359	1.2986	0.0019	0.0476	0.0438	0.0969	0.7765	1.3122	0.0019	0.0423	0.0389
OFF - ConstMin - Bore/Drill Rigs	16	0.4234	3.2325	1.9103	0.0056	0.1217	0.1120	0.4227	3.2272	1.9072	0.0056	0.1215	0.1118
OFF - ConstMin - Cement and Mortar Mixers	10	0.3100	2.3502	1.8212	0.0048	0.0920	0.0846	0.3093	2.3471	1.8191	0.0048	0.0917	0.0843
OFF - ConstMin - Concrete/Industrial Saws	31	0.3668	2.7946	3.2020	0.0054	0.0987	0.0908	0.3398	2.7095	3.1703	0.0054	0.0848	0.0780
OFF - ConstMin - Dumpers/Tenders	16	0.2163	1.6536	0.8931	0.0028	0.0619	0.0570	0.2168	1.6581	0.8956	0.0028	0.0619	0.0570
OFF - ConstMin - Excavators	23	0.3228	2.4683	1.3332	0.0041	0.0922	0.0849	0.3231	2.4707	1.3345	0.0041	0.0923	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3412	2.5898	2.0245	0.0053	0.1004	0.0923	0.3411	2.5893	2.0241	0.0053	0.1003	0.0923
OFF - ConstMin - Pavers	24	0.3540	2.7072	1.4619	0.0045	0.1021	0.0939	0.3516	2.6884	1.4520	0.0045	0.1009	0.0928
OFF - ConstMin - Paving Equipment	19	0.2999	2.2931	1.2385	0.0038	0.0857	0.0788	0.3005	2.2975	1.2409	0.0038	0.0858	0.0790
OFF - ConstMin - Plate Compactors	8	0.2351	1.7814	1.4921	0.0038	0.0696	0.0640	0.2351	1.7814	1.4921	0.0038	0.0696	0.0640
OFF - ConstMin - Rollers	12	0.3114	2.3696	1.6464	0.0045	0.0906	0.0834	0.3113	2.3694	1.6462	0.0045	0.0906	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3054	2.3349	1.2612	0.0039	0.0872	0.0803	0.3061	2.3408	1.2643	0.0039	0.0875	0.0805
OFF - ConstMin - Signal Boards	6	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3135	2.3990	1.2892	0.0040	0.0933	0.0859	0.3125	2.3938	1.2875	0.0040	0.0922	0.0848
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3116	2.3823	1.2867	0.0040	0.0890	0.0818	0.3117	2.3832	1.2872	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4219	3.2202	1.9206	0.0056	0.1214	0.1117	0.4215	3.2174	1.9189	0.0056	0.1213	0.1116
OFF - Industrial - Aerial Lifts	17	0.2589	1.9742	1.2476	0.0036	0.0768	0.0706	0.2582	1.9709	1.2464	0.0036	0.0761	0.0700
OFF - Industrial - Other General Industrial Equipment	18	0.2794	2.1869	1.3303	0.0039	0.0826	0.0760	0.2794	2.1866	1.3301	0.0039	0.0826	0.0760
OFF - Industrial - Sweepers/Scrubbers	18	0.3652	2.9004	1.8840	0.0053	0.1102	0.1014	0.3647	2.8959	1.8811	0.0053	0.1100	0.1012
OFF - Light Commercial - Air Compressors	35	0.2830	1.8870	2.3303	0.0035	0.0703	0.0647	0.2645	1.8352	2.3156	0.0035	0.0606	0.0558
OFF - Light Commercial - Generator Sets	21	0.4052	3.2439	2.1364	0.0059	0.1345	0.1238	0.4024	3.2241	2.1276	0.0059	0.1316	0.1210
OFF - Light Commercial - Pressure Washers	21	0.1583	1.3083	0.9695	0.0025	0.0550	0.0506	0.1573	1.3007	0.9680	0.0025	0.0538	0.0495
OFF - Light Commercial - Pumps	18	0.4322	3.2393	2.2335	0.0060	0.1388	0.1277	0.4273	3.2169	2.2253	0.0060	0.1349	0.1241
OFF - Light Commercial - Welders	33	0.2443	1.7310	2.0401	0.0033	0.0633	0.0582	0.2268	1.6832	2.0240	0.0033	0.0546	0.0502
Portable Equipment - Non-Rental Compressor	167	0.0331	0.3063	0.9144	0.0015	0.0116	0.0107	0.0340	0.3201	0.9244	0.0015	0.0119	0.0110
Portable Equipment - Non-Rental Generator	369	0.0613	0.3663	0.3617	0.0015	0.0159	0.0147	0.0613	0.3609	0.3656	0.0015	0.0159	0.0146
Portable Equipment - Non-Rental Other Portable Equipment	407	0.0362	0.3630	0.3084	0.0015	0.0143	0.0131	0.0362	0.3487	0.3118	0.0015	0.0139	0.0127
Portable Equipment - Non-Rental Pump	197	0.0299	0.2591	0.3042	0.0015	0.0096	0.0088	0.0289	0.2191	0.3075	0.0015	0.0083	0.0076
Portable Equipment - Rental Compressor	361	0.0252	0.1081	0.2976	0.0015	0.0058	0.0053	0.0252	0.0957	0.3009	0.0015	0.0053	0.0049
Portable Equipment - Rental Generator	406	0.0499	0.2370	0.3278	0.0015	0.0106	0.0098	0.0479	0.2008	0.3314	0.0015	0.0092	0.0085
Portable Equipment - Rental Other Portable Equipment	657	0.0499	0.0513	0.3439	0.0015	0.0051	0.0047	0.0505	0.0519	0.3476	0.0015	0.0052	0.0048
Portable Equipment - Rental Pump	165	0.0424	0.3251	0.9761	0.0015	0.0114	0.0105	0.0414	0.2810	0.9867	0.0015	0.0094	0.0086

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Database. Availab
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "Horsepower_

EMFAC2014 Emission Factor Summary

Table A-40. On-Road Medium-Duty Vehicle Diesel Emission Factors (San Joaquin Valley Air Basin), grams per hour

Calendar Year	Speed	VOC	NOx	CO	SO2	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	1.1152	0.8467	18.5053	0.0219	0.1445	0.0400	0.1838	0.3682	0.1382	0.0100	0.0788	0.2270
2020	10	1.6599	1.4585	27.6260	0.0439	0.2221	0.0800	0.3675	0.6696	0.2125	0.0200	0.1575	0.3900
2020	15	1.2707	1.5896	20.5190	0.0658	0.2490	0.1200	0.5513	0.9203	0.2383	0.0300	0.2363	0.5045
2020	20	0.7813	1.6713	11.1247	0.0878	0.2936	0.1600	0.7350	1.1886	0.2809	0.0400	0.3150	0.6359
2020	25	0.6285	1.8019	8.5668	0.1097	0.2878	0.2000	0.9188	1.4066	0.2754	0.0500	0.3938	0.7191
2020	30	0.5648	1.8868	7.8038	0.1317	0.2763	0.2400	1.1025	1.6188	0.2643	0.0600	0.4725	0.7968
2020	35	0.5653	2.2084	7.4534	0.1536	0.3084	0.2800	1.2863	1.8746	0.2950	0.0700	0.5513	0.9163
2020	40	0.5754	2.6071	7.2952	0.1756	0.3420	0.3200	1.4700	2.1320	0.3272	0.0800	0.6300	1.0372
2020	45	0.5722	2.8126	7.1359	0.1975	0.3578	0.3600	1.6538	2.3716	0.3423	0.0900	0.7088	1.1411
2020	50	0.5896	3.1055	7.1638	0.2195	0.3880	0.4000	1.8375	2.6255	0.3712	0.1000	0.7875	1.2587
2020	55	0.6607	3.6487	7.5607	0.2414	0.4590	0.4400	2.0213	2.9203	0.4392	0.1100	0.8663	1.4154
2020	60	0.7080	3.9272	8.2243	0.2634	0.5009	0.4800	2.2050	3.1859	0.4793	0.1200	0.9450	1.5443
2020	65	0.7520	3.9095	9.1127	0.2853	0.5256	0.5200	2.3888	3.4344	0.5029	0.1300	1.0238	1.6566
2020	70	0.8227	4.1168	10.1156	0.3073	0.5774	0.5600	2.5725	3.7099	0.5524	0.1400	1.1025	1.7949
2021	5	1.0532	0.7766	18.2780	0.0214	0.1319	0.0400	0.1838	0.3556	0.1262	0.0100	0.0788	0.2149
2021	10	1.5726	1.3462	27.2845	0.0427	0.2102	0.0800	0.3675	0.6577	0.2011	0.0200	0.1575	0.3786
2021	15	1.1913	1.4416	20.2208	0.0641	0.2244	0.1200	0.5513	0.8957	0.2147	0.0300	0.2363	0.4810
2021	20	0.7242	1.5030	10.9108	0.0855	0.2641	0.1600	0.7350	1.1591	0.2526	0.0400	0.3150	0.6076
2021	25	0.5821	1.6158	8.3752	0.1068	0.2620	0.2000	0.9188	1.3808	0.2507	0.0500	0.3938	0.6945
2021	30	0.5231	1.6871	7.6247	0.1282	0.2521	0.2400	1.1025	1.5946	0.2411	0.0600	0.4725	0.7736
2021	35	0.5208	1.9659	7.2615	0.1496	0.2801	0.2800	1.2863	1.8463	0.2680	0.0700	0.5513	0.8892
2021	40	0.5304	2.3216	7.0863	0.1710	0.3119	0.3200	1.4700	2.1019	0.2984	0.0800	0.6300	1.0084
2021	45	0.5240	2.4905	6.9059	0.1923	0.3241	0.3600	1.6538	2.3379	0.3101	0.0900	0.7088	1.1089
2021	50	0.5374	2.7382	6.8949	0.2137	0.3506	0.4000	1.8375	2.5881	0.3355	0.1000	0.7875	1.2230
2021	55	0.5839	3.1346	7.1481	0.2351	0.4010	0.4400	2.0213	2.8622	0.3836	0.1100	0.8663	1.3599
2021	60	0.6479	3.5006	7.8562	0.2564	0.4557	0.4800	2.2050	3.1407	0.4360	0.1200	0.9450	1.5010
2021	65	0.6777	3.4062	8.5922	0.2778	0.4712	0.5200	2.3888	3.3799	0.4508	0.1300	1.0238	1.6046
2021	70	0.7465	3.6261	9.5601	0.2992	0.5211	0.5600	2.5725	3.6536	0.4986	0.1400	1.1025	1.7411
2022	5	0.9930	0.7120	18.0415	0.0208	0.1186	0.0400	0.1838	0.3423	0.1134	0.0100	0.0788	0.2022
2022	10	1.4815	1.2302	26.9245	0.0416	0.1892	0.0800	0.3675	0.6367	0.1810	0.0200	0.1575	0.3585
2022	15	1.1193	1.3124	19.9210	0.0624	0.2033	0.1200	0.5513	0.8745	0.1945	0.0300	0.2363	0.4607
2022	20	0.6735	1.3581	10.7075	0.0832	0.2385	0.1600	0.7350	1.1335	0.2282	0.0400	0.3150	0.5832
2022	25	0.5392	1.4508	8.1933	0.1040	0.2376	0.2000	0.9188	1.3563	0.2273	0.0500	0.3938	0.6710
2022	30	0.4848	1.5125	7.4568	0.1248	0.2294	0.2400	1.1025	1.5719	0.2194	0.0600	0.4725	0.7519
2022	35	0.4810	1.7557	7.0844	0.1456	0.2544	0.2800	1.2863	1.8207	0.2434	0.0700	0.5513	0.8647
2022	40	0.4879	2.0650	6.8894	0.1663	0.2828	0.3200	1.4700	2.0728	0.2706	0.0800	0.6300	0.9806
2022	45	0.4815	2.2142	6.7000	0.1871	0.2941	0.3600	1.6538	2.3079	0.2814	0.0900	0.7088	1.0801
2022	50	0.4914	2.4257	6.6572	0.2079	0.3170	0.4000	1.8375	2.5545	0.3033	0.1000	0.7875	1.1908
2022	55	0.5309	2.7685	6.8535	0.2287	0.3612	0.4400	2.0213	2.8225	0.3456	0.1100	0.8663	1.3218
2022	60	0.5891	3.0948	7.4987	0.2495	0.4110	0.4800	2.2050	3.0960	0.3932	0.1200	0.9450	1.4582
2022	65	0.6163	3.0133	8.1887	0.2703	0.4251	0.5200	2.3888	3.3339	0.4067	0.1300	1.0238	1.5605
2022	70	0.6768	3.2012	9.0748	0.2911	0.4687	0.5600	2.5725	3.6012	0.4484	0.1400	1.1025	1.6909
2023	5	0.9374	0.6566	17.8376	0.0202	0.1034	0.0400	0.1838	0.3272	0.0990	0.0100	0.0788	0.1877
2023	10	1.3948	1.1280	26.6129	0.0404	0.1636	0.0800	0.3675	0.6111	0.1566	0.0200	0.1575	0.3341
2023	15	1.0486	1.1960	19.6538	0.0606	0.1775	0.1200	0.5513	0.8488	0.1698	0.0300	0.2363	0.4361
2023	20	0.6201	1.2247	10.5176	0.0808	0.2087	0.1600	0.7350	1.1037	0.1997	0.0400	0.3150	0.5547
2023	25	0.4890	1.2897	8.0139	0.1010	0.2060	0.2000	0.9188	1.3248	0.1971	0.0500	0.3938	0.6409
2023	30	0.4412	1.3431	7.2926	0.1212	0.2013	0.2400	1.1025	1.5438	0.1926	0.0600	0.4725	0.7251
2023	35	0.4357	1.5512	6.9103	0.1414	0.2236	0.2800	1.2863	1.7898	0.2139	0.0700	0.5513	0.8352
2023	40	0.4408	1.8187	6.6980	0.1616	0.2492	0.3200	1.4700	2.0392	0.2384	0.0800	0.6300	0.9484
2023	45	0.4320	1.9415	6.4925	0.1818	0.2581	0.3600	1.6538	2.2718	0.2469	0.0900	0.7088	1.0457
2023	50	0.4385	2.1194	6.4188	0.2020	0.2776	0.4000	1.8375	2.5151	0.2656	0.1000	0.7875	1.1531
2023	55	0.4658	2.3958	6.5449	0.2221	0.3118	0.4400	2.0213	2.7731	0.2983	0.1100	0.8663	1.2746
2023	60	0.5175	2.6888	7.1266	0.2423	0.3563	0.4800	2.2050	3.0413	0.3409	0.1200	0.9450	1.4059
2023	65	0.5369	2.6083	7.7504	0.2625	0.3651	0.5200	2.3888	3.2739	0.3493	0.1300	1.0238	1.5031
2023	70	0.5890	2.7708	8.5576	0.2827	0.4021	0.5600	2.5725	3.5346	0.3847	0.1400	1.1025	1.6272

Table A-41. On-Road Medium-Duty Vehicle Diesel Emission Factors (San Francisco Bay Area Air Basin), grams per hour

Calendar Year	Speed	VOC	NOx	CO	SO2	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	1.0595	0.7931	18.3365	0.0217	0.0917	0.0400	0.1838	0.3154	0.0877	0.0100	0.0788	0.1765
2020	10	1.5726	1.3347	27.4888	0.0433	0.1379	0.0800	0.3675	0.5854	0.1320	0.0200	0.1575	0.3095
2020	15	1.1863	1.4325	20.3797	0.0650	0.1712	0.1200	0.5513	0.8424	0.1638	0.0300	0.2363	0.4300
2020	20	0.6502	1.3427	10.6354	0.0867	0.1817	0.1600	0.7350	1.0767	0.1739	0.0400	0.3150	0.5289
2020	25	0.5079	1.3743	8.0922	0.1084	0.1890	0.2000	0.9188	1.3078	0.1809	0.0500	0.3938	0.6246
2020	30	0.4734	1.4988	7.4028	0.1300	0.2016	0.2400	1.1025	1.5441	0.1929	0.0600	0.4725	0.7254
2020	35	0.4544	1.6732	6.9823	0.1517	0.2161	0.2800	1.2863	1.7824	0.2068	0.0700	0.5513	0.8280
2020	40	0.4433	1.8407	6.6684	0.1734	0.2305	0.3200	1.4700	2.0205	0.2206	0.0800	0.6300	0.9306
2020	45	0.4176	1.8574	6.3670	0.1950	0.2285	0.3600	1.6538	2.2422	0.2186	0.0900	0.7088	1.0173
2020	50	0.4242	2.0731	6.2896	0.2167	0.2503	0.4000	1.8375	2.4878	0.2395	0.1000	0.7875	1.1270
2020	55	0.4292	2.2427	6.2910	0.2384	0.2678	0.4400	2.0213	2.7290	0.2562	0.1100	0.8663	1.2325
2020	60	0.4480	2.3163	6.5818	0.2600	0.2858	0.4800	2.2050	2.9708	0.2734	0.1200	0.9450	1.3384
2020	65	0.5459	2.8225	7.7265	0.2817	0.3589	0.5200	2.3888	3.2676	0.3433	0.1300	1.0238	1.4971
2021	5	0.9926	0.7206	18.0047	0.0211	0.0833	0.0400	0.1838	0.3070	0.0797	0.0100	0.0788	0.1684
2021	10	1.4737	1.2117	26.9800	0.0422	0.1265	0.0800	0.3675	0.5740	0.1210	0.0200	0.1575	0.2985
2021	15	1.1098	1.2968	19.9834	0.0632	0.1565	0.1200	0.5513	0.8277	0.1497	0.0300	0.2363	0.4160
2021	20	0.6056	1.2099	10.4072	0.0843	0.1668	0.1600	0.7350	1.0618	0.1596	0.0400	0.3150	0.5146
2021	25	0.4722	1.2353	7.9082	0.1054	0.1738	0.2000	0.9188	1.2925	0.1663	0.0500	0.3938	0.6100
2021	30	0.4394	1.3423	7.2263	0.1265	0.1852	0.2400	1.1025	1.5277	0.1772	0.0600	0.4725	0.7097
2021	35	0.4204	1.4918	6.8012	0.1475	0.1980	0.2800	1.2863	1.7642	0.1894	0.0700	0.5513	0.8106
2021	40	0.4096	1.6377	6.4855	0.1686	0.2112	0.3200	1.4700	2.0012	0.2021	0.0800	0.6300	0.9121
2021	45	0.3872	1.6570	6.1987	0.1897	0.2105	0.3600	1.6538	2.2242	0.2014	0.0900	0.7088	1.0001
2021	50	0.3913	1.8414	6.0982	0.2108	0.2295	0.4000	1.8375	2.4670	0.2196	0.1000	0.7875	1.1071
2021	55	0.3957	1.9912	6.0837	0.2319	0.2457	0.4400	2.0213	2.7069	0.2351	0.1100	0.8663	1.2113
2021	60	0.4123	2.0554	6.3497	0.2529	0.2617	0.4800	2.2050	2.9467	0.2504	0.1200	0.9450	1.3154
2021	65	0.4985	2.4923	7.3894	0.2740	0.3260	0.5200	2.3888	3.2348	0.3119	0.1300	1.0238	1.4656
2022	5	0.9339	0.6587	17.7032	0.0205	0.0765	0.0400	0.1838	0.3002	0.0732	0.0100	0.0788	0.1619
2022	10	1.3863	1.1067	26.5143	0.0409	0.1166	0.0800	0.3675	0.5641	0.1116	0.0200	0.1575	0.2891
2022	15	1.0432	1.1819	19.6215	0.0614	0.1444	0.1200	0.5513	0.8157	0.1382	0.0300	0.2363	0.4044
2022	20	0.5670	1.0983	10.2049	0.0819	0.1538	0.1600	0.7350	1.0488	0.1472	0.0400	0.3150	0.5022
2022	25	0.4415	1.1190	7.7460	0.1024	0.1604	0.2000	0.9188	1.2791	0.1535	0.0500	0.3938	0.5972
2022	30	0.4103	1.2123	7.0724	0.1228	0.1709	0.2400	1.1025	1.5134	0.1635	0.0600	0.4725	0.6960
2022	35	0.3919	1.3428	6.6447	0.1433	0.1825	0.2800	1.2863	1.7487	0.1746	0.0700	0.5513	0.7958
2022	40	0.3814	1.4717	6.3290	0.1638	0.1947	0.3200	1.4700	1.9847	0.1863	0.0800	0.6300	0.8963
2022	45	0.3611	1.4910	6.0535	0.1843	0.1945	0.3600	1.6538	2.2082	0.1861	0.0900	0.7088	0.9848
2022	50	0.3637	1.6515	5.9358	0.2047	0.2114	0.4000	1.8375	2.4489	0.2023	0.1000	0.7875	1.0898
2022	55	0.3675	1.7843	5.9079	0.2252	0.2263	0.4400	2.0213	2.6876	0.2165	0.1100	0.8663	1.1928
2022	60	0.3821	1.8410	6.1545	0.2457	0.2407	0.4800	2.2050	2.9257	0.2303	0.1200	0.9450	1.2953
2022	65	0.4604	2.2263	7.1142	0.2662	0.2988	0.5200	2.3888	3.2076	0.2859	0.1300	1.0238	1.4397
2023	5	0.8821	0.6068	17.4497	0.0199	0.0687	0.0400	0.1838	0.2925	0.0658	0.0100	0.0788	0.1545
2023	10	1.3103	1.0189	26.1214	0.0397	0.1062	0.0800	0.3675	0.5537	0.1016	0.0200	0.1575	0.2791
2023	15	0.9833	1.0838	19.3096	0.0596	0.1313	0.1200	0.5513	0.8025	0.1256	0.0300	0.2363	0.3918
2023	20	0.5309	1.0019	10.0305	0.0794	0.1398	0.1600	0.7350	1.0348	0.1338	0.0400	0.3150	0.4888
2023	25	0.4123	1.0175	7.6046	0.0993	0.1462	0.2000	0.9188	1.2650	0.1399	0.0500	0.3938	0.5837
2023	30	0.3819	1.0969	6.9368	0.1191	0.1555	0.2400	1.1025	1.4980	0.1488	0.0600	0.4725	0.6813
2023	35	0.3643	1.2106	6.5063	0.1390	0.1663	0.2800	1.2863	1.7326	0.1591	0.0700	0.5513	0.7804
2023	40	0.3531	1.3213	6.1880	0.1588	0.1769	0.3200	1.4700	1.9669	0.1693	0.0800	0.6300	0.8793
2023	45	0.3342	1.3385	5.9211	0.1787	0.1770	0.3600	1.6538	2.1908	0.1694	0.0900	0.7088	0.9681
2023	50	0.3361	1.4806	5.7893	0.1985	0.1925	0.4000	1.8375	2.4300	0.1842	0.1000	0.7875	1.0717
2023	55	0.3379	1.5946	5.7446	0.2184	0.2054	0.4400	2.0213	2.6666	0.1965	0.1100	0.8663	1.1728
2023	60	0.3508	1.6455	5.9731	0.2382	0.2182	0.4800	2.2050	2.9032	0.2088	0.1200	0.9450	1.2738
2023	65	0.4205	1.9849	6.8568	0.2581	0.2698	0.5200	2.3888	3.1785	0.2581	0.1300	1.0238	1.4118

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Emissions

Construction Duration 47 months
3.9 years
Months in Final Year 11

Table A-42. Trip Rate Information

Vehicle Type	Round Trips		One-Way Trips		One-Way Distance	VMT		Annual VMT	
	Max Day Trips	Total Trips	Max Day Trips	Total Trips	(miles)	Daily	Total	2020 - 2022	2023
Dump Truck	6	100	12	200	40	480	8,000	2,043	1,872
Concrete Trucks	15	7,500	30	15,000	40	1,200	600,000	153,191	140,426
Delivery Trucks (non-soil)	5	1,300	10	2,600	40	400	104,000	26,553	24,340
Gravel/paving trucks	3	250	6	500	40	240	20,000	5,106	4,681
Haul trucks (soil)	40	19,420	80	38,840	5	400	194,200	49,583	45,451
Total Truck Trips	69	28,570	138	57,140	165	2,720	926,200	236,476	216,770
Workers	100	43,800	200	87,600	40	8,000	3,504,000	894,638	820,085
Grand Total	**169**	**72,370**	**338**	**144,740**	**205**	**10,720**	**4,430,200**	**1,131,114**	**1,036,855**

Source: EngineeringDataNeeds_July30_2012.xlsx

Table A-43. Maximum Daily Emissions

Truck Emission Factors (g/mi)		0.104	4.124	0.430	0.016	0.209	0.077
Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.139	0.042
	Maximum Daily VMT	Peak Daily Emissions (lbs/day)					
Truck Type	(miles/day)	ROG	NOx	CO	SOx	PM10	PM2.5
Dump Truck	480	0.11	4.36	0.46	0.02	0.22	0.08
Concrete Trucks	1,200	0.27	10.91	1.14	0.04	0.55	0.20
Delivery Trucks (non-soil)	400	0.09	3.64	0.38	0.01	0.18	0.07
Gravel/paving trucks	240	0.05	2.18	0.23	0.01	0.11	0.04
Haul trucks (soil)	400	0.09	3.64	0.38	0.01	0.18	0.07
Truck Subtotal	2,720	0.62	24.73	2.58	0.09	1.25	0.46
Workers	8,000	0.27	1.37	13.29	0.05	2.44	0.75
Grand Total	**10,720**	**0.89**	**26.10**	**15.87**	**0.15**	**3.69**	**1.21**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust).

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Emissions

Table A-44. Annual Emissions

	Truck Emission Factors (g/mi)		0.104	4.124	0.430	0.016	0.206	0.076	0.100	3.639	0.427	0.015	0.204	0.074
	Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.136	0.042	0.014	0.069	0.692	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2020 (tons/year)**						**Annual Emissions - 2021 (tons/year)**					
Truck Type	**2020 - 2022**	**2023**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,043	1,872	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Concrete Trucks	153,191	140,426	0.02	0.70	0.07	0.00	0.03	0.01	0.02	0.61	0.07	0.00	0.03	0.01
Delivery Trucks (non-soil)	26,553	24,340	0.00	0.12	0.01	0.00	0.01	0.00	0.00	0.11	0.01	0.00	0.01	0.00
Gravel/paving trucks	5,106	4,681	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Haul trucks (soil)	49,583	45,451	0.01	0.23	0.02	0.00	0.01	0.00	0.01	0.20	0.02	0.00	0.01	0.00
Truck Subtotal	236,476	216,770	0.03	1.08	0.11	0.00	0.05	0.02	0.03	0.95	0.11	0.00	0.05	0.02
Workers	894,638	820,085	0.02	0.08	0.74	0.00	0.13	0.04	0.01	0.07	0.68	0.00	0.13	0.04
Grand Total	**1,131,114**	**1,036,855**	**0.04**	**1.15**	**0.86**	**0.01**	**0.19**	**0.06**	**0.04**	**1.02**	**0.79**	**0.01**	**0.19**	**0.06**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust). Annual emissions include natural control efficiency from precipitation.

Start Year: 2020
Air Basin: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Em

Table A-44. Annual Emissions

	Truck Emission Factors (g/mi)		0.096	3.225	0.423	0.015	0.201	0.072	0.063	1.295	0.367	0.015	0.192	0.062
	Worker Emission Factors (g/mi)		0.012	0.062	0.640	0.003	0.136	0.042	0.011	0.056	0.594	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2022 (tons/year)**						**Annual Emissions - 2023 (tons/year)**					
Truck Type	**2020 - 2022**	**2023**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,043	1,872	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	153,191	140,426	0.02	0.54	0.07	0.00	0.03	0.01	0.01	0.20	0.06	0.00	0.03	0.01
Delivery Trucks (non-soil)	26,553	24,340	0.00	0.09	0.01	0.00	0.01	0.00	0.00	0.03	0.01	0.00	0.01	0.00
Gravel/paving trucks	5,106	4,681	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Haul trucks (soil)	49,583	45,451	0.01	0.18	0.02	0.00	0.01	0.00	0.00	0.06	0.02	0.00	0.01	0.00
Truck Subtotal	236,476	216,770	0.03	0.84	0.11	0.00	0.05	0.02	0.01	0.31	0.09	0.00	0.05	0.01
Workers	894,638	820,085	0.01	0.06	0.63	0.00	0.13	0.04	0.01	0.06	0.59	0.00	0.13	0.04
Grand Total	**1,131,114**	**1,036,855**	**0.04**	**0.90**	**0.74**	**0.01**	**0.19**	**0.06**	**0.03**	**0.36**	**0.67**	**0.01**	**0.18**	**0.06**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and r

Start Year: 2020
Air Basin: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Lower San Felipe Intake Alternative - Pipeline Option
Haul Truck and Construction Worker Commuting Emissions

Construction Duration	33	months
	2.8	years
Months in Final Year	9	

Table A-45. Trip Rate Information

	Round Trips		One-Way Trips		One-Way Distance	VMT		Annual VMT	
Vehicle Type	**Max Day Trips**	**Total Trips**	**Max Day Trips**	**Total Trips**	**(miles)**	**Daily**	**Total**	**2020 - 2021**	**2022**
Dump Truck	6	100	12	200	40	480	8,000	2,909	2,182
Concrete Trucks	2	5	4	10	40	160	400	145	109
Delivery Trucks (non-soil)	5	1,950	10	3,900	40	400	156,000	56,727	42,545
Gravel/paving trucks	3	250	6	500	40	240	20,000	7,273	5,455
Haul trucks (soil)	2	4,100	4	8,200	5	20	41,000	14,909	11,182
Total Truck Trips	18	6,405	36	12,810	165	1,300	225,400	81,963	61,473
Workers	30	15,000	60	30,000	40	2,400	1,200,000	436,364	327,273
Grand Total	**48**	**21,405**	**96**	**42,810**	**205**	**3,700**	**1,425,400**	**518,327**	**388,746**

Source: EngineeringDataNeeds_July30_2012.xlsx

Table A-46. Maximum Daily Emissions

Truck Emission Factors (g/mi)		0.104	4.124	0.430	0.016	0.209	0.077
Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.139	0.042
	Maximum Daily VMT	**Peak Daily Emissions (lbs/day)**					
Truck Type	**(miles/day)**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	480	0.11	4.36	0.46	0.02	0.22	0.08
Concrete Trucks	160	0.04	1.45	0.15	0.01	0.07	0.03
Delivery Trucks (non-soil)	400	0.09	3.64	0.38	0.01	0.18	0.07
Gravel/paving trucks	240	0.05	2.18	0.23	0.01	0.11	0.04
Haul trucks (soil)	20	0.00	0.18	0.02	0.00	0.01	0.00
Truck Subtotal	1,300	0.30	11.82	1.23	0.04	0.60	0.22
Workers	2,400	0.08	0.41	3.99	0.02	0.73	0.22
Grand Total	**3,700**	**0.38**	**12.23**	**5.22**	**0.06**	**1.33**	**0.44**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface.

Lower San Felipe Intake Alternative - Pipeline Option
Haul Truck and Construction Worker Commuting Emissions

Table A-47. Annual Emissions

	Truck Emission Factors (g/mi)		0.104	4.124	0.430	0.016	0.206	0.076	0.100	3.639	0.427	0.015	0.204	0.074	0.096	3.225	0.423	0.015	0.201	0.072
	Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.136	0.042	0.014	0.069	0.692	0.003	0.136	0.042	0.012	0.062	0.640	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2020 (tons/year)**						**Annual Emissions - 2021 (tons/year)**						**Annual Emissions - 2022 (tons/year)**					
Truck Type	**2020 - 2021**	**2022**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,909	2,182	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Concrete Trucks	145	109	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	0.00	0.00
Delivery Trucks (non-soil)	56,727	42,545	0.01	0.26	0.03	0.00	0.01	0.00	0.01	0.23	0.03	0.00	0.01	0.00	0.00	0.15	0.02	0.00	0.01	0.00
Gravel/paving trucks	7,273	5,455	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Haul trucks (soil)	14,909	11,182	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.06	0.01	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00
Truck Subtotal	81,963	61,473	0.01	0.37	0.04	0.00	0.02	0.01	0.01	0.33	0.04	0.00	0.02	0.01	0.01	0.22	0.03	0.00	0.01	0.00
Workers	436,364	327,273	0.01	0.04	0.36	0.00	0.07	0.02	0.01	0.03	0.33	0.00	0.07	0.02	0.00	0.02	0.23	0.00	0.05	0.02
Grand Total	**518,327**	**388,746**	**0.02**	**0.41**	**0.40**	**0.00**	**0.08**	**0.03**	**0.02**	**0.36**	**0.37**	**0.00**	**0.08**	**0.03**	**0.01**	**0.24**	**0.26**	**0.00**	**0.06**	**0.02**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust). Annual emissions include natural control efficiency from precipitation.

Start Year: 2020
County: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Treatment Alternative
Haul Truck and Construction Worker Commuting Emissions

Construction Duration
Santa Teresa WTP 36 months

Table A-48. Trip Rate Information

Vehicle Type	Round Trips		One-Way Trips		One-Way Distance	VMT		Annual VMT
	Max Day Trips	Total Trips	Max Day Trips	Total Trips	(miles)	Daily	Total	2020-2022
Dump Truck	2	302	4	604	10	40	6,040	2,013
Concrete Trucks	2	155	4	310	10	40	3,100	1,033
Delivery Trucks (non-soil)	3	604	6	1,208	25	150	30,200	10,067
Gravel/paving trucks	2	30	4	60	10	40	600	200
Haul trucks (soil)	2	279	4	558	15	60	8,370	2,790
Total Truck Trips	11	1,370	22	2,740	70	330	48,310	16,103
Workers	80	16,538	160	33,076	30	4,800	992,280	330,760
Grand Total	**91**	**17,908**	**182**	**35,816**	**100**	**5,130**	**1,040,590**	**346,863**

Source: EngineeringDataNeeds_July30_2012.xlsx
Note:
Assume earliest alternative could start would be 2018 (earliest possible date following publication of EIS/EIR and feasibility study).

Table A-49. Maximum Daily Emissions

Truck Emission Factors (g/mi)		0.107	4.144	0.444	0.016	0.209	0.077
Worker Emission Factors (g/mi)		0.014	0.071	0.697	0.003	0.139	0.042
	Maximum Daily VMT	Peak Daily Emissions (lbs/day)					
Truck Type	(miles/day)	ROG	NOx	CO	SOx	PM10	PM2.5
Dump Truck	40	0.01	0.37	0.04	0.00	0.02	0.01
Concrete Trucks	40	0.01	0.37	0.04	0.00	0.02	0.01
Delivery Trucks (non-soil)	150	0.04	1.37	0.15	0.01	0.07	0.03
Gravel/paving trucks	40	0.01	0.37	0.04	0.00	0.02	0.01
Haul trucks (soil)	60	0.01	0.55	0.06	0.00	0.03	0.01
Truck Subtotal	330	0.08	3.02	0.32	0.01	0.15	0.06
Workers	4,800	0.15	0.75	7.37	0.03	1.47	0.45
Grand Total	**5,130**	**0.23**	**3.77**	**7.70**	**0.04**	**1.62**	**0.50**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust).
Emission factors for 2020 used because the start year has the highest emission factors and represents the worst-case impact.

Treatment Alternative
Haul Truck and Construction Worker Commuting Emissions

Table A-50. Annual Emissions

Truck Emission Factors (g/mi)		0.107	4.144	0.444	0.016	0.205	0.076	0.104	3.662	0.441	0.015	0.203	0.074	0.100	3.249	0.437	0.015	0.200	0.071
Worker Emission Factors (g/mi)		0.014	0.071	0.697	0.003	0.134	0.041	0.013	0.064	0.644	0.003	0.134	0.041	0.011	0.058	0.600	0.003	0.134	0.041
	Annual VMT (miles/year)	**Annual Emissions - 2020 (tons/year)**						**Annual Emissions - 2021 (tons/year)**						**Annual Emissions - 2022 (tons/year)**					
Truck Type	**2020-2022**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,013	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Concrete Trucks	1,033	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	0.00	0.00
Delivery Trucks (non-soil)	10,067	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Gravel/paving trucks	200	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	0.00	0.00
Haul trucks (soil)	2,790	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Truck Subtotal	16,103	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.07	0.01	0.00	0.00	0.00	0.00	0.06	0.01	0.00	0.00	0.00
Workers	330,760	0.01	0.03	0.25	0.00	0.05	0.02	0.00	0.02	0.23	0.00	0.05	0.02	0.00	0.02	0.22	0.00	0.05	0.02
Grand Total	**346,863**	**0.01**	**0.10**	**0.26**	**0.00**	**0.05**	**0.02**	**0.01**	**0.09**	**0.24**	**0.00**	**0.05**	**0.02**	**0.01**	**0.08**	**0.23**	**0.00**	**0.05**	**0.02**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust). Annual emissions include natural control efficiency from precipitation.
Mileage assumed to be distributed evenly over each year of construction. Therefore, annual VMT value represents the mileage that would occur in each year of construction.

Start Year: 2020
County: San Francisco Bay Area

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Emission Factors - Weighted Average
Passenger Vehicles (Light duty automobiles and trucks)

Table A-51. Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.0153	0.0223	0.0776	0.7533	0.0031	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2021	0.0137	0.0199	0.0692	0.6917	0.0030	0.0018	0.0080	0.0368	0.0465	0.0017	0.0020	0.0158	0.0194
	2022	0.0123	0.0179	0.0621	0.6401	0.0029	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0111	0.0161	0.0560	0.5941	0.0028	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2024	0.0100	0.0146	0.0507	0.5567	0.0026	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
San Francisco Bay Area	2020	0.0139	0.0202	0.0711	0.6967	0.0030	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0195
	2021	0.0125	0.0182	0.0638	0.6437	0.0029	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2022	0.0113	0.0164	0.0576	0.5996	0.0028	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0102	0.0149	0.0522	0.5596	0.0027	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2024	0.0093	0.0135	0.0475	0.5237	0.0025	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Emission Factors - Weighted Average
Heavy-Duty Trucks (Diesel)

Table A-52. Emission Factors for Haul and Delivery Trucks

		grams per mile												
County	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.104	0.118	4.124	0.430	0.016	0.019	0.036	0.062	0.117	0.018	0.009	0.026	0.054
	2021	0.100	0.114	3.639	0.427	0.015	0.017	0.036	0.062	0.115	0.016	0.009	0.026	0.052
	2022	0.096	0.110	3.225	0.423	0.015	0.015	0.036	0.062	0.112	0.014	0.009	0.026	0.049
	2023	0.063	0.071	1.295	0.367	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2024	0.063	0.072	1.277	0.369	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
San Francisco Bay Area	2020	0.107	0.122	4.144	0.444	0.016	0.019	0.036	0.062	0.117	0.018	0.009	0.026	0.054
	2021	0.104	0.118	3.662	0.441	0.015	0.017	0.036	0.062	0.115	0.016	0.009	0.026	0.052
	2022	0.100	0.114	3.249	0.437	0.015	0.015	0.036	0.062	0.112	0.014	0.009	0.026	0.049
	2023	0.065	0.074	1.328	0.380	0.015	0.005	0.036	0.062	0.102	0.005	0.009	0.026	0.040
	2024	0.065	0.074	1.310	0.382	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-53. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed October 18, 2018].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Default Assumptions

Number precipitation days >0.1 inches

San Joaquin Valley Air Basin	45
San Francisco Bay Area Air Basin	64

Road silt loading	0.03	g/m^2	(AP-42, ADT > 10,000, ubiquitous baseline)
Average vehicle weight	2.2	tons	

Source: CAPCOA. 2017. California Emissions Estimator Model User's Guide, Version 2016.3.2, Appendix D: Default Data Tables. Prepared by BREEZE Software, A Division of Trinity Consultants in collaboration with South Coast Air Quality Management District and the California Air Districts. November. Available online at: http://www.caleemod.com/ [Accessed on October 18, 2018].

Table A-54. Paved Road Dust Emission Factors

Air Basin	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
San Joaquin Valley	0.092	0.023	0.089	0.022
San Francisco Bay Area	0.092	0.023	0.088	0.022

Note:

Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Lower San Felipe Intake Alternative - Tunnel Option
Marine Emissions

Table A-55. Unmitigated Propulsion Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	1,274	32	1989	21	0.50	0.930	0.720	0.720	0.21	0.67	0.44	0.25	12.98	0.50	0.84	2.99
Crew and Supply	439	27	1994	22	0.45	0.930	0.720	0.720	0.21	0.67	0.44	0.25	12.98	0.50	0.84	2.99

Note:
Barges and dredgers are not typically self-propelled and emissions from barge/dredger propulsion engines are not estimated.
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-56. Unmitigated Propulsion Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	7.97	0.36	0.51	2.06	0.0055	8.03	0.37	0.51	2.08	0.0055	8.09	0.38	0.52	2.10	0.0055
Crew and Supply	6.83	0.30	0.42	1.76	0.0055	6.88	0.30	0.42	1.77	0.0055	6.94	0.31	0.43	1.79	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Table A-57. Unmitigated Auxiliary Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	111	32	1989	23	0.31	0.930	0.720	0.720	0.14	0.44	0.28	0.16	15.34	0.80	1.44	3.50
Crew and Supply	79	27	1994	22	0.43	0.930	0.720	0.720	0.14	0.44	0.28	0.16	15.34	0.80	1.44	3.50

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-58. Unmitigated Auxiliary Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	5.28	0.29	0.45	1.33	0.0055	5.31	0.29	0.45	1.33	0.0055	5.34	0.29	0.45	1.34	0.0055
Crew and Supply	7.19	0.38	0.60	1.80	0.0055	7.23	0.39	0.60	1.81	0.0055	7.27	0.39	0.61	1.82	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Tunneling and Spreading of Spoils)

Table A-59. Maximum Daily Unmitigated Marine Vessel Emissions

Vessel Type	Quantity	Trips per Day	Hours per Trip	No. Propulsion Engines	No. Auxiliary Engines	Propulsion Engine Emissions (lbs/day)						Auxiliary Engine Emissions (lbs/day)						Total Engine Emissions (lbs/day)					
						ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5
Tug Boats	2	2	2	2	2	22.70	358.03	92.78	0.25	16.35	15.04	1.75	20.69	5.19	0.02	1.13	1.04	24.45	378.72	97.97	0.27	17.47	16.08
Crew and Supply	2	2	2	3	1	9.74	158.69	40.84	0.13	6.86	6.31	0.83	10.02	2.51	0.01	0.53	0.49	10.57	168.71	43.35	0.14	7.39	6.80
Total	**4**	**4**	**4**	**5**	**3**	**32.44**	**516.72**	**133.62**	**0.38**	**23.20**	**21.35**	**2.58**	**30.70**	**7.70**	**0.03**	**1.66**	**1.53**	**35.02**	**547.43**	**141.32**	**0.41**	**24.86**	**22.87**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

Table A-60. Annual Unmitigated Marine Vessel Emissions by Year

	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)						Annual Emissions - 2023 (tons per year)					
Vessel Type	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Tug Boats																		
Propulsion Engines	0.53	8.41	2.18	0.01	0.38	0.35	0.92	14.50	3.76	0.01	0.66	0.61	0.08	1.25	0.32	0.00	0.06	0.05
Auxiliary Engines	0.04	0.49	0.12	0.00	0.03	0.02	0.07	0.84	0.21	0.00	0.05	0.04	0.01	0.07	0.02	0.00	0.00	0.00
Tug Boats Subtotal	0.57	8.90	2.30	0.01	0.41	0.38	0.99	15.34	3.97	0.01	0.71	0.65	0.09	1.33	0.34	0.00	0.06	0.06
Crew and Supply																		
Propulsion Engines	0.23	3.73	0.96	0.00	0.16	0.15	0.39	6.43	1.65	0.01	0.28	0.26	0.03	0.56	0.14	0.00	0.02	0.02
Auxiliary Engines	0.02	0.24	0.06	0.00	0.01	0.01	0.03	0.41	0.10	0.00	0.02	0.02	0.00	0.04	0.01	0.00	0.00	0.00
Crew and Supply Subtotal	0.25	3.96	1.02	0.00	0.17	0.16	0.43	6.83	1.76	0.01	0.30	0.28	0.04	0.59	0.15	0.00	0.03	0.02
Grand Total	**0.82**	**12.86**	**3.32**	**0.01**	**0.58**	**0.54**	**1.42**	**22.17**	**5.72**	**0.02**	**1.01**	**0.93**	**0.12**	**1.92**	**0.49**	**0.00**	**0.09**	**0.08**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

ROG, CO, NOx, or PM Emission Estimation Method

$$E = EF_0 \times F \times \left(1 + D \times \frac{A}{UL}\right) \times HP \times LF \times Hr$$

Where:
- E = amount of emissions of a pollutant (PM and NOx) emitted during one period
- EF_0 = the model year, horsepower, and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
- F = fuel correction factor that accounts for emission reduction benefits from burning cleaner fuel
- D = horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
- A = age of the engine when the emissions are estimated
- UL = 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

Source: California Air Resources Board. 2010. Staff Report: Initial Statement of Reasons for the Proposed Rulemaking. Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline.
http://www.arb.ca.gov/ports/marinevess/harborcraft/hcdocuments.htm

SOx Emission Estimation Method

$$F_c = HP \times LF \times Hr \times BSFC$$

Where:
- Fc = fuel consumed per engine per year
- HP = rated horsepower of the engine
- Hr = number of annual operating hours of the engine
- LF = vessel type specific engine load factor
- BSFC = brake specific fuel consumption rate; 0.078 gal/kW-hr or 184 g/hp-hr

The sulfur content is assumed to be 15ppm per 13 CCR 2281(a).

Conversion Factors
453.6 grams per pound
2000 pounds per ton

PMSIZE Profile
0.92 PM2.5:PM10
Profile No. 425, Diesel Vehicle Exhaust

Trips per Project

2021	94
2022	162
2023	14
Total	270

Lower San Felipe Intake Alternative - Pipeline Option
Marine Emissions

Table A-61. Unmitigated Propulsion Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	1,274	32	1989	21	0.50	0.930	0.720	0.720	0.21	0.67	0.44	0.25	12.98	0.50	0.84	2.99
Crew and Supply	439	27	1994	22	0.45	0.930	0.720	0.720	0.21	0.67	0.44	0.25	12.98	0.50	0.84	2.99

Note:
Barges and dredgers are not typically self-propelled and emissions from barge/dredger propulsion engines are not estimated.
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-62. Unmitigated Propulsion Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	7.97	0.36	0.51	2.06	0.0055	8.03	0.37	0.51	2.08	0.0055	8.09	0.38	0.52	2.10	0.0055
Crew and Supply	6.83	0.30	0.42	1.76	0.0055	6.88	0.30	0.42	1.77	0.0055	6.94	0.31	0.43	1.79	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Table A-63. Unmitigated Auxiliary Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	111	32	1989	23	0.31	0.930	0.720	0.720	0.14	0.44	0.28	0.16	15.34	0.80	1.44	3.50
Crew and Supply	79	27	1994	22	0.43	0.930	0.720	0.720	0.14	0.44	0.28	0.16	15.34	0.80	1.44	3.50

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-64. Unmitigated Auxiliary Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	5.28	0.29	0.45	1.33	0.0055	5.31	0.29	0.45	1.33	0.0055	5.34	0.29	0.45	1.34	0.0055
Crew and Supply	7.19	0.38	0.60	1.80	0.0055	7.23	0.39	0.60	1.81	0.0055	7.27	0.39	0.61	1.82	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Lay Pipeline)

Table A-65. Maximum Daily Unmitigated Marine Vessel Emissions

Vessel Type	Quantity	Trips per Day	Hours per Trip	No. Propulsion Engines	No. Auxiliary Engines	Propulsion Engine Emissions (lbs/day)						Auxiliary Engine Emissions (lbs/day)						Total Engine Emissions (lbs/day)					
						ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5
Tug Boats	4	2	2	2	2	45.40	716.06	185.55	0.50	32.69	30.08	3.50	41.38	10.39	0.04	2.25	2.07	48.90	757.43	195.94	0.54	34.95	32.15
Crew and Supply	4	2	2	3	1	19.47	317.39	81.68	0.26	13.71	12.62	1.67	20.03	5.02	0.02	1.06	0.98	21.14	337.42	86.70	0.27	14.78	13.59
Total	**8**	**4**	**4**	**5**	**3**	**64.87**	**1,033.44**	**267.24**	**0.75**	**46.41**	**42.70**	**5.17**	**61.41**	**15.40**	**0.06**	**3.32**	**3.05**	**70.04**	**1,094.85**	**282.64**	**0.81**	**49.73**	**45.75**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

Table A-66. Annual Unmitigated Marine Vessel Emissions by Year

	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)					
Vessel Type	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Tug Boats												
Propulsion Engines	7.68	121.19	31.40	0.08	5.53	5.09	0.70	11.10	2.88	0.01	0.51	0.47
Auxiliary Engines	0.59	7.00	1.76	0.01	0.38	0.35	0.05	0.64	0.16	0.00	0.03	0.03
Tug Boats Subtotal	8.28	128.20	33.16	0.09	5.92	5.44	0.76	11.74	3.04	0.01	0.54	0.50
Crew and Supply												
Propulsion Engines	3.30	53.72	13.82	0.04	2.32	2.14	0.30	4.92	1.27	0.00	0.21	0.20
Auxiliary Engines	0.28	3.39	0.85	0.00	0.18	0.17	0.03	0.31	0.08	0.00	0.02	0.02
Crew and Supply Subtotal	3.58	57.11	14.67	0.05	2.50	2.30	0.33	5.23	1.34	0.00	0.23	0.21
Grand Total	**11.85**	**185.30**	**47.84**	**0.14**	**8.42**	**7.74**	**1.09**	**16.97**	**4.38**	**0.01**	**0.77**	**0.71**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

ROG, CO, NOx, or PM Emission Estimation Method

$$E = EF_0 \times F \times \left(1 + D \times \frac{A}{UL}\right) \times HP \times LF \times Hr$$

Where:
- E = amount of emissions of a pollutant (PM and NOx) emitted during one period
- EF_0 = the model year, horsepower, and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
- F = fuel correction factor that accounts for emission reduction benefits from burning cleaner fuel
- D = horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
- A = age of the engine when the emissions are estimated
- UL = 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

Source: California Air Resources Board. 2010. Staff Report: Initial Statement of Reasons for the Proposed Rulemaking. Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline.
http://www.arb.ca.gov/ports/marinevess/harborcraft/hcdocuments.htm

SOx Emission Estimation Method

$$F_c = HP \times LF \times Hr \times BSFC$$

Where:
- Fc = fuel consumed per engine per year
- HP = rated horsepower of the engine
- Hr = number of annual operating hours of the engine
- LF = vessel type specific engine load factor
- BSFC = brake specific fuel consumption rate; 0.078 gal/kW-hr or 184 g/hp-hr

The sulfur content is assumed to be 15ppm per 13 CCR 2281(a).

Conversion Factors

453.6	grams per pound
2000	pounds per ton

Trips per Project

2021	677
2022	62
Total	739

PMSIZE Profile

0.92 PM2.5:PM10
Profile No. 425, Diesel Vehicle Exhaust

Lower San Felipe Intake Alternative
Data Tables

Table A-67. California Commercial Harbor Craft Engine Profile by Vessel Type

	Propulsion Engine			Auxiliary Engine		
Vessel Type	# of Engines per Vessel	Average Annual Operating Hrs	Useful Life	# of Engines per Vessel	Average Annual Operating Hrs	Useful Life
Commercial Fishing	1.12	1,250	21	0.46	1,633	15
Charter Fishing	1.77	1,622	16	0.75	2,077	15
Ferry/excursion Vessels	2.01	1,843	20	1.23	1,254	20
Crew and Supply	2.5	788	22	1.1	3,036	22
Pilot Vessels	1.7	1,031	19	0.14	994	25
Tug Boats	1.92	2,274	21	1.59	2,486	23
Tow Boats	2.1	1,993	26	1.17	2,965	25
Work Boats	1.46	675	17	0.32	750	23
Others	1.11	779	23	0.46	805	22

Source: California Air Resources Board (CARB). Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B [2007 Rulemaking], Available online at: http://www.arb.ca.gov/regact/2007/chc07/appb.pdf [Accessed on: June 13, 2016].

Table A-68. Engine Load Factor by Vessel Type and by Engine Use

Vessel Type	Propulsion Engine Load	Auxiliary Engine Load
Commercial Fishing	0.27	0.43
Charter Fishing	0.52	0.43
Ferry/excursion Vessel	0.42	0.43
Crew and Supply	0.45	0.43
Pilot Vessels	0.51	0.43
Tug Boats	0.5	0.31
Tow Boats	0.68	0.43
Work Boats	0.45	0.43
Others	0.52	0.43

Source: CARB. Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B [2007 Rulemaking], Available online at: http://www.arb.ca.gov/regact/2007/chc07/appb.pdf [Accessed on: June 13, 2016].

Table A-69. Fuel Correction Factor

Calendar Years	Horsepower Range	Model Years	NOx	PM
1994-2006	<25	Pre-1995	0.930	0.750
	25-50	Pre-1999		
	51-100	Pre-1998		
	101-175	Pre-1997		
	176+	Pre-1996		
	<25	1995+	0.948	0.822
	25-50	1999-2010		
	51-100	1998-2010		
	101-175	1997-2010		
	176+	1996-2010		
2007+	<25	Pre-1995	0.930	0.720
	25-50	Pre-1999		
	51-100	Pre-1998		
	101-175	Pre-1997		
	176+	Pre-1996		
	<25	1995+	0.948	0.800
	25-50	1999-2010		
	51-100	1998-2010		
	101-175	1997-2010		
	176+	1996-2010		
	All	2011+	0.948	0.852

Source: CARB. Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B [2007 Rulemaking], Available online at: http://www.arb.ca.gov/regact/2007/chc07/appb.pdf [Accessed on: June 13, 2016].

Table A-70. Engine Deterioration Factor

Horsepower Range	NOx	PM	HC	CO
25-50	0.06	0.31	0.51	0.41
51-250	0.14	0.44	0.28	0.16
>251	0.21	0.67	0.44	0.25

Source: CARB. Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B [2007 Rulemaking], Available online at: http://www.arb.ca.gov/regact/2007/chc07/appb.pdf [Accessed on: June 13, 2016].

Table A-71. Commercial Harbor Craft Emission Factor Table (Zero-Hour)

		Main Engines				Auxiliary Engines			
HP Range	Model Year	NOx	PM	ROG	CO	NOx	PM	ROG	CO
25-50 hp	pre-1998	8.14	0.72	1.84	3.65	6.90	0.64	2.19	5.15
	1998-1999	8.14	0.72	1.80	3.65	6.90	0.64	2.14	5.15
	2000-2004	7.31	0.72	1.80	3.65	6.90	0.64	2.14	5.15
	2005-2008	5.32	0.30	1.80	3.73	5.32	0.30	2.14	3.73
	2009-2020	5.32	0.22	1.80	3.73	5.32	0.22	2.14	3.73
51-120 hp	pre-1997	15.34	0.80	1.44	3.50	13.00	0.71	1.71	4.94
	1997-1999	10.33	0.66	0.99	2.55	8.75	0.58	1.18	3.59
	2000-2004	7.31	0.66	0.99	2.55	7.31	0.58	1.18	3.59
	2005-2008	5.32	0.30	0.99	3.73	5.32	0.30	1.18	3.73
	2009-2020	5.32	0.22	0.99	3.73	5.32	0.22	1.18	3.73
121-175 hp	pre-1971	16.52	0.73	1.32	3.21	14.00	0.65	1.57	4.53
	1971-1978	15.34	0.63	1.10	3.21	13.00	0.55	1.31	4.53
	1979-1983	14.16	0.52	1.00	3.21	12.00	0.46	1.19	4.53
	1984-1986	12.98	0.52	0.94	3.14	11.00	0.46	1.12	4.43
	1987-1995	12.98	0.52	0.88	3.07	11.00	0.46	1.05	4.33
	1996-1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2003	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2004-2012	5.10	0.22	0.68	3.73	5.10	0.22	0.81	3.73
	2013-2020	3.80	0.09	0.68	3.73	3.80	0.09	0.81	3.73
176-250 hp	pre-1971	16.52	0.73	1.32	3.21	14.00	0.65	1.57	4.53
	1971-1978	15.34	0.63	1.10	3.21	13.00	0.55	1.31	4.53
	1979-1983	14.16	0.52	1.00	3.21	12.00	0.46	1.19	4.53
	1984-1986	12.98	0.52	0.94	3.14	11.00	0.46	1.12	4.43
	1987-1994	12.98	0.52	0.88	3.07	11.00	0.46	1.05	4.33
	1995-1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2003	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2004-2013	5.10	0.15	0.68	3.73	5.10	0.15	0.81	3.73
	2014-2020	3.99	0.08	0.68	3.73	3.99	0.08	0.81	3.73
251-500 hp	pre-1971	16.52	0.70	1.26	3.07	14.00	0.62	1.50	4.33
	1971-1978	15.34	0.60	1.05	3.07	13.00	0.53	1.25	4.33
	1979-1983	14.16	0.50	0.95	3.07	12.00	0.45	1.13	4.33
	1984-1986	12.98	0.50	0.90	3.07	11.00	0.45	1.07	4.33
	1987-1994	12.98	0.50	0.84	2.99	11.00	0.45	1.00	4.22
	1995-1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2003	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2004-2013	5.10	0.15	0.68	3.73	5.10	0.15	0.81	3.73
	2014-2020	3.99	0.08	0.68	3.73	3.99	0.08	0.81	3.73
501-750 hp	pre-1971	16.52	0.70	1.26	3.07	14.00	0.62	1.50	4.33
	1971-1978	15.34	0.60	1.05	3.07	13.00	0.53	1.25	4.33
	1979-1983	14.16	0.50	0.95	3.07	12.00	0.45	1.13	4.33
	1984-1986	12.98	0.50	0.90	3.07	11.00	0.45	1.07	4.33
	1987-1994	12.98	0.50	0.84	2.99	11.00	0.45	1.00	4.22
	1995-1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2006	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2007-2012	5.10	0.15	0.68	3.73	5.10	0.15	0.81	3.73
	2013-2020	3.99	0.08	0.68	3.73	3.99	0.08	0.81	3.73

Table A-71. Commercial Harbor Craft Emission Factor Table (Zero-Hour)

HP Range	Model Year	Main Engines				Auxiliary Engines			
		NOx	PM	ROG	CO	NOx	PM	ROG	CO
751-1900 hp	pre-1971	16.52	0.70	1.26	3.07	14.00	0.62	1.50	4.33
	1971-1978	15.34	0.60	1.05	3.07	13.00	0.53	1.25	4.33
	1979-1983	14.16	0.50	0.95	3.07	12.00	0.45	1.13	4.33
	1984-1986	12.98	0.50	0.90	3.07	11.00	0.45	1.07	4.33
	1987-1998	12.98	0.50	0.84	2.99	11.00	0.45	1.00	4.22
	1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2006	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2007-2011	5.53	0.20	0.68	3.73	5.53	0.20	0.81	3.73
	2012-2016	4.09	0.08	0.68	3.73	4.09	0.08	0.81	3.73
	2017-2020	1.30	0.03	0.18	3.73	1.30	0.03	0.18	3.73
1901-3300 hp	pre-1971	16.52	0.70	1.26	3.07	14.00	0.62	1.50	4.33
	1971-1978	15.34	0.60	1.05	3.07	13.00	0.53	1.25	4.33
	1979-1983	14.16	0.50	0.95	3.07	12.00	0.45	1.13	4.33
	1984-1986	12.98	0.50	0.90	3.07	11.00	0.45	1.07	4.33
	1987-1998	12.98	0.50	0.84	2.99	11.00	0.45	1.00	4.22
	1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2006	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2007-2012	5.53	0.20	0.68	3.73	5.53	0.20	0.81	3.73
	2013-2015	4.37	0.10	0.68	3.73	4.37	0.10	0.81	3.73
	2016-2020	1.30	0.03	0.18	3.73	1.30	0.03	0.18	3.73
3301-5000 hp	pre-1971	16.52	0.70	1.26	3.07	14.00	0.62	1.50	4.33
	1971-1978	15.34	0.60	1.05	3.07	13.00	0.53	1.25	4.33
	1979-1983	14.16	0.50	0.95	3.07	12.00	0.45	1.13	4.33
	1984-1986	12.98	0.50	0.90	3.07	11.00	0.45	1.07	4.33
	1987-1998	12.98	0.50	0.84	2.99	11.00	0.45	1.00	4.22
	1999	9.64	0.36	0.68	1.97	8.17	0.32	0.81	2.78
	2000-2006	7.31	0.36	0.68	1.97	7.31	0.32	0.81	2.78
	2007-2013	5.53	0.20	0.68	3.73	5.53	0.20	0.81	3.73
	2014-2015	4.94	0.25	0.68	3.73	4.94	0.25	0.81	3.75
	2016-2020	1.30	0.03	0.18	3.73	1.30	0.03	0.18	3.75

Source: CARB. Emissions Estimation Methodology for Commercial Harbor Craft Operating in California, Appendix B [2007 Rulemaking], Available online at: http://www.arb.ca.gov/regact/2007/chc07/appb.pdf [Accessed on: June 13, 2016].

Table A-72. Quantity of Auxiliary Engines and Average Horsepower

Vessel Category	# Auxiliary Engines	Horsepower	
		Range	Average
Commercial Fishing	212	6 - 300	71
Tug Boats	120	7 - 300	111
Ferry/excursion Vessels	98	10 - 400	94
Charter Fishing	82	4 - 185	50
Others	34	10 - 240	56
Work Boats	26	9 - 221	101
Crew and Supply	22	16 - 110	79
Tow Boats	21	18 - 175	79
Pilot Vessels	1	N/A	30

min	max
30	111

Source: CARB. 2004. Statewide Commercial Harbor Craft Survey, Final Report. March. Available online at: http://www.arb.ca.gov/ports/marinevess/documents/hcsurveyrep0304.pdf [Accessed on: June 13, 2016].

Note:

Vessel categories changed from cited document to be consistent with names used in 2007 and 2010 rulemaking documents to assist with VLOOKUP formulas.

Table A-73. Quantity of Propulsion Engines and Average Horsepower

Vessel Category	# Propulsion Engines	Horsepower		min	max
		Range	Average		
Commercial Fishing	516	8 – 1,485	230	230	1274
Charter Fishing	192	80 – 1,400	381		
Ferry/excursion Vessels	164	35 – 3,110	733		
Tug Boats	144	24 – 3,600	1,274		
Work Boats	99	15 – 1,300	239		
Others	89	28 - 764	281		
Crew and Supply	50	225 - 750	439		
Tow Boats	38	24 – 1,500	500		
Pilot Vessels	15	230 - 550	408		

Source: CARB. 2004. Statewide Commercial Harbor Craft Survey, Final Report. March. Available online at: http://www.arb.ca.gov/ports/marinevess/documents/hcsurveyrep0304.pdf [Accessed on: June 13, 2016].

Note:

Vessel categories changed from cited document to be consistent with names used in 2007 and 2010 rulemaking documents to assist with VLOOKUP formulas.

Table A-74. Vessel Age

Vessel Category	Age
Charter Fishing	27
Ferry/excursion Vessels	27
Tug Boats	32
Commercial Fishing	32
Pilot Vessels	24
Work Boats	27
Crew and Supply	27
Tow Boats	39

Source: CARB. 2004. Statewide Commercial Harbor Craft Survey, Final Report. March. Available online at: http://www.arb.ca.gov/ports/marinevess/documents/hcsurveyrep0304.pdf [Accessed on: June 13, 2016].

Note:

Vessel categories changed from cited document to be consistent with names used in 2007 and 2010 rulemaking documents to assist with VLOOKUP formulas.

Lower San Felipe Intake Alternative - Pipeline Option
Dredge Emissions

Table A-75. Unmitigated Emission Factor Equation Variables

Engine Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Compressor	353	20	2001	19.5	0.5384	0.948	0.8	0.72	0.21	0.67	0.44	0.25	4.95	0.12	0.2299	0.92
Crane	377	43	1978	9	0.42016	0.93	0.72	0.72	0.21	0.67	0.44	0.25	13	0.63	1.2705	4.2
Deck door engine	86	51	1970	16	0.88989	0.93	0.72	0.72	0.14	0.44	0.28	0.16	13	0.84	1.7424	4.8
Generator	464	22	1999	22.5	0.74576	0.948	0.8	0.72	0.21	0.67	0.44	0.25	8.17	0.38	0.8228	2.7
Hoist swing winch	379	33	1988	27	0.31182	0.93	0.72	0.72	0.21	0.67	0.44	0.25	11	0.53	1.0164	4.1
Other	390	24	1997	16	0.80208	0.948	0.8	0.72	0.21	0.67	0.44	0.25	8.17	0.38	0.8228	2.7
Pump	518	21	2000	21	0.71213	0.948	0.8	0.72	0.21	0.67	0.44	0.25	8.17	0.38	0.8228	2.7

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-76. Unmitigated Dredging Auxiliary Engine Emission Factors

Engine Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Compressor	3.07	0.09	0.13	0.62	0.0055	3.10	0.09	0.13	0.63	0.0055
Crane	10.18	0.80	1.19	3.87	0.0055	10.29	0.81	1.21	3.92	0.0055
Deck door engine	15.56	1.29	2.11	6.45	0.0055	15.65	1.31	2.13	6.49	0.0055
Generator	6.96	0.38	0.63	2.51	0.0055	7.02	0.38	0.64	2.53	0.0055
Hoist swing winch	4.01	0.22	0.35	1.67	0.0055	4.03	0.22	0.35	1.68	0.0055
Other	8.17	0.49	0.79	2.98	0.0055	8.25	0.50	0.80	3.01	0.0055
Pump	6.67	0.36	0.61	2.40	0.0055	6.73	0.37	0.62	2.43	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Lay Pipeline)

Table A-77. Unmitigated Maximum Daily Emissions

Type	Quantity	Hours/ Day	Daily Emissions (lbs/day)					
			ROG	NOx	CO	SO2	PM10	PM2.5
Compressor	1	20	2.01	47.79	9.69	0.09	1.36	1.25
Crane	1	20	19.82	169.16	64.37	0.09	13.31	12.24
Deck door engine	1	20	8.01	59.00	24.46	0.02	4.90	4.51
Generator	1	20	12.93	142.43	51.26	0.11	7.68	7.06
Hoist swing winch	1	20	5.86	66.99	27.89	0.09	3.62	3.33
Other	1	20	13.56	140.47	51.20	0.09	8.41	7.73
Pump	1	20	13.88	152.43	54.89	0.13	8.26	7.60
		Total	**76.07**	**778.27**	**283.77**	**0.62**	**47.53**	**43.72**

Note: Emissions based on 2021 calendar year because this would represent the worst-case (highest) emissions scenario.

Table A-78. Unmitigated Annual Emissions

Type	Trips/ Project	Trips per Year 2021	Trips per Year 2022	Hours/ Day	Annual Emissions - 2021 (tons/year) ROG	NOx	CO	SO2	PM10	PM2.5	Annual Emissions - 2022 (tons/year) ROG	NOx	CO	SO2	PM10	PM2.5
Compressor	12	11	1	20	0.01	0.26	0.05	0.00	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00
Crane	12	11	1	20	0.11	0.93	0.35	0.00	0.07	0.07	0.01	0.09	0.03	0.00	0.01	0.01
Deck door engine	12	11	1	20	0.04	0.32	0.13	0.00	0.03	0.02	0.00	0.03	0.01	0.00	0.00	0.00
Generator	12	11	1	20	0.07	0.78	0.28	0.00	0.04	0.04	0.01	0.07	0.03	0.00	0.00	0.00
Hoist swing winch	12	11	1	20	0.03	0.37	0.15	0.00	0.02	0.02	0.00	0.03	0.01	0.00	0.00	0.00
Other	12	11	1	20	0.07	0.77	0.28	0.00	0.05	0.04	0.01	0.07	0.03	0.00	0.00	0.00
Pump	12	11	1	20	0.08	0.84	0.30	0.00	0.05	0.04	0.01	0.08	0.03	0.00	0.00	0.00
				Total	**0.42**	**4.28**	**1.56**	**0.00**	**0.26**	**0.24**	**0.04**	**0.39**	**0.14**	**0.00**	**0.02**	**0.02**

Conversions
453.6 g/lb
2,000 lbs/ton

PMSIZE Ratio
0.92 PM2.5:PM10
Profile No. 425, Diesel Vehicle Exhaust

Dredge Trips
1 dredge (1 trip per day)
12 trips per project

Lower San Felipe Intake Alternative - Pipeline Optin

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Generator	2001	1	95	890	15
Pump	2001	1	156	991	15
Pump	2001	1	156	1,077	15
Pump	2001	1	255	1,420	15
Pump	2001	1	255	726	15
Pump	2001	1	371	350	15
Pump	2001	1	371	412	15
Pump	2001	1	371	444	15
Pump	2001	1	371	408	15
Generator	2001	1	95	205	15
Pump	2001	1	156	1,276	15
Pump	2001	1	156	571	15
Pump	2001	1	255	851	15
Pump	2001	1	255	932	15
Pump	2001	1	371	510	15
Pump	2001	1	371	79	15
Pump	2001	1	371	87	15
Pump	2001	1	371	546	15
Generator	2001	1	95	1,853	15
Pump	2001	1	156	1,511	15
Pump	2001	1	156	953	15
Pump	2001	1	255	111	15
Pump	2001	1	255	1,362	15
Pump	2001	1	371	583	15
Pump	2001	1	371	213	15
Pump	2001	1	371	207	15
Pump	2001	1	371	764	15
Generator	2001	1	95	273	15
Pump	2001	1	156	1,330	15
Pump	2001	1	156	637	15
Pump	2001	1	255	994	15
Pump	2001	1	255	1,220	15
Pump	2001	1	371	589	15
Pump	2001	1	371	148	15
Pump	2001	1	371	159	15
Pump	2001	1	371	751	15
Generator	2004	1	95	220	15
Pump	2004	1	1,900	1,500	15
Pump	2004	1	1,900	1,500	15
Generator	2006	2	95	250	15
Pump	2006	1	1,900	1,500	15
Pump	2006	1	1,900	1,500	15
Generator	2008	3	95	1	15
Pump	2008	2	1,900	1	15
Pump	2008	2	1,900	1	15
Generator	1976	0	46	1	15
Pump	1976	0	160	1	15
Pump	1976	0	200	1	15
Pump	1976	0	200	1	15
Pump	1976	0	200	1	15
Pump	1990	0	160	1	15
Pump	1990	0	160	1	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Pump	1990	0	160	1	15
Pump	1990	0	160	1	15
Pump	1990	0	160	1	15
Pump	1990	0	160	1	15
Generator	1999	1	202	1	15
Compressor	1997	1	80	91	15
Crane	1978	0	287	290	15
Other	1996	0	90	670	15
Hoist_swing_winch	1960	0	120	8	15
Hoist_swing_winch	1988	0	185	12	15
Compressor	1969	0	250	17	15
Crane	1966	0	185	450	15
Hoist_swing_winch	1960	0	45	30	15
Hoist_swing_winch	1988	0	110	24	15
Hoist_swing_winch	1974	0	270	0	15
Hoist_swing_winch	1988	0	291	0	15
Hoist_swing_winch	1988	0	318	0	15
Compressor	2001	1	71	160	15
Crane	1945	0	316	59	15
Hoist_swing_winch	1988	0	185	6	15
Hoist_swing_winch	1969	0	194	5	15
Generator	1998	1	77	55	15
Crane	2005	2	445	1,050	15
Hoist_swing_winch	1988	0	120	26	15
Hoist_swing_winch	1988	0	210	2	15
Compressor	2007	2	65	360	15
Pump	2008	3	665	800	15
Pump	2008	3	665	1,210	15
Pump	2008	3	665	625	15
Pump	2008	3	665	520	15
Pump	2008	3	665	0	15
Pump	2008	3	665	0	15
Other	1999		126	620	15
Hoist_swing_winch	1988		160	90	15
Hoist_swing_winch	1978		100	528	15
Other	1999		65	637	15
Other	1999		350	445	15
Other	1999		350	445	15
Pump	2000		409	1,497	15
Pump	2000		409	562	15
Other	1999		65	858	15
Other	1999		65	912	15
Other	2002		126	1,536	15
Other	2002		440	193	15
Other	2002		440	180	15
Other	2001		1,100	600	15
Dredger	2006		665	0	15
Dredger	2006		665	0	15
Dredger	2006		665	0	15
Dredger	2003		425	0	15
Dredger	2003		425	0	15
Dredger	2003		425	0	15
Dredger	2003		425	0	15
Other	1984		265	4,284	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Other	1984		304	257	15
Other	1984		375	600	15
Other	1983		1,000	1,390	15
Other	2007		765	183	15
Other	2006		300	5	15
Other	2007		700	183	15
Other	2006		540	183	15
Other	2006		300	5	15
Other	1999		210	150	15
Other	2001		2,934	1,300	15
Other	2003		106	1,300	15
Other	2006		225	213	15
Other	2005		440	213	15
Other	2006		350	213	15
Other	2006		225	15	15
Other	1999		180	60	15
Other	1999		180	60	15
Hoist_swing_winch	2007		185	24	15
Deck_door_engine	1970		86	1,400	15
Generator	1999		349	2,209	15
Other	2002		425	1,531	15
Hoist_swing_winch	1997		180	200	15
Pump	1997		60	200	15
Hoist_swing_winch	1997		228	200	15
Hoist_swing_winch	1997		180	200	15
Deck_door_engine	1970		86	1,400	15
Other	2006		375	500	15
Hoist_swing_winch	1970		238	280	15
Generator	2000		49	100	15
Pump	2003		460	1,325	15
Other	1998		400	1,865	15
Generator	1991		685	1,825	15
Pump	1966		1,846	1,410	15
Pump	1986		1,325	0	15
Other	1991		390	0	15
Pump	2002		425	471	15
Pump	2002		425	354	15
Pump	2002		425	121	15
Pump	2002		425	55	15
Generator	2002		190	589	15
Generator	2002		190	1,319	15
Pump	2002		500	388	15
Pump	2002		500	415	15
Generator	2002		166	589	15
Generator	2002		166	1,319	15
Pump	2005		500	229	15
Pump	2005		500	247	15
Compressor	2005		500	180	15
Compressor	2005		500	169	15
Generator	2005		219	1,618	15
Generator	2005		219	713	15
Pump	2006		425	606	15
Pump	2006		425	276	15
Pump	2006		425	654	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Pump	2006		425	213	15
Generator	2005		219	1,798	15
Generator	2005		219	628	15
Compressor	2006		425	391	15
Compressor	2006		425	483	15
Compressor	2003		425	346	15
Pump	2006		425	189	15
Pump	2006		425	195	15
Pump	2006		425	546	15
Pump	2006		425	535	15
Generator	2007		237	628	15
Generator	2007		237	1,074	15
Compressor	2006		500	468	15
Compressor	2006		500	451	15
Compressor	2003		500	428	15
Pump	2003		500	1,487	15
Pump	2003		500	1,464	15
Generator	2004		219	1,626	15
Generator	2004		219	734	15
Other	1997		225	520	15
Other	2000		210	0	15
Crane	1998		650	1	15
Generator	1985		38	0	15
Hoist_swing_winch	1999		120	0	15
Hoist_swing_winch	1985		365	0	15
Other	2004		72	6,710	15
Other	2004		72	806	15
Other	2004		325	90	15
Other	2004		325	266	15
Other	2003		5	3,500	15
Other	2003		15	250	15
Other	2003		15	250	15
Other	1983		325	468	15
Other	1983		325	468	15
Other	1993		160	1,076	15
Other	1999		300	0	15
Other	1999		300	0	15
Other	1999		277	0	15
Other	1999		277	0	15
Other	1999		277	0	15
Other	2003		72	0	15
Other	2003		72	0	15
Other	2003		300	0	15
Other	2003		300	0	15
Other	1999		325	519	15
Other	1999		325	519	15
Other	1999		90	580	15
Other	2003		90	684	15
Other	2003		325	80	15
Other	2003		325	84	15
Other	1993		250	290	15
Other	1993		250	290	15
Other	1993		277	758	15
Other	1993		277	1,778	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Other	1993		250	375	15
Other	1992		250	504	15
Other	2001		325	265	15
Other	2001		325	265	15
Other	2006		40	280	15
Other	1975		210	135	15
Other	1975		120	135	15
Other	1975		96	322	15
Other	1975		120	322	15
Other	1984		211	191	15
Other	1984		211	191	15
Other	1984		211	406	15
Other	1984		211	406	15
Other	1980		260	103	15
Other	1980		260	103	15
Other	1971		120	69	15
Other	1971		96	69	15
Other	2008		225	83	15
Other	2008		225	83	15
Other	1975		120	200	15
Other	1975		120	90	15
Other	1975		120	50	15
Other	1975		120	50	15
Other	1975		96	550	15
Other	1975		210	550	15
Pump	2007		155	200	15
Pump	2007		280	580	15
Pump	2007		518	1,300	15
Pump	2003		100	185	15
Pump	2003		100	190	15
Generator	1999		31	375	15
Pump	2007		173	130	15
Pump	2007		173	400	15
Generator	2006		55	500	15
Pump	2000		170	500	15
Pump	2000		170	500	15
Generator	2006		32	300	15
Other	1999		100	159	15
Hoist_swing_winch	1982		478	82	15
Generator	2002		440	748	15
Other	1999		500	771	15
Other	1999		500	771	15
Pump	1999		1,500	561	15
Pump	1999		1,500	561	15
Generator	1999		359	748	15
Generator	1995		230	748	15
Generator	1999		359	748	15
Pump	2001		2,500	561	15
Hoist_swing_winch	1980		400	82	15
Generator	2002		335	748	15
Generator	2002		425	748	15
Hoist_swing_winch	2002		440	82	15
Hoist_swing_winch	1997		290	82	15
Hoist_swing_winch	2004		300	82	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Generator	2000		550	748	15
Hoist_swing_winch	2000		211	82	15
Generator	1998		2,600	748	15
Generator	1998		2,600	748	15
Generator	1998		2,600	748	15
Generator	1998		550	748	15
Generator	1998		2,600	748	15
Generator	1989		500	748	15
Generator	1974		245	748	15
Hoist_swing_winch	1974		243	82	15
Hoist_swing_winch	2000		1,650	82	15
Other	2007		174	771	15
Hoist_swing_winch	1976		182	82	15
Hoist_swing_winch	1969		180	82	15
Hoist_swing_winch	1974		400	82	15
Generator	2007		197	748	15
Generator	1994		500	748	15
Hoist_swing_winch	2008		300	82	15
Generator	2000		205	748	15
Hoist_swing_winch	1997		250	82	15
Hoist_swing_winch	1997		250	82	15
Generator	2005		2,686	748	15
Hoist_swing_winch	2007		202	82	15
Generator	2004		425	748	15
Generator	2008		235	748	15
Generator	2002		440	748	15
Generator	1979		180	748	15
Generator	1982		425	748	15
Hoist_swing_winch	1999		599	82	15
Hoist_swing_winch	1999		599	82	15
Generator	2000		550	748	15
Hoist_swing_winch	2000		2,935	82	15
Hoist_swing_winch	2000		250	82	15
Generator	2002		440	748	15
Hoist_swing_winch	2007		173	82	15
Hoist_swing_winch	2007		173	82	15
Hoist_swing_winch	2003		425	82	15
Generator	2008		80	748	15
Hoist_swing_winch	1956		300	82	15
Hoist_swing_winch	2000		860	82	15
Generator	2000		635	748	15
Generator	2002		112	748	15
Generator	2004		275	748	15
Hoist_swing_winch	1982		239	82	15
Hoist_swing_winch	1982		239	82	15
Generator	2005		500	748	15
Hoist_swing_winch	1989		1,200	82	15
Hoist_swing_winch	2000		250	82	15
Generator	1995		350	748	15
Generator	2007		2,206	748	15
Generator	2008		384	748	15
Pump	2008		630	561	15
Pump	2007		630	561	15
Generator	1974		180	748	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Hoist_swing_winch	1954		400	82	15
Hoist_swing_winch	1970		400	82	15
Hoist_swing_winch	1980		475	82	15
Generator	1963		700	748	15
Other	1982		235	1,200	15
Other	1982		280	1,200	15
Other	1982		280	1,200	15
Other	2006		425	1,200	15
Other	2006		425	1,200	15
Other	2006		157	1,400	15
Other	2006		157	1,400	15
Other	2006		157	1,400	15
Other	2006		54	360	15
Other	1999		49	360	15
Other	1999		50	175	15
Other	1999		82	162	15
Other	1999		300	771	15
Other	1999		300	771	15
Other	2004		277	771	15
Other	2000		56	771	15
Other	2001		75	771	15
Other	1999		160	771	15
Other	1999		230	771	15
Other	1999		160	771	15
Other	1999		85	771	15
Other	1999		85	771	15
Pump	1982		565	561	15
Pump	1982		565	561	15
Other	1982		565	771	15
Other	1982		565	771	15
Other	2007		1,476	771	15
Other	2007		1,476	771	15
Other	2007		1,476	771	15
Other	1999		1,175	771	15
Generator	1998		400	748	15
Other	1999		400	771	15
Other	1999		280	771	15
Other	1999		460	771	15
Other	1999		460	771	15
Other	1999		180	771	15
Other	1999		565	771	15
Other	1999		565	771	15
Other	1999		565	771	15
Other	1999		565	771	15
Other	1994		89	771	15
Other	2005		90	771	15
Other	1999		245	771	15
Other	1999		385	771	15
Other	1999		385	771	15
Other	1999		99	771	15
Hoist_swing_winch	1988		800	82	15
Generator	1998		147	748	15
Other	1999		380	771	15
Generator	1998		390	748	15

Table A-79. Sample Auxiliary Engine Data

Engine Use	Model Year	Engine_tier	HP	Annual Hours	Sulfur Content
Hoist_swing_winch	1988		240	82	15
Hoist_swing_winch	1988		240	82	15
Generator	1998		390	748	15
Other	1999		540	771	15
Other	1999		2,600	771	15
Other	1999		2,600	771	15
Other	1999		2,600	771	15
Other	1999		2,600	771	15
Generator	1998		550	748	15
Hoist_swing_winch	1988		379	82	15
Generator	1998		464	748	15
Hoist_swing_winch	1988		490	82	15
Generator	1998		464	748	15
Generator	1998		249	748	15
Other	1999		930	771	15
Other	1999		930	771	15
Generator	1998		240	748	15
Generator	1998		240	748	15
Other	1999		520	771	15
Other	1999		315	771	15

Source: CARB. California Barge and Dredge Emissions Inventory Database (Access Database). "View Sample Auxiliary Engine Data" input data table. Accessed on: October 18, 2018. Available at: https://www.arb.ca.gov/msei/ordiesel.htm

Table A-80. Average Engine Data

Type	Average Model Year	Average HP	Average Hours	Percentage
Compressor	2001	353	295	7%
Crane	1978	377	370	9%
Deck_door_engine	1970	86	1,400	34%
Dredger	2004	528	0	0%
Generator	1999	464	748	18%
Hoist_swing_winch	1988	379	82	2%
Other	1997	390	635	16%
Pump	2000	518	561	14%

Note: Represents average values from auxiliary engine data shown in Table 79.

Lower San Felipe Intake Alternative - Pipeline Optin

Table A-81. Vessel Profiles by Vessel Type

Vessel Type	Ves	ME Load	AE Load	ME Useful Life	AE Useful Life
Compressor	Compressor		0.54		19.5
Crane	Crane		0.42		9
Deck_door_engine	Deck_door_engine		0.89		16
Dredger	Dredger		0.51		16
Generator	Generator		0.75		22.5
Hoist_swing_winch	Hoist_swing_winch		0.31		27
Other	Other		0.80		16
Pump	Pump		0.71		21
propulsion	propulsion	0.45		17	

Source: CARB. 2010. Barge and Dredge Emission Inventory (Access Database).

Table A-82. Fuel Correction Factor

Calendar Years	Horsepower Range	Model Years	NOx	PM
1994-2006	<25	Pre-1995	0.930	0.750
	25-50	Pre-1999		
	51-100	Pre-1998		
	101-175	Pre-1997		
	176+	Pre-1996		
	<25	1995+	0.948	0.822
	25-50	1999-2010		
	51-100	1998-2010		
	101-175	1997-2010		
	176+	1996-2010		
2007+	<25	Pre-1995	0.930	0.720
	25-50	Pre-1999		
	51-100	Pre-1998		
	101-175	Pre-1997		
	176+	Pre-1996		
	<25	1995+	0.948	0.800
	25-50	1999-2010		
	51-100	1998-2010		
	101-175	1997-2010		
	176+	1996-2010		
	All	2011+	0.948	0.852

Table A-83. Deterioration Factors

HP_Range	ROG	CO	NOX	PM
0-15	0.51	0.41	0.06	0.31
15-25	0.51	0.41	0.06	0.31
25-50	0.51	0.41	0.06	0.31
51-120	0.28	0.16	0.14	0.44
121-175	0.28	0.16	0.14	0.44
176-250	0.28	0.16	0.14	0.44
251-500	0.44	0.25	0.21	0.67
501-750	0.44	0.25	0.21	0.67
>751	0.44	0.25	0.21	0.67

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
1	0<HP<=15	1	MY1994HP1	15	1994	1.815	5	10	1	244.9398798	568.3	Y	1.5
2	0<HP<=15	1	MY1995HP1	15	1995	1.815	5	10	1	244.9398798	568.3		1.5
3	0<HP<=15	1	MY1996HP1	15	1996	1.815	5	10	1	244.9398798	568.3		1.5
4	0<HP<=15	1	MY1997HP1	15	1997	1.815	5	10	1	244.9398798	568.3		1.5
5	0<HP<=15	1	MY1998HP1	15	1998	1.815	5	10	1	244.9398798	568.3		1.5
6	0<HP<=15	1	MY1999HP1	15	1999	1.2705	5	9.35	0.57	244.9398798	568.3	Y	1.05
7	0<HP<=15	1	MY2000HP1	15	2000	1.2705	5	9.35	0.57	244.9398798	568.3		1.05
8	0<HP<=15	1	MY2001HP1	15	2001	1.2705	5	9.35	0.57	244.9398798	568.3		1.05
9	0<HP<=15	1	MY2002HP1	15	2002	1.2705	5	9.35	0.57	244.9398798	568.3		1.05
10	0<HP<=15	1	MY2003HP1	15	2003	1.2705	5	9.35	0.57	244.9398798	568.3		1.05
11	0<HP<=15	1	MY2004HP1	15	2004	0.8228	3.47	6.08	0.47	244.9398798	568.3	Y	0.68
12	0<HP<=15	1	MY2005HP1	15	2005	0.8228	3.47	6.08	0.47	244.9398798	568.3		0.68
13	0<HP<=15	1	MY2006HP1	15	2006	0.8228	3.47	6.08	0.47	244.9398798	568.3		0.68
14	0<HP<=15	1	MY2007HP1	15	2007	0.5929	3.47	4.37	0.38	244.9398798	568.3	Y	0.49
15	0<HP<=15	1	MY2008HP1	15	2008	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
16	0<HP<=15	1	MY2009HP1	15	2009	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
17	0<HP<=15	1	MY2010HP1	15	2010	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
18	0<HP<=15	1	MY2011HP1	15	2011	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
19	0<HP<=15	1	MY2012HP1	15	2012	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
20	0<HP<=15	1	MY2013HP1	15	2013	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
21	0<HP<=15	1	MY2014HP1	15	2014	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
22	0<HP<=15	1	MY2015HP1	15	2015	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
23	0<HP<=15	1	MY2016HP1	15	2016	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
24	0<HP<=15	1	MY2017HP1	15	2017	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
25	0<HP<=15	1	MY2018HP1	15	2018	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
26	0<HP<=15	1	MY2019HP1	15	2019	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
27	0<HP<=15	1	MY2020HP1	15	2020	0.5929	3.47	4.37	0.38	244.9398798	568.3		0.49
28	0<HP<=15	1	MY2040HP1	15	2040	0.5929	3.47	4.37	0.19	244.9398798	568.3	Y	0.49
29	15<HP<=25	2	MY1994HP2	25	1994	2.2264	5	6.92	0.76	244.9398798	568.3	Y	1.84
30	15<HP<=25	2	MY1995HP2	25	1995	2.2264	5	6.92	0.76	244.9398798	568.3		1.84
31	15<HP<=25	2	MY1996HP2	25	1996	2.2264	5	6.92	0.76	244.9398798	568.3		1.84
32	15<HP<=25	2	MY1997HP2	25	1997	2.2264	5	6.92	0.76	244.9398798	568.3		1.84
33	15<HP<=25	2	MY1998HP2	25	1998	2.2264	5	6.92	0.76	244.9398798	568.3		1.84
34	15<HP<=25	2	MY1999HP2	25	1999	1.089	5	6.92	0.57	244.9398798	568.3	Y	0.9
35	15<HP<=25	2	MY2000HP2	25	2000	1.089	5	6.92	0.57	244.9398798	568.3		0.9
36	15<HP<=25	2	MY2001HP2	25	2001	1.089	5	6.92	0.57	244.9398798	568.3		0.9
37	15<HP<=25	2	MY2002HP2	25	2002	1.089	5	6.92	0.57	244.9398798	568.3		0.9
38	15<HP<=25	2	MY2003HP2	25	2003	1.089	5	6.92	0.57	244.9398798	568.3		0.9
39	15<HP<=25	2	MY2004HP2	25	2004	0.7744	2.34	5.79	0.38	244.9398798	568.3	Y	0.64
40	15<HP<=25	2	MY2005HP2	25	2005	0.7744	2.34	5.79	0.38	244.9398798	568.3		0.64
41	15<HP<=25	2	MY2006HP2	25	2006	0.7744	2.34	5.79	0.38	244.9398798	568.3		0.64
42	15<HP<=25	2	MY2007HP2	25	2007	0.6897	2.34	4.57	0.38	244.9398798	568.3	Y	0.57
43	15<HP<=25	2	MY2008HP2	25	2008	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
44	15<HP<=25	2	MY2009HP2	25	2009	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
45	15<HP<=25	2	MY2010HP2	25	2010	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
46	15<HP<=25	2	MY2011HP2	25	2011	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
47	15<HP<=25	2	MY2012HP2	25	2012	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
48	15<HP<=25	2	MY2013HP2	25	2013	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
49	15<HP<=25	2	MY2014HP2	25	2014	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
50	15<HP<=25	2	MY2015HP2	25	2015	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
51	15<HP<=25	2	MY2016HP2	25	2016	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
52	15<HP<=25	2	MY2017HP2	25	2017	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
53	15<HP<=25	2	MY2018HP2	25	2018	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
54	15<HP<=25	2	MY2019HP2	25	2019	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57
55	15<HP<=25	2	MY2020HP2	25	2020	0.6897	2.34	4.57	0.38	244.9398798	568.3		0.57

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
56	15<HP<=25	2	MY2040HP2	25	2040	0.6897	2.34	4.57	0.19	244.9398798	568.3	Y	0.57
57	25<HP<=50	3	MY1987HP3	50	1987	2.2264	5	7	0.76	244.9398798	568.3	Y	1.84
58	25<HP<=50	3	MY1988HP3	50	1988	2.2264	5	7	0.76	244.9398798	568.3		1.84
59	25<HP<=50	3	MY1989HP3	50	1989	2.2264	5	7	0.76	244.9398798	568.3		1.84
60	25<HP<=50	3	MY1990HP3	50	1990	2.2264	5	7	0.76	244.9398798	568.3		1.84
61	25<HP<=50	3	MY1991HP3	50	1991	2.2264	5	7	0.76	244.9398798	568.3		1.84
62	25<HP<=50	3	MY1992HP3	50	1992	2.2264	5	7	0.76	244.9398798	568.3		1.84
63	25<HP<=50	3	MY1993HP3	50	1993	2.2264	5	7	0.76	244.9398798	568.3		1.84
64	25<HP<=50	3	MY1994HP3	50	1994	2.2264	5	7	0.76	244.9398798	568.3		1.84
65	25<HP<=50	3	MY1995HP3	50	1995	2.2264	5	7	0.76	244.9398798	568.3		1.84
66	25<HP<=50	3	MY1996HP3	50	1996	2.2264	5	7	0.76	244.9398798	568.3		1.84
67	25<HP<=50	3	MY1997HP3	50	1997	2.2264	5	7	0.76	244.9398798	568.3		1.84
68	25<HP<=50	3	MY1998HP3	50	1998	2.178	5	6.9	0.76	244.9398798	568.3	Y	1.8
69	25<HP<=50	3	MY1999HP3	50	1999	2.178	5	6.9	0.76	244.9398798	568.3		1.8
70	25<HP<=50	3	MY2000HP3	50	2000	2.178	5	6.9	0.76	244.9398798	568.3		1.8
71	25<HP<=50	3	MY2001HP3	50	2001	2.178	5	6.9	0.76	244.9398798	568.3		1.8
72	25<HP<=50	3	MY2002HP3	50	2002	2.178	5	6.9	0.76	244.9398798	568.3		1.8
73	25<HP<=50	3	MY2003HP3	50	2003	1.7545	4.1	5.55	0.6	244.9398798	568.3	Y	1.45
74	25<HP<=50	3	MY2004HP3	50	2004	0.7744	3.27	5.1	0.43	244.9398798	568.3	Y	0.64
75	25<HP<=50	3	MY2005HP3	50	2005	0.4477	3	4.95	0.38	244.9398798	568.3	Y	0.37
76	25<HP<=50	3	MY2006HP3	50	2006	0.4477	3	4.95	0.38	244.9398798	568.3		0.37
77	25<HP<=50	3	MY2007HP3	50	2007	0.2904	2.86	4.88	0.35	244.9398798	568.3	Y	0.24
78	25<HP<=50	3	MY2008HP3	50	2008	0.2904	2.86	4.88	0.35	244.9398798	568.3		0.24
79	25<HP<=50	3	MY2009HP3	50	2009	0.2904	2.86	4.88	0.35	244.9398798	568.3		0.24
80	25<HP<=50	3	MY2010HP3	50	2010	0.2904	2.86	4.88	0.35	244.9398798	568.3		0.24
81	25<HP<=50	3	MY2011HP3	50	2011	0.2904	2.86	4.88	0.35	244.9398798	568.3		0.24
82	25<HP<=50	3	MY2012HP3	50	2012	0.121	2.72	4.8	0.16	244.9398798	568.3	Y	0.1
83	25<HP<=50	3	MY2013HP3	50	2013	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
84	25<HP<=50	3	MY2014HP3	50	2014	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
85	25<HP<=50	3	MY2015HP3	50	2015	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
86	25<HP<=50	3	MY2016HP3	50	2016	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
87	25<HP<=50	3	MY2017HP3	50	2017	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
88	25<HP<=50	3	MY2018HP3	50	2018	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
89	25<HP<=50	3	MY2019HP3	50	2019	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
90	25<HP<=50	3	MY2020HP3	50	2020	0.121	2.72	4.8	0.16	244.9398798	568.3		0.1
91	25<HP<=50	3	MY2040HP3	50	2040	0.121	2.72	2.9	0.01	244.9398798	568.3	Y	0.1
92	50<HP<=120	4	MY1987HP4	120	1987	1.7424	4.8	13	0.84	222.2602613	568.3	Y	1.44
93	50<HP<=120	4	MY1988HP4	120	1988	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
94	50<HP<=120	4	MY1989HP4	120	1989	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
95	50<HP<=120	4	MY1990HP4	120	1990	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
96	50<HP<=120	4	MY1991HP4	120	1991	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
97	50<HP<=120	4	MY1992HP4	120	1992	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
98	50<HP<=120	4	MY1993HP4	120	1993	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
99	50<HP<=120	4	MY1994HP4	120	1994	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
100	50<HP<=120	4	MY1995HP4	120	1995	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
101	50<HP<=120	4	MY1996HP4	120	1996	1.7424	4.8	13	0.84	222.2602613	568.3		1.44
102	50<HP<=120	4	MY1997HP4	120	1997	1.1979	3.49	8.75	0.69	222.2602613	568.3	Y	0.99
103	50<HP<=120	4	MY1998HP4	120	1998	1.1979	3.49	8.75	0.69	222.2602613	568.3		0.99
104	50<HP<=120	4	MY1999HP4	120	1999	1.1979	3.49	8.75	0.69	222.2602613	568.3		0.99
105	50<HP<=120	4	MY2000HP4	120	2000	1.1979	3.49	8.75	0.69	222.2602613	568.3		0.99
106	50<HP<=120	4	MY2001HP4	120	2001	1.1979	3.49	8.75	0.69	222.2602613	568.3		0.99
107	50<HP<=120	4	MY2002HP4	120	2002	1.1979	3.49	8.75	0.69	222.2602613	568.3		0.99
108	50<HP<=120	4	MY2003HP4	120	2003	1.1979	3.49	6.9	0.69	222.2602613	568.3	Y	0.99
109	50<HP<=120	4	MY2004HP4	120	2004	0.5566	3.23	5.64	0.39	222.2602613	568.3	Y	0.46
110	50<HP<=120	4	MY2005HP4	120	2005	0.3388	3.14	5.22	0.29	222.2602613	568.3	Y	0.28

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
111	50<HP<=120	4	MY2006HP4	120	2006	0.3388	3.14	5.22	0.29	222.2602613	568.3		0.28
112	50<HP<=120	4	MY2007HP4	120	2007	0.2299	3.09	5.01	0.24	222.2602613	568.3	Y	0.19
113	50<HP<=120	4	MY2008HP4	120	2008	0.2299	3.09	5.01	0.24	222.2602613	568.3		0.19
114	50<HP<=120	4	MY2009HP4	120	2009	0.2299	3.09	5.01	0.24	222.2602613	568.3		0.19
115	50<HP<=120	4	MY2010HP4	120	2010	0.2299	3.09	5.01	0.24	222.2602613	568.3		0.19
116	50<HP<=120	4	MY2011HP4	120	2011	0.121	3.05	2.89	0.2	222.2602613	568.3	Y	0.1
117	50<HP<=120	4	MY2012HP4	120	2012	0.1089	3.05	2.53	0.07	222.2602613	568.3	Y	0.09
118	50<HP<=120	4	MY2013HP4	120	2013	0.1089	3.05	2.53	0.07	222.2602613	568.3		0.09
119	50<HP<=120	4	MY2014HP4	120	2014	0.1089	3.05	2.53	0.01	222.2602613	568.3	Y	0.09
120	50<HP<=120	4	MY2015HP4	120	2015	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
121	50<HP<=120	4	MY2016HP4	120	2016	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
122	50<HP<=120	4	MY2017HP4	120	2017	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
123	50<HP<=120	4	MY2018HP4	120	2018	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
124	50<HP<=120	4	MY2019HP4	120	2019	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
125	50<HP<=120	4	MY2020HP4	120	2020	0.1089	3.05	2.53	0.01	222.2602613	568.3		0.09
126	50<HP<=120	4	MY2040HP4	120	2040	0.0847	3.05	1.4	0.01	222.2602613	568.3	Y	0.07
127	120<HP<=175	5	MY1969HP5	175	1969	1.5972	4.4	14	0.77	213.1884139	568.3	Y	1.32
128	120<HP<=175	5	MY1970HP5	175	1970	1.5972	4.4	14	0.77	213.1884139	568.3		1.32
129	120<HP<=175	5	MY1971HP5	175	1971	1.331	4.4	13	0.66	213.1884139	568.3	Y	1.1
130	120<HP<=175	5	MY1972HP5	175	1972	1.331	4.4	13	0.66	213.1884139	568.3		1.1
131	120<HP<=175	5	MY1973HP5	175	1973	1.331	4.4	13	0.66	213.1884139	568.3		1.1
132	120<HP<=175	5	MY1974HP5	175	1974	1.331	4.4	13	0.66	213.1884139	568.3		1.1
133	120<HP<=175	5	MY1975HP5	175	1975	1.331	4.4	13	0.66	213.1884139	568.3		1.1
134	120<HP<=175	5	MY1976HP5	175	1976	1.331	4.4	13	0.66	213.1884139	568.3		1.1
135	120<HP<=175	5	MY1977HP5	175	1977	1.331	4.4	13	0.66	213.1884139	568.3		1.1
136	120<HP<=175	5	MY1978HP5	175	1978	1.331	4.4	13	0.66	213.1884139	568.3		1.1
137	120<HP<=175	5	MY1979HP5	175	1979	1.21	4.4	12	0.55	213.1884139	568.3	Y	1
138	120<HP<=175	5	MY1980HP5	175	1980	1.21	4.4	12	0.55	213.1884139	568.3		1
139	120<HP<=175	5	MY1981HP5	175	1981	1.21	4.4	12	0.55	213.1884139	568.3		1
140	120<HP<=175	5	MY1982HP5	175	1982	1.21	4.4	12	0.55	213.1884139	568.3		1
141	120<HP<=175	5	MY1983HP5	175	1983	1.21	4.4	12	0.55	213.1884139	568.3		1
142	120<HP<=175	5	MY1984HP5	175	1984	1.1374	4.3	11	0.55	213.1884139	568.3	Y	0.94
143	120<HP<=175	5	MY1985HP5	175	1985	1.1374	4.3	11	0.55	213.1884139	568.3		0.94
144	120<HP<=175	5	MY1986HP5	175	1986	1.1374	4.3	11	0.55	213.1884139	568.3	Y	0.94
145	120<HP<=175	5	MY1987HP5	175	1987	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
146	120<HP<=175	5	MY1988HP5	175	1988	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
147	120<HP<=175	5	MY1989HP5	175	1989	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
148	120<HP<=175	5	MY1990HP5	175	1990	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
149	120<HP<=175	5	MY1991HP5	175	1991	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
150	120<HP<=175	5	MY1992HP5	175	1992	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
151	120<HP<=175	5	MY1993HP5	175	1993	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
152	120<HP<=175	5	MY1994HP5	175	1994	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
153	120<HP<=175	5	MY1995HP5	175	1995	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
154	120<HP<=175	5	MY1996HP5	175	1996	0.8228	2.7	8.17	0.38	213.1884139	568.3	Y	0.68
155	120<HP<=175	5	MY1997HP5	175	1997	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
156	120<HP<=175	5	MY1998HP5	175	1998	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
157	120<HP<=175	5	MY1999HP5	175	1999	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
158	120<HP<=175	5	MY2000HP5	175	2000	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
159	120<HP<=175	5	MY2001HP5	175	2001	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
160	120<HP<=175	5	MY2002HP5	175	2002	0.8228	2.7	6.9	0.38	213.1884139	568.3	Y	0.68
161	120<HP<=175	5	MY2003HP5	175	2003	0.3993	2.7	5.26	0.24	213.1884139	568.3	Y	0.33
162	120<HP<=175	5	MY2004HP5	175	2004	0.2662	2.7	4.72	0.19	213.1884139	568.3	Y	0.22
163	120<HP<=175	5	MY2005HP5	175	2005	0.2662	2.7	4.72	0.19	213.1884139	568.3		0.22
164	120<HP<=175	5	MY2006HP5	175	2006	0.1936	2.7	4.44	0.16	213.1884139	568.3	Y	0.16
165	120<HP<=175	5	MY2007HP5	175	2007	0.1936	2.7	4.44	0.16	213.1884139	568.3		0.16

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
166	120<HP<=175	5	MY2008HP5	175	2008	0.1936	2.7	4.44	0.16	213.1884139	568.3		0.16
167	120<HP<=175	5	MY2009HP5	175	2009	0.1936	2.7	4.44	0.16	213.1884139	568.3		0.16
168	120<HP<=175	5	MY2010HP5	175	2010	0.1936	2.7	4.44	0.16	213.1884139	568.3		0.16
169	120<HP<=175	5	MY2011HP5	175	2011	0.121	2.7	2.45	0.14	213.1884139	568.3	Y	0.1
170	120<HP<=175	5	MY2012HP5	175	2012	0.121	2.7	2.45	0.14	213.1884139	568.3		0.1
171	120<HP<=175	5	MY2013HP5	175	2013	0.121	2.7	2.45	0.14	213.1884139	568.3		0.1
172	120<HP<=175	5	MY2014HP5	175	2014	0.1089	2.7	2.27	0.01	213.1884139	568.3	Y	0.09
173	120<HP<=175	5	MY2015HP5	175	2015	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
174	120<HP<=175	5	MY2016HP5	175	2016	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
175	120<HP<=175	5	MY2017HP5	175	2017	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
176	120<HP<=175	5	MY2018HP5	175	2018	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
177	120<HP<=175	5	MY2019HP5	175	2019	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
178	120<HP<=175	5	MY2020HP5	175	2020	0.1089	2.7	2.27	0.01	213.1884139	568.3		0.09
179	120<HP<=175	5	MY2040HP5	175	2040	0.0605	2.7	0.27	0.01	213.1884139	568.3	Y	0.05
180	175<HP<=250	6	MY1969HP6	250	1969	1.5972	4.4	14	0.77	213.1884139	568.3	Y	1.32
181	175<HP<=250	6	MY1970HP6	250	1970	1.5972	4.4	14	0.77	213.1884139	568.3		1.32
182	175<HP<=250	6	MY1971HP6	250	1971	1.331	4.4	13	0.66	213.1884139	568.3	Y	1.1
183	175<HP<=250	6	MY1972HP6	250	1972	1.331	4.4	13	0.66	213.1884139	568.3		1.1
184	175<HP<=250	6	MY1973HP6	250	1973	1.331	4.4	13	0.66	213.1884139	568.3		1.1
185	175<HP<=250	6	MY1974HP6	250	1974	1.331	4.4	13	0.66	213.1884139	568.3		1.1
186	175<HP<=250	6	MY1975HP6	250	1975	1.331	4.4	13	0.66	213.1884139	568.3		1.1
187	175<HP<=250	6	MY1976HP6	250	1976	1.331	4.4	13	0.66	213.1884139	568.3		1.1
188	175<HP<=250	6	MY1977HP6	250	1977	1.331	4.4	13	0.66	213.1884139	568.3		1.1
189	175<HP<=250	6	MY1978HP6	250	1978	1.331	4.4	13	0.66	213.1884139	568.3		1.1
190	175<HP<=250	6	MY1979HP6	250	1979	1.21	4.4	12	0.55	213.1884139	568.3	Y	1
191	175<HP<=250	6	MY1980HP6	250	1980	1.21	4.4	12	0.55	213.1884139	568.3		1
192	175<HP<=250	6	MY1981HP6	250	1981	1.21	4.4	12	0.55	213.1884139	568.3		1
193	175<HP<=250	6	MY1982HP6	250	1982	1.21	4.4	12	0.55	213.1884139	568.3		1
194	175<HP<=250	6	MY1983HP6	250	1983	1.21	4.4	12	0.55	213.1884139	568.3		1
195	175<HP<=250	6	MY1984HP6	250	1984	1.1374	4.3	11	0.55	213.1884139	568.3	Y	0.94
196	175<HP<=250	6	MY1985HP6	250	1985	1.1374	4.3	11	0.55	213.1884139	568.3		0.94
197	175<HP<=250	6	MY1986HP6	250	1986	1.1374	4.3	11	0.55	213.1884139	568.3		0.94
198	175<HP<=250	6	MY1987HP6	250	1987	1.0648	4.2	11	0.55	213.1884139	568.3	Y	0.88
199	175<HP<=250	6	MY1988HP6	250	1988	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
200	175<HP<=250	6	MY1989HP6	250	1989	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
201	175<HP<=250	6	MY1990HP6	250	1990	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
202	175<HP<=250	6	MY1991HP6	250	1991	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
203	175<HP<=250	6	MY1992HP6	250	1992	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
204	175<HP<=250	6	MY1993HP6	250	1993	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
205	175<HP<=250	6	MY1994HP6	250	1994	1.0648	4.2	11	0.55	213.1884139	568.3		0.88
206	175<HP<=250	6	MY1995HP6	250	1995	0.8228	2.7	8.17	0.38	213.1884139	568.3	Y	0.68
207	175<HP<=250	6	MY1996HP6	250	1996	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
208	175<HP<=250	6	MY1997HP6	250	1997	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
209	175<HP<=250	6	MY1998HP6	250	1998	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
210	175<HP<=250	6	MY1999HP6	250	1999	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
211	175<HP<=250	6	MY2000HP6	250	2000	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
212	175<HP<=250	6	MY2001HP6	250	2001	0.8228	2.7	8.17	0.38	213.1884139	568.3		0.68
213	175<HP<=250	6	MY2002HP6	250	2002	0.3872	0.92	6.25	0.15	213.1884139	568.3	Y	0.32
214	175<HP<=250	6	MY2003HP6	250	2003	0.2299	0.92	5	0.12	213.1884139	568.3	Y	0.19
215	175<HP<=250	6	MY2004HP6	250	2004	0.1694	0.92	4.58	0.11	213.1884139	568.3	Y	0.14
216	175<HP<=250	6	MY2005HP6	250	2005	0.1694	0.92	4.58	0.11	213.1884139	568.3		0.14
217	175<HP<=250	6	MY2006HP6	250	2006	0.1452	0.92	4.38	0.11	213.1884139	568.3	Y	0.12
218	175<HP<=250	6	MY2007HP6	250	2007	0.1452	0.92	4.38	0.11	213.1884139	568.3		0.12
219	175<HP<=250	6	MY2008HP6	250	2008	0.1452	0.92	4.38	0.11	213.1884139	568.3		0.12
220	175<HP<=250	6	MY2009HP6	250	2009	0.1452	0.92	4.38	0.11	213.1884139	568.3		0.12

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
221	175<HP<=250	6	MY2010HP6	250	2010	0.121	0.92	2.45	0.11	213.1884139	568.3	Y	0.1
222	175<HP<=250	6	MY2011HP6	250	2011	0.121	0.92	2.45	0.11	213.1884139	568.3		0.1
223	175<HP<=250	6	MY2012HP6	250	2012	0.121	0.92	2.45	0.11	213.1884139	568.3		0.1
224	175<HP<=250	6	MY2013HP6	250	2013	0.0847	0.92	1.36	0.01	213.1884139	568.3	Y	0.07
225	175<HP<=250	6	MY2014HP6	250	2014	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
226	175<HP<=250	6	MY2015HP6	250	2015	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
227	175<HP<=250	6	MY2016HP6	250	2016	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
228	175<HP<=250	6	MY2017HP6	250	2017	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
229	175<HP<=250	6	MY2018HP6	250	2018	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
230	175<HP<=250	6	MY2019HP6	250	2019	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
231	175<HP<=250	6	MY2020HP6	250	2020	0.0847	0.92	1.36	0.01	213.1884139	568.3		0.07
232	175<HP<=250	6	MY2040HP6	250	2040	0.0605	0.92	0.27	0.01	213.1884139	568.3	Y	0.05
233	250<HP<=500	7	MY1969HP7	500	1969	1.5246	4.2	14	0.74	185.9728717	568.3	Y	1.26
234	250<HP<=500	7	MY1970HP7	500	1970	1.5246	4.2	14	0.74	185.9728717	568.3		1.26
235	250<HP<=500	7	MY1971HP7	500	1971	1.2705	4.2	13	0.63	185.9728717	568.3	Y	1.05
236	250<HP<=500	7	MY1972HP7	500	1972	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
237	250<HP<=500	7	MY1973HP7	500	1973	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
238	250<HP<=500	7	MY1974HP7	500	1974	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
239	250<HP<=500	7	MY1975HP7	500	1975	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
240	250<HP<=500	7	MY1976HP7	500	1976	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
241	250<HP<=500	7	MY1977HP7	500	1977	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
242	250<HP<=500	7	MY1978HP7	500	1978	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
243	250<HP<=500	7	MY1979HP7	500	1979	1.1495	4.2	12	0.53	185.9728717	568.3	Y	0.95
244	250<HP<=500	7	MY1980HP7	500	1980	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
245	250<HP<=500	7	MY1981HP7	500	1981	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
246	250<HP<=500	7	MY1982HP7	500	1982	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
247	250<HP<=500	7	MY1983HP7	500	1983	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
248	250<HP<=500	7	MY1984HP7	500	1984	1.089	4.2	11	0.53	185.9728717	568.3	Y	0.9
249	250<HP<=500	7	MY1985HP7	500	1985	1.089	4.2	11	0.53	185.9728717	568.3		0.9
250	250<HP<=500	7	MY1986HP7	500	1986	1.089	4.2	11	0.53	185.9728717	568.3		0.9
251	250<HP<=500	7	MY1987HP7	500	1987	1.0164	4.1	11	0.53	185.9728717	568.3	Y	0.84
252	250<HP<=500	7	MY1988HP7	500	1988	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
253	250<HP<=500	7	MY1989HP7	500	1989	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
254	250<HP<=500	7	MY1990HP7	500	1990	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
255	250<HP<=500	7	MY1991HP7	500	1991	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
256	250<HP<=500	7	MY1992HP7	500	1992	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
257	250<HP<=500	7	MY1993HP7	500	1993	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
258	250<HP<=500	7	MY1994HP7	500	1994	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
259	250<HP<=500	7	MY1995HP7	500	1995	0.8228	2.7	8.17	0.38	185.9728717	568.3	Y	0.68
260	250<HP<=500	7	MY1996HP7	500	1996	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
261	250<HP<=500	7	MY1997HP7	500	1997	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
262	250<HP<=500	7	MY1998HP7	500	1998	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
263	250<HP<=500	7	MY1999HP7	500	1999	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
264	250<HP<=500	7	MY2000HP7	500	2000	0.3872	0.92	6.25	0.15	185.9728717	568.3	Y	0.32
265	250<HP<=500	7	MY2001HP7	500	2001	0.2299	0.92	4.95	0.12	185.9728717	568.3	Y	0.19
266	250<HP<=500	7	MY2002HP7	500	2002	0.1694	0.92	4.51	0.11	185.9728717	568.3	Y	0.14
267	250<HP<=500	7	MY2003HP7	500	2003	0.1694	0.92	4.51	0.11	185.9728717	568.3		0.14
268	250<HP<=500	7	MY2004HP7	500	2004	0.1452	0.92	4.29	0.11	185.9728717	568.3	Y	0.12
269	250<HP<=500	7	MY2005HP7	500	2005	0.121	0.92	4	0.11	185.9728717	568.3	Y	0.1
270	250<HP<=500	7	MY2006HP7	500	2006	0.121	0.92	4	0.11	185.9728717	568.3		0.1
271	250<HP<=500	7	MY2007HP7	500	2007	0.121	0.92	4	0.11	185.9728717	568.3		0.1
272	250<HP<=500	7	MY2008HP7	500	2008	0.121	0.92	4	0.11	185.9728717	568.3		0.1
273	250<HP<=500	7	MY2009HP7	500	2009	0.121	0.92	4	0.11	185.9728717	568.3		0.1
274	250<HP<=500	7	MY2010HP7	500	2010	0.121	0.92	2.45	0.11	185.9728717	568.3	Y	0.1
275	250<HP<=500	7	MY2011HP7	500	2011	0.121	0.92	2.45	0.11	185.9728717	568.3		0.1

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
276	250<HP<=500	7	MY2012HP7	500	2012	0.121	0.92	2.45	0.11	185.9728717	568.3		0.1
277	250<HP<=500	7	MY2013HP7	500	2013	0.0847	0.92	1.36	0.01	185.9728717	568.3	Y	0.07
278	250<HP<=500	7	MY2014HP7	500	2014	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
279	250<HP<=500	7	MY2015HP7	500	2015	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
280	250<HP<=500	7	MY2016HP7	500	2016	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
281	250<HP<=500	7	MY2017HP7	500	2017	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
282	250<HP<=500	7	MY2018HP7	500	2018	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
283	250<HP<=500	7	MY2019HP7	500	2019	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
284	250<HP<=500	7	MY2020HP7	500	2020	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
285	250<HP<=500	7	MY2040HP7	500	2040	0.0605	0.92	0.27	0.01	185.9728717	568.3	Y	0.05
286	500<HP<=750	8	MY1969HP8	750	1969	1.5246	4.2	14	0.74	185.9728717	568.3	Y	1.26
287	500<HP<=750	8	MY1970HP8	750	1970	1.5246	4.2	14	0.74	185.9728717	568.3		1.26
288	500<HP<=750	8	MY1971HP8	750	1971	1.2705	4.2	13	0.63	185.9728717	568.3	Y	1.05
289	500<HP<=750	8	MY1972HP8	750	1972	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
290	500<HP<=750	8	MY1973HP8	750	1973	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
291	500<HP<=750	8	MY1974HP8	750	1974	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
292	500<HP<=750	8	MY1975HP8	750	1975	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
293	500<HP<=750	8	MY1976HP8	750	1976	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
294	500<HP<=750	8	MY1977HP8	750	1977	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
295	500<HP<=750	8	MY1978HP8	750	1978	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
296	500<HP<=750	8	MY1979HP8	750	1979	1.1495	4.2	12	0.53	185.9728717	568.3	Y	0.95
297	500<HP<=750	8	MY1980HP8	750	1980	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
298	500<HP<=750	8	MY1981HP8	750	1981	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
299	500<HP<=750	8	MY1982HP8	750	1982	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
300	500<HP<=750	8	MY1983HP8	750	1983	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
301	500<HP<=750	8	MY1984HP8	750	1984	1.089	4.2	11	0.53	185.9728717	568.3	Y	0.9
302	500<HP<=750	8	MY1985HP8	750	1985	1.089	4.2	11	0.53	185.9728717	568.3		0.9
303	500<HP<=750	8	MY1986HP8	750	1986	1.089	4.2	11	0.53	185.9728717	568.3		0.9
304	500<HP<=750	8	MY1987HP8	750	1987	1.0164	4.1	11	0.53	185.9728717	568.3	Y	0.84
305	500<HP<=750	8	MY1988HP8	750	1988	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
306	500<HP<=750	8	MY1989HP8	750	1989	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
307	500<HP<=750	8	MY1990HP8	750	1990	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
308	500<HP<=750	8	MY1991HP8	750	1991	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
309	500<HP<=750	8	MY1992HP8	750	1992	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
310	500<HP<=750	8	MY1993HP8	750	1993	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
311	500<HP<=750	8	MY1994HP8	750	1994	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
312	500<HP<=750	8	MY1995HP8	750	1995	0.8228	2.7	8.17	0.38	185.9728717	568.3	Y	0.68
313	500<HP<=750	8	MY1996HP8	750	1996	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
314	500<HP<=750	8	MY1997HP8	750	1997	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
315	500<HP<=750	8	MY1998HP8	750	1998	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
316	500<HP<=750	8	MY1999HP8	750	1999	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
317	500<HP<=750	8	MY2000HP8	750	2000	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
318	500<HP<=750	8	MY2001HP8	750	2001	0.3872	0.92	6.25	0.15	185.9728717	568.3	Y	0.32
319	500<HP<=750	8	MY2002HP8	750	2002	0.2299	0.92	4.95	0.12	185.9728717	568.3	Y	0.19
320	500<HP<=750	8	MY2003HP8	750	2003	0.1694	0.92	4.51	0.11	185.9728717	568.3	Y	0.14
321	500<HP<=750	8	MY2004HP8	750	2004	0.1694	0.92	4.51	0.11	185.9728717	568.3		0.14
322	500<HP<=750	8	MY2005HP8	750	2005	0.1452	0.92	4.29	0.11	185.9728717	568.3	Y	0.12
323	500<HP<=750	8	MY2006HP8	750	2006	0.1452	0.92	4.29	0.11	185.9728717	568.3		0.12
324	500<HP<=750	8	MY2007HP8	750	2007	0.1452	0.92	4.29	0.11	185.9728717	568.3		0.12
325	500<HP<=750	8	MY2008HP8	750	2008	0.1452	0.92	4.29	0.11	185.9728717	568.3		0.12
326	500<HP<=750	8	MY2009HP8	750	2009	0.1452	0.92	4.29	0.11	185.9728717	568.3		0.12
327	500<HP<=750	8	MY2010HP8	750	2010	0.121	0.92	2.45	0.11	185.9728717	568.3	Y	0.1
328	500<HP<=750	8	MY2011HP8	750	2011	0.121	0.92	2.45	0.11	185.9728717	568.3		0.1
329	500<HP<=750	8	MY2012HP8	750	2012	0.121	0.92	2.45	0.11	185.9728717	568.3		0.1
330	500<HP<=750	8	MY2013HP8	750	2013	0.0847	0.92	1.36	0.01	185.9728717	568.3	Y	0.07

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
331	500<HP<=750	8	MY2014HP8	750	2014	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
332	500<HP<=750	8	MY2015HP8	750	2015	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
333	500<HP<=750	8	MY2016HP8	750	2016	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
334	500<HP<=750	8	MY2017HP8	750	2017	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
335	500<HP<=750	8	MY2018HP8	750	2018	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
336	500<HP<=750	8	MY2019HP8	750	2019	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
337	500<HP<=750	8	MY2020HP8	750	2020	0.0847	0.92	1.36	0.01	185.9728717	568.3		0.07
338	500<HP<=750	8	MY2040HP8	750	2040	0.0605	0.92	0.27	0.01	185.9728717	568.3	Y	0.05
339	750<HP<=1000	9	MY1969HP9	1000	1969	1.5246	4.2	14	0.74	185.9728717	568.3	Y	1.26
340	750<HP<=1000	9	MY1970HP9	1000	1970	1.5246	4.2	14	0.74	185.9728717	568.3		1.26
341	750<HP<=1000	9	MY1971HP9	1000	1971	1.2705	4.2	13	0.63	185.9728717	568.3	Y	1.05
342	750<HP<=1000	9	MY1972HP9	1000	1972	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
343	750<HP<=1000	9	MY1973HP9	1000	1973	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
344	750<HP<=1000	9	MY1974HP9	1000	1974	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
345	750<HP<=1000	9	MY1975HP9	1000	1975	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
346	750<HP<=1000	9	MY1976HP9	1000	1976	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
347	750<HP<=1000	9	MY1977HP9	1000	1977	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
348	750<HP<=1000	9	MY1978HP9	1000	1978	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
349	750<HP<=1000	9	MY1979HP9	1000	1979	1.1495	4.2	12	0.53	185.9728717	568.3	Y	0.95
350	750<HP<=1000	9	MY1980HP9	1000	1980	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
351	750<HP<=1000	9	MY1981HP9	1000	1981	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
352	750<HP<=1000	9	MY1982HP9	1000	1982	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
353	750<HP<=1000	9	MY1983HP9	1000	1983	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
354	750<HP<=1000	9	MY1984HP9	1000	1984	1.089	4.2	11	0.53	185.9728717	568.3	Y	0.9
355	750<HP<=1000	9	MY1985HP9	1000	1985	1.089	4.2	11	0.53	185.9728717	568.3		0.9
356	750<HP<=1000	9	MY1986HP9	1000	1986	1.089	4.2	11	0.53	185.9728717	568.3		0.9
357	750<HP<=1000	9	MY1987HP9	1000	1987	1.0164	4.1	11	0.53	185.9728717	568.3	Y	0.84
358	750<HP<=1000	9	MY1988HP9	1000	1988	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
359	750<HP<=1000	9	MY1989HP9	1000	1989	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
360	750<HP<=1000	9	MY1990HP9	1000	1990	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
361	750<HP<=1000	9	MY1991HP9	1000	1991	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
362	750<HP<=1000	9	MY1992HP9	1000	1992	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
363	750<HP<=1000	9	MY1993HP9	1000	1993	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
364	750<HP<=1000	9	MY1994HP9	1000	1994	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
365	750<HP<=1000	9	MY1995HP9	1000	1995	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
366	750<HP<=1000	9	MY1996HP9	1000	1996	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
367	750<HP<=1000	9	MY1997HP9	1000	1997	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
368	750<HP<=1000	9	MY1998HP9	1000	1998	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
369	750<HP<=1000	9	MY1999HP9	1000	1999	0.8228	2.7	8.17	0.38	185.9728717	568.3	Y	0.68
370	750<HP<=1000	9	MY2000HP9	1000	2000	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
371	750<HP<=1000	9	MY2001HP9	1000	2001	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
372	750<HP<=1000	9	MY2002HP9	1000	2002	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
373	750<HP<=1000	9	MY2003HP9	1000	2003	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
374	750<HP<=1000	9	MY2004HP9	1000	2004	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
375	750<HP<=1000	9	MY2005HP9	1000	2005	0.3872	0.92	6.25	0.15	185.9728717	568.3	Y	0.32
376	750<HP<=1000	9	MY2006HP9	1000	2006	0.2299	0.92	4.95	0.12	185.9728717	568.3	Y	0.19
377	750<HP<=1000	9	MY2007HP9	1000	2007	0.1694	0.92	4.51	0.11	185.9728717	568.3	Y	0.14
378	750<HP<=1000	9	MY2008HP9	1000	2008	0.1694	0.92	4.51	0.11	185.9728717	568.3		0.14
379	750<HP<=1000	9	MY2009HP9	1000	2009	0.1452	0.92	4.29	0.11	185.9728717	568.3	Y	0.12
380	750<HP<=1000	9	MY2010HP9	1000	2010	0.121	0.92	4.08	0.11	185.9728717	568.3	Y	0.1
381	750<HP<=1000	9	MY2011HP9	1000	2011	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
382	750<HP<=1000	9	MY2012HP9	1000	2012	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
383	750<HP<=1000	9	MY2013HP9	1000	2013	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
384	750<HP<=1000	9	MY2014HP9	1000	2014	0.0847	0.92	2.36	0.06	185.9728717	568.3	Y	0.07
385	750<HP<=1000	9	MY2015HP9	1000	2015	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
386	750<HP<=1000	9	MY2016HP9	1000	2016	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07
387	750<HP<=1000	9	MY2017HP9	1000	2017	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07
388	750<HP<=1000	9	MY2018HP9	1000	2018	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07
389	750<HP<=1000	9	MY2019HP9	1000	2019	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07
390	750<HP<=1000	9	MY2020HP9	1000	2020	0.0847	0.92	2.36	0.06	185.9728717	568.3		0.07
391	750<HP<=1000	9	MY2040HP9	1000	2040	0.0605	0.92	2.36	0.02	185.9728717	568.3	Y	0.05
392	1000<HP<=9999	10	MY1969HP10	9999	1969	1.5246	4.2	14	0.74	185.9728717	568.3	Y	1.26
393	1000<HP<=9999	10	MY1970HP10	9999	1970	1.5246	4.2	14	0.74	185.9728717	568.3		1.26
394	1000<HP<=9999	10	MY1971HP10	9999	1971	1.2705	4.2	13	0.63	185.9728717	568.3	Y	1.05
395	1000<HP<=9999	10	MY1972HP10	9999	1972	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
396	1000<HP<=9999	10	MY1973HP10	9999	1973	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
397	1000<HP<=9999	10	MY1974HP10	9999	1974	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
398	1000<HP<=9999	10	MY1975HP10	9999	1975	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
399	1000<HP<=9999	10	MY1976HP10	9999	1976	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
400	1000<HP<=9999	10	MY1977HP10	9999	1977	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
401	1000<HP<=9999	10	MY1978HP10	9999	1978	1.2705	4.2	13	0.63	185.9728717	568.3		1.05
402	1000<HP<=9999	10	MY1979HP10	9999	1979	1.1495	4.2	12	0.53	185.9728717	568.3	Y	0.95
403	1000<HP<=9999	10	MY1980HP10	9999	1980	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
404	1000<HP<=9999	10	MY1981HP10	9999	1981	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
405	1000<HP<=9999	10	MY1982HP10	9999	1982	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
406	1000<HP<=9999	10	MY1983HP10	9999	1983	1.1495	4.2	12	0.53	185.9728717	568.3		0.95
407	1000<HP<=9999	10	MY1984HP10	9999	1984	1.089	4.2	11	0.53	185.9728717	568.3	Y	0.9
408	1000<HP<=9999	10	MY1985HP10	9999	1985	1.089	4.2	11	0.53	185.9728717	568.3		0.9
409	1000<HP<=9999	10	MY1986HP10	9999	1986	1.089	4.2	11	0.53	185.9728717	568.3		0.9
410	1000<HP<=9999	10	MY1987HP10	9999	1987	1.0164	4.1	11	0.53	185.9728717	568.3	Y	0.84
411	1000<HP<=9999	10	MY1988HP10	9999	1988	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
412	1000<HP<=9999	10	MY1989HP10	9999	1989	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
413	1000<HP<=9999	10	MY1990HP10	9999	1990	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
414	1000<HP<=9999	10	MY1991HP10	9999	1991	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
415	1000<HP<=9999	10	MY1992HP10	9999	1992	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
416	1000<HP<=9999	10	MY1993HP10	9999	1993	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
417	1000<HP<=9999	10	MY1994HP10	9999	1994	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
418	1000<HP<=9999	10	MY1995HP10	9999	1995	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
419	1000<HP<=9999	10	MY1996HP10	9999	1996	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
420	1000<HP<=9999	10	MY1997HP10	9999	1997	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
421	1000<HP<=9999	10	MY1998HP10	9999	1998	1.0164	4.1	11	0.53	185.9728717	568.3		0.84
422	1000<HP<=9999	10	MY1999HP10	9999	1999	0.8228	2.7	8.17	0.38	185.9728717	568.3	Y	0.68
423	1000<HP<=9999	10	MY2000HP10	9999	2000	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
424	1000<HP<=9999	10	MY2001HP10	9999	2001	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
425	1000<HP<=9999	10	MY2002HP10	9999	2002	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
426	1000<HP<=9999	10	MY2003HP10	9999	2003	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
427	1000<HP<=9999	10	MY2004HP10	9999	2004	0.8228	2.7	8.17	0.38	185.9728717	568.3		0.68
428	1000<HP<=9999	10	MY2005HP10	9999	2005	0.3872	0.92	6.25	0.15	185.9728717	568.3	Y	0.32
429	1000<HP<=9999	10	MY2006HP10	9999	2006	0.2299	0.92	4.95	0.12	185.9728717	568.3	Y	0.19
430	1000<HP<=9999	10	MY2007HP10	9999	2007	0.1694	0.92	4.51	0.11	185.9728717	568.3	Y	0.14
431	1000<HP<=9999	10	MY2008HP10	9999	2008	0.1694	0.92	4.51	0.11	185.9728717	568.3		0.14
432	1000<HP<=9999	10	MY2009HP10	9999	2009	0.1452	0.92	4.29	0.11	185.9728717	568.3	Y	0.12
433	1000<HP<=9999	10	MY2010HP10	9999	2010	0.121	0.92	4.08	0.11	185.9728717	568.3	Y	0.1
434	1000<HP<=9999	10	MY2011HP10	9999	2011	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
435	1000<HP<=9999	10	MY2012HP10	9999	2012	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
436	1000<HP<=9999	10	MY2013HP10	9999	2013	0.121	0.92	4.08	0.11	185.9728717	568.3		0.1
437	1000<HP<=9999	10	MY2014HP10	9999	2014	0.121	0.92	2.36	0.06	185.9728717	568.3	Y	0.1
438	1000<HP<=9999	10	MY2015HP10	9999	2015	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1
439	1000<HP<=9999	10	MY2016HP10	9999	2016	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1
440	1000<HP<=9999	10	MY2017HP10	9999	2017	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1

Table A-84. Zero-Hour Emissions Factors (g/hp-hr)

ID	HP Range	HPGroup	MYHPGroup	MaxHP	Model Year	AE ROG	AE CO	AE NOx	AE PM	Fuel	CO2zh	Offroad_original	THCzh
441	1000<HP<=9999	10	MY2018HP10	9999	2018	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1
442	1000<HP<=9999	10	MY2019HP10	9999	2019	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1
443	1000<HP<=9999	10	MY2020HP10	9999	2020	0.121	0.92	2.36	0.06	185.9728717	568.3		0.1
444	1000<HP<=9999	10	MY2040HP10	9999	2040	0.0605	0.92	2.36	0.02	185.9728717	568.3	Y	0.05

CVP Enlarged Reservoir Expansion Alternative

Table A-85. Unmitigated Onsite Construction Equipment Emissions

Equipment Type	Quantity	OFFROAD Description	HP	Hours per Day	Emission Factors (g/hp-hr or g/mi)						Daily Emissions (lb/day)						Annual Emissions (tons/year)					
					ROG	CO	NOX	SO2	PM10	PM2.5	ROG	CO	NOX	SO2	PM10	PM2.5	ROG	CO	NOX	SO2	PM10	PM2.5
Excavators	3	ConstMin - Excavators	158	20	0.089	1.180	0.875	0.002	0.043	0.039	1.86	24.65	18.28	0.04	0.89	0.82	0.34	4.50	3.34	0.01	0.16	0.15
Bulldozers	4	ConstMin - Rubber Tired Dozers	249	20	0.266	1.399	2.836	0.002	0.138	0.127	11.69	61.46	124.56	0.08	6.07	5.58	2.13	11.22	22.73	0.02	1.11	1.02
Cranes/Lifts	5	ConstMin - Cranes	231	20	0.108	0.507	1.297	0.001	0.053	0.049	5.50	25.84	66.06	0.07	2.70	2.48	1.00	4.72	12.06	0.01	0.49	0.45
Compactors	5	ConstMin - Rollers	80	20	0.142	1.314	1.427	0.002	0.091	0.083	2.50	23.18	25.17	0.03	1.60	1.47	0.46	4.23	4.59	0.01	0.29	0.27
Graders	2	ConstMin - Graders	188	20	0.140	0.565	1.756	0.002	0.058	0.054	2.33	9.37	29.11	0.03	0.97	0.89	0.42	1.71	5.31	0.01	0.18	0.16
Scrapers	2	ConstMin - Scrapers	367	20	0.143	1.024	1.682	0.002	0.064	0.059	4.62	33.13	54.43	0.08	2.08	1.91	0.84	6.05	9.93	0.01	0.38	0.35
Loaders (small)	2	ConstMin - Rubber Tired Loaders	188	20	0.100	0.459	1.164	0.002	0.039	0.036	1.66	7.62	19.30	0.03	0.64	0.59	0.30	1.39	3.52	0.01	0.12	0.11
Loaders (large)	3	ConstMin - Rubber Tired Loaders	541	20	0.109	0.584	1.138	0.002	0.043	0.039	7.81	41.80	81.46	0.13	3.06	2.82	1.42	7.63	14.87	0.02	0.56	0.51
Dump trucks	13	ConstMin - Off-Highway Trucks	403	20	0.094	0.545	0.903	0.002	0.033	0.030	21.75	125.98	208.63	0.43	7.62	7.01	3.97	22.99	38.07	0.08	1.39	1.28
Water Trucks	5		N/A	20	0.085	1.368	0.106	0.004	0.061	0.034	0.28	4.52	0.35	0.01	0.20	0.11	0.05	0.83	0.06	0.00	0.04	0.02
Offroad equipment have units of g/hp-hr; onroad equipment have units of g/mi.										**Total**	**60.00**	**357.54**	**627.35**	**0.93**	**25.82**	**23.68**	10.95	65.25	114.49	0.17	4.71	4.32

Note:
Offroad equipment emission factors from OFFROAD2017 model.
Onroad truck emission factors from EMFAC2014.

Sources:
OFFROAD2017: https://www.arb.ca.gov/orion/
EMFAC2014: http://www.arb.ca.gov/emfac/2014/

Operating Schedule

2 shifts per day
10 hours per shift
365 days per year

Construction Start: 2020

Speed Limit for Onroad Vehicles (Onsite)

15 miles per hour
(speed limit is 35 mph on site, but it is assumed that a water truck will be operating at a lower rate of speed)

Conversions

453.6 grams per pound
2,000 pounds per ton

CVP Enlarged Reservoir Expansion Alternative
Offsite Construction Emissions

Table A-86. Unmitigated Emission Factors (g/mi)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.015	0.753	0.078	0.003	0.002	0.008	0.037	0.100	0.147	0.002	0.002	0.016	0.025	0.045
Haul trucks	0.104	0.430	4.124	0.016	0.019	0.036	0.062	0.100	0.217	0.018	0.009	0.026	0.025	0.079

Table A-87. Unmitigated Daily Emissions (pounds per day)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.59	28.83	2.97	0.12	0.07	0.31	1.41	3.84	5.63	0.06	0.08	0.60	0.96	1.71
Haul trucks	4.40	18.21	174.57	0.66	0.80	1.52	2.61	4.25	9.19	0.77	0.38	1.12	1.06	3.33
Total	**4.98**	**47.05**	**177.54**	**0.78**	**0.87**	**1.83**	**4.02**	**8.10**	**14.82**	**0.83**	**0.46**	**1.72**	**2.02**	**5.04**

Table A-88. Unmitigated Annual Emissions (tons per year)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.11	5.26	0.54	0.02	0.01	0.06	0.26	0.70	1.03	0.01	0.01	0.11	0.18	0.31
Haul trucks	0.80	3.32	31.86	0.12	0.15	0.28	0.48	0.78	1.68	0.14	0.07	0.20	0.19	0.61
Total	**0.91**	**8.59**	**32.40**	**0.14**	**0.16**	**0.33**	**0.73**	**1.48**	**2.70**	**0.15**	**0.08**	**0.31**	**0.37**	**0.92**

One-way trip distance

Workers	40	miles per trip
Trucks	40	miles per trip

Maximum Daily Workers and Trucks

217	workers per day	(130 day time workers and 87 night time workers)
240	trucks per day	

Conversions

453.6	grams per pound
2,000	pounds per ton

Operating Schedule

365	days per year

Construction Start Year

2020

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Material Handling

Excavated Volume
11,200 cubic yards per shift
8,176,000 cubic yards per year

Equation (AP-42, Chapter 13.2.4):

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where:
E = emission factor, pound per ton
k = particle size multiplier
U = mean wind speed, miles per hour
M = material moisture content, %

Average Wind Speed 9.64 mph
Source: MesoWest, Station CF031 (Rt. 152 San Luis), 2015 data. Accessed on: July 27, 2016. Available at: mesowest.utah.edu.

Material Moisture Content: 7.9 %
Source: EPA. 1998. AP-42, Chapter 11-9, Overburden moisture content, bulldozing.

Table A-89. Material Handling Emissions

Size	k	EF	Emissions	
		lb/ton	lbs/day	tpy
PM10	0.35	3.8E-04	8.4	1.5
PM2.5	0.053	5.8E-05	1.3	0.2

Operating Schedule
2 shift per day
7 days per week
365 days per year

Density
1.25 tons per cubic yard
Note: CalEEMod assumes haul trucks can handle 20 tons or 16 cy.

Number of Drops
2 drops per truck *(one drop at borrow site and one drop at dam site)*

Dust Control
61% reduction from watering at least 3 times per day
Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Grading

Operating Schedule

2	graders
7.1	miles per hour (AP-42, Table 11.9-3)
20	hours per day (total)
142	miles per day
51,830	miles per year *assumes 365 days per year*

Equations (AP-42, Chapter 11.9):

$TSP = 0.040(S)^{2.5}$ and $PM15 = 0.051(S)^{2.0}$

where:
S = mean vehicle speed, miles per hour

Scaling Factors

PM10	0.60	(multiply the 15-micron equation by this fraction to determine emissions)
PM2.5	0.031	(multiply the TSP equation by this fraction to determine emissions)

Table A-90. Grading Emissions

	EF	Emissions	
Size	lb/VMT	lbs/day	tpy
PM10	1.54	85.4	15.6
PM2.5	0.17	9.2	1.7

Dust Control

61% reduction from watering at least 3 times per day

Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Bulldozing

Operating Schedule

4	bulldozers	
20	hours per day (total)	
7,300	hours per year (total)	*assumes 365 days per year*

Equations (AP-42, Chapter 11.9):

$$TSP = \frac{5.7(s)^{1.2}}{M^{1.3}} \quad \text{and} \quad PM15 = \frac{1.0(s)^{1.5}}{M^{1.4}}$$

where:

s = silt content	6.9 %	(AP-42, Table 11.9-3, Overburden)
M = material moisture content	7.9 %	(AP-42, Table 11.9-3, Overburden)

Scaling Factors

PM10	0.75	(multiply the 15-micron equation by this fraction to determine emissions)
PM2.5	0.105	(multiply the TSP equation by this fraction to determine emissions)

Table A-91. Bulldozing Emissions

	EF	Emissions	
Size	lb/hr	lbs/day	tpy
PM10	0.75	5.9	1.1
PM2.5	0.41	3.2	0.6

Dust Control

61% reduction from watering at least 3 times per day

Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Paved Road Dust (Haul Roads)

Number of Trucks	13		
Excavated quantity	11,200	cubic yards per shift	
Number of shifts	2	shift per day	
	1,723	cubic yards per truck per day	
	46.75	cubic yards per truck (body capacity)	
	74	trips per day per truck (loaded and unloaded trips)	
Haul Road Length	0.8	miles one-way (paved road; total route is 3.2 miles)	
	770	miles per day	
	280,904	miles per year	*assumes 365 days per year*

Table A-92. Paved Road Dust Emissions

	EF, g/VMT		Emissions	
Size	Uncontrolled	Controlled	lbs/day	tpy
PM10	22.2	21.5	7.5	1.3
PM2.5	5.6	5.4	1.9	0.3

Note: Uncontrolled EF used for daily emissions and controlled EF used for annual emissions.

Dust Control

80% assumes pipe-grid trackout-control device installed

Source: SCAQMD, Mitigation Measures, Fugitive Dust from Paved Roads
http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies/fugitive-dust

Conversions

453.6 grams per pound
2,000 pounds per ton

Percentage of haul route paved (estimated from Google Earth) 25%

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Unpaved Road Dust (Haul Roads)

Number of Trucks	13		
Excavated quantity	11,200	cubic yards per shift	
Number of shifts	2	shift per day	
	1,723	cubic yards per truck per day	
	46.75	cubic yards per truck (body capacity)	
	74	trips per day per truck (loaded and unloaded trips)	
Haul Road Length	2.4	miles one-way (unpaved road; total route is 3.2 miles)	
	2,309	miles per day	
	842,712	miles per year	*assumes 365 days per year*

Equations (AP-42, Chapter 13.2.2):

$$E = k(s/12)^a(W/3)^b$$

$$E_{ext} = E[(365 - P)/365]$$

where:
k, a, and b are empirical constants
E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
Eext = annual size-specific emission factor extrapolated for natural mitigation
P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation

silt content (construction)	8.5	%	(AP-42, Table 13.2.2-1)
days of precipitation	49		(CalEEMod default)
Unloaded truck weight	50	tons	
Loaded truck weight	126	tons	
Average vehicle weight	88	tons	(estimated from eqiupment specifications)

Table A-93. Unmitigated Unpaved Road Dust Emissions

Size	k	a	b	EF, lb/VMT		Emissions	
				Uncontrolled	Controlled	lbs/day	tpy
PM10	1.5	0.9	0.45	5.0	4.4	4,529.0	715.6
PM2.5	0.15	0.9	0.45	0.5	0.4	452.9	71.6

Source: AP-42, Table 13.2.2-2

Dust Control

61% reduction from watering at least 3 times per day

Source: CalEEMod

Percentage of haul route unpaved 75%
(estimated from Google Earth)

Conversions

2,000 pounds per ton

EMFAC2014 Emission Factors
On-Road Motor Vehicles

Table A-94. Unmitigated Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.0153	0.0223	0.0776	0.7533	0.0031	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2021	0.0137	0.0199	0.0692	0.6917	0.0030	0.0018	0.0080	0.0368	0.0465	0.0017	0.0020	0.0158	0.0194
	2022	0.0123	0.0179	0.0621	0.6401	0.0029	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0111	0.0161	0.0560	0.5941	0.0028	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2024	0.0100	0.0146	0.0507	0.5567	0.0026	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Table A-95. Unmitigated Emission Factors for Haul and Delivery Trucks

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.104	0.118	4.124	0.430	0.016	0.019	0.036	0.062	0.117	0.018	0.009	0.026	0.054
	2021	0.100	0.114	3.639	0.427	0.015	0.017	0.036	0.062	0.115	0.016	0.009	0.026	0.052
	2022	0.096	0.110	3.225	0.423	0.015	0.015	0.036	0.062	0.112	0.014	0.009	0.026	0.049
	2023	0.063	0.071	1.295	0.367	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2024	0.063	0.072	1.277	0.369	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040

Table A-96. Unmitigated Emission Factors for On-Site Water Trucks (San Joaquin Valley Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	0.223	0.254	0.169	3.701	0.004	0.029	0.008	0.037	0.074	0.028	0.002	0.016	0.045
2020	10	0.166	0.189	0.146	2.763	0.004	0.022	0.008	0.037	0.067	0.021	0.002	0.016	0.039
2020	15	0.085	0.096	0.106	1.368	0.004	0.017	0.008	0.037	0.061	0.016	0.002	0.016	0.034
2020	20	0.039	0.044	0.084	0.556	0.004	0.015	0.008	0.037	0.059	0.014	0.002	0.016	0.032
2020	25	0.025	0.029	0.072	0.343	0.004	0.012	0.008	0.037	0.056	0.011	0.002	0.016	0.029
2020	30	0.019	0.021	0.063	0.260	0.004	0.009	0.008	0.037	0.054	0.009	0.002	0.016	0.027
2020	35	0.016	0.018	0.063	0.213	0.004	0.009	0.008	0.037	0.054	0.008	0.002	0.016	0.026
2020	40	0.014	0.016	0.065	0.182	0.004	0.009	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2020	45	0.013	0.014	0.063	0.159	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.025
2020	50	0.012	0.013	0.062	0.143	0.004	0.008	0.008	0.037	0.053	0.007	0.002	0.016	0.025
2020	55	0.012	0.014	0.066	0.137	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2020	60	0.012	0.013	0.065	0.137	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2020	65	0.012	0.013	0.060	0.140	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.025
2021	5	0.211	0.240	0.155	3.656	0.004	0.026	0.008	0.037	0.071	0.025	0.002	0.016	0.043
2021	10	0.157	0.179	0.135	2.728	0.004	0.021	0.008	0.037	0.066	0.020	0.002	0.016	0.038
2021	15	0.079	0.090	0.096	1.348	0.004	0.015	0.008	0.037	0.060	0.014	0.002	0.016	0.032
2021	20	0.036	0.041	0.075	0.546	0.004	0.013	0.008	0.037	0.058	0.013	0.002	0.016	0.030
2021	25	0.023	0.027	0.065	0.335	0.004	0.010	0.008	0.037	0.055	0.010	0.002	0.016	0.028
2021	30	0.017	0.020	0.056	0.254	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2021	35	0.015	0.017	0.056	0.207	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.025
2021	40	0.013	0.015	0.058	0.177	0.004	0.008	0.008	0.037	0.053	0.007	0.002	0.016	0.025
2021	45	0.012	0.013	0.055	0.153	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025

Table A-96. Unmitigated Emission Factors for On-Site Water Trucks (San Joaquin Valley Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2021	50	0.011	0.012	0.055	0.138	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.024
2021	55	0.011	0.012	0.057	0.130	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2021	60	0.011	0.012	0.058	0.131	0.004	0.008	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2021	65	0.010	0.012	0.052	0.132	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2022	5	0.199	0.226	0.142	3.608	0.004	0.024	0.008	0.037	0.068	0.023	0.002	0.016	0.040
2022	10	0.148	0.169	0.123	2.692	0.004	0.019	0.008	0.037	0.064	0.018	0.002	0.016	0.036
2022	15	0.075	0.085	0.087	1.328	0.004	0.014	0.008	0.037	0.058	0.013	0.002	0.016	0.031
2022	20	0.034	0.038	0.068	0.535	0.004	0.012	0.008	0.037	0.057	0.011	0.002	0.016	0.029
2022	25	0.022	0.025	0.058	0.328	0.004	0.010	0.008	0.037	0.054	0.009	0.002	0.016	0.027
2022	30	0.016	0.018	0.050	0.249	0.004	0.008	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2022	35	0.014	0.016	0.050	0.202	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2022	40	0.012	0.014	0.052	0.172	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2022	45	0.011	0.012	0.049	0.149	0.004	0.007	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2022	50	0.010	0.011	0.049	0.133	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2022	55	0.010	0.011	0.050	0.125	0.004	0.007	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2022	60	0.010	0.011	0.052	0.125	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.024
2022	65	0.009	0.011	0.046	0.126	0.004	0.007	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2023	5	0.187	0.213	0.131	3.568	0.004	0.021	0.008	0.037	0.065	0.020	0.002	0.016	0.038
2023	10	0.139	0.159	0.113	2.661	0.004	0.016	0.008	0.037	0.061	0.016	0.002	0.016	0.033
2023	15	0.070	0.080	0.080	1.310	0.004	0.012	0.008	0.037	0.057	0.011	0.002	0.016	0.029
2023	20	0.031	0.035	0.061	0.526	0.004	0.010	0.008	0.037	0.055	0.010	0.002	0.016	0.028
2023	25	0.020	0.022	0.052	0.321	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2023	30	0.015	0.017	0.045	0.243	0.004	0.007	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2023	35	0.012	0.014	0.044	0.197	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2023	40	0.011	0.013	0.045	0.167	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2023	45	0.010	0.011	0.043	0.144	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2023	50	0.009	0.010	0.042	0.128	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2023	55	0.008	0.010	0.044	0.119	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2023	60	0.009	0.010	0.045	0.119	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.023
2023	65	0.008	0.009	0.040	0.119	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	5	0.177	0.201	0.121	3.527	0.004	0.017	0.008	0.037	0.062	0.017	0.002	0.016	0.034
2024	10	0.131	0.150	0.104	2.630	0.004	0.014	0.008	0.037	0.059	0.013	0.002	0.016	0.031
2024	15	0.065	0.074	0.073	1.292	0.004	0.010	0.008	0.037	0.055	0.010	0.002	0.016	0.027
2024	20	0.028	0.032	0.055	0.517	0.004	0.009	0.008	0.037	0.054	0.009	0.002	0.016	0.026
2024	25	0.018	0.020	0.046	0.314	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2024	30	0.013	0.015	0.040	0.238	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.023
2024	35	0.011	0.013	0.039	0.193	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	40	0.010	0.011	0.040	0.163	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	45	0.009	0.010	0.038	0.140	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2024	50	0.008	0.009	0.037	0.124	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2024	55	0.007	0.008	0.037	0.114	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2024	60	0.007	0.008	0.038	0.113	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	65	0.007	0.008	0.034	0.113	0.004	0.005	0.008	0.037	0.049	0.005	0.002	0.016	0.022

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-97. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed July 17, 2012].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Offsite Construction Vehicles

Number precipitation days >0.1 inches
Merced County 49

Road silt loading 0.03 g/m^2 (AP-42, Table 13.2.1-2, ADT > 10,000, ubiquitous baseline)
Average vehicle weight 2.4 tons

Source: CAPCOA. 2013. California Emissions Estimator Model User's Guide, Version 2013.2, Appendix D: Default Data Tables. Prepared by ENVIRON International Corporation and California Air Districts. July. Available online at: http://www.caleemod.com/ [Accessed on July 28, 2016].

Table A-98. Paved Road Dust Emission Factors - Offsite Construction Vehicles

	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
County	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	0.100	0.025	0.097	0.024

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Haul Road Vehicles

Number precipitation days >0.1 inches			
Merced County	49		
Road silt loading	0.2	g/m^2	(AP-42, Table 13.2.1-2, ADT 500-5,000, ubiquitous baseline)
Unloaded truck weight	50	tons	
	126	tons	
Average vehicle weight	88	tons	(estimated from eqiupment specifications)

Table A-99. Paved Road Dust Emission Factors - Onsite Haul Trucks

	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
County	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	22.2	5.6	21.5	5.4

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Unmitigated Emissions Summary

Table A-100. New Pacheco Alternative - Maximum Daily Unmitigated Emissions

Source	Daily Emissions (pounds per day)					
	ROG	NOx	CO	SOx	PM10	PM2.5
			2024			
Off-Road Construction Equipment	2,099.53	2,639.92	2,847.58	2,025.58	2,051.43	2,048.45
On-Road Haul Trucks and Delivery Vehicles	1.41	28.31	8.26	0.32	4.38	1.41
Construction Worker Commuting	0.49	2.51	27.71	0.13	7.77	2.35
Total	**2101.43**	**2670.74**	**2883.55**	**2026.03**	**2063.58**	**2052.21**
			2025			
Off-Road Construction Equipment	2,096.57	2,576.55	2,837.15	2,026.57	2,049.68	2,046.93
On-Road Haul Trucks and Delivery Vehicles	2.49	49.25	14.60	0.55	7.69	2.47
Construction Worker Commuting	0.45	2.30	25.93	0.13	7.77	2.35
Total	**2099.51**	**2628.10**	**2877.68**	**2027.26**	**2065.15**	**2051.75**
			2026			
Off-Road Construction Equipment	2,095.81	2,548.05	2,833.15	2,027.57	2,049.13	2,046.50
On-Road Haul Trucks and Delivery Vehicles	2.51	48.85	14.70	0.55	7.69	2.46
Construction Worker Commuting	0.62	3.19	36.64	0.19	11.65	3.52
Total	**2098.94**	**2600.09**	**2884.49**	**2028.31**	**2068.48**	**2052.49**
			2027			
Off-Road Construction Equipment	2,095.01	2,515.94	2,826.33	2,028.57	2,048.63	2,046.12
On-Road Haul Trucks and Delivery Vehicles	2.52	48.37	14.77	0.55	7.69	2.46
Construction Worker Commuting	0.60	3.12	36.58	0.19	12.29	3.71
Total	**2098.13**	**2567.43**	**2877.69**	**2029.31**	**2068.61**	**2052.29**
			2028			
Off-Road Construction Equipment	2,094.76	2,492.61	2,827.05	2,029.57	2,048.55	2,046.13
On-Road Haul Trucks and Delivery Vehicles	0.18	3.35	1.04	0.04	0.54	0.17
Construction Worker Commuting	0.56	2.90	34.72	0.18	12.28	3.70
Total	**2095.49**	**2498.86**	**2862.80**	**2029.80**	**2061.38**	**2050.00**
			2029			
Off-Road Construction Equipment	2,094.26	2,468.34	2,817.82	2,030.57	2,048.39	2,046.06
On-Road Haul Trucks and Delivery Vehicles	0.18	3.32	1.04	0.04	0.54	0.17
Construction Worker Commuting	0.30	1.57	19.10	0.10	7.11	2.14
Total	**2094.73**	**2473.23**	**2837.96**	**2030.71**	**2056.03**	**2048.37**
Maximum Daily Emissions	**2101.43**	**2670.74**	**2884.49**	**2030.71**	**2068.61**	**2052.49**
BAAQMD Significance Threshold	54	54	n/a	n/a	82	54
Significant?	Yes	Yes	n/a	n/a	Yes	Yes

Source: BAAQMD 2017

Table A-101. New Pacheco Alternative - Annual Unmitigated Emissions

Source	Annual Emissions (tons per year)					
	ROG	NOx	CO	SOx	PM10	PM2.5
			2024			
Off-Road Construction Equipment	2,037.78	2,136.41	2,174.30	2,024.29	2,029.01	2,028.46
On-Road Haul Trucks and Delivery Vehicles	0.14	2.79	0.81	0.03	0.43	0.14
Construction Worker Commuting	0.07	0.33	3.68	0.02	1.03	0.31
Total	**2037.99**	**2139.53**	**2178.79**	**2024.34**	**2030.47**	**2028.91**
			2025			
Off-Road Construction Equipment	2,038.06	2,125.66	2,173.22	2,025.29	2,029.50	2,029.00
On-Road Haul Trucks and Delivery Vehicles	0.38	7.57	2.25	0.09	1.18	0.38
Construction Worker Commuting	0.07	0.37	4.15	0.02	1.24	0.38
Total	**2038.52**	**2133.60**	**2179.61**	**2025.39**	**2031.93**	**2029.76**
			2026			
Off-Road Construction Equipment	2,038.74	2,121.27	2,173.30	2,026.29	2,030.22	2,029.74
On-Road Haul Trucks and Delivery Vehicles	0.46	8.89	2.68	0.10	1.40	0.45
Construction Worker Commuting	0.10	0.52	5.93	0.03	1.89	0.57
Total	**2039.30**	**2130.68**	**2181.91**	**2026.42**	**2033.51**	**2030.76**
			2027			
Off-Road Construction Equipment	2,039.41	2,116.23	2,172.88	2,027.29	2,030.95	2,030.49
On-Road Haul Trucks and Delivery Vehicles	0.42	8.12	2.48	0.09	1.29	0.41
Construction Worker Commuting	0.10	0.51	5.96	0.03	2.00	0.60
Total	**2039.93**	**2124.86**	**2181.32**	**2027.41**	**2034.24**	**2031.51**
			2028			
Off-Road Construction Equipment	2,040.18	2,112.79	2,173.83	2,028.29	2,031.75	2,031.31
On-Road Haul Trucks and Delivery Vehicles	0.03	0.61	0.19	0.01	0.10	0.03
Construction Worker Commuting	0.09	0.47	5.65	0.03	2.00	0.60
Total	**2040.31**	**2113.87**	**2179.67**	**2028.32**	**2033.85**	**2031.94**
			2029			
Off-Road Construction Equipment	2,040.91	2,109.18	2,172.96	2,029.29	2,032.54	2,032.11
On-Road Haul Trucks and Delivery Vehicles	0.01	0.25	0.08	0.00	0.04	0.01
Construction Worker Commuting	0.04	0.20	2.48	0.01	0.92	0.28
Total	**2040.96**	**2109.64**	**2175.51**	**2029.30**	**2033.50**	**2032.40**
Maximum Annual Emissions	**2040.96**	**2139.53**	**2181.91**	**2029.30**	**2034.24**	**2032.40**
De Minimis Threshold	100	100	100	100	n/a	100
Significant?	Yes	Yes	Yes	Yes	n/a	Yes

Source: 40 CFR 93.153

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Emission Factors - 2024 (g/hp-hr or g/hr)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	0.2314	1.4875	2.0419	0.0019	0.1316	0.1211
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	0.2314	1.4875	2.0419	0.0019	0.1316	0.1211
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	0.1615	1.2857	1.5853	0.0019	0.0706	0.0649
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.0698	0.4227	0.6454	0.0018	0.0214	0.0197
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	0.0793	0.4875	0.6496	0.0018	0.0246	0.0226
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	0.0713	0.5566	0.4721	0.0018	0.0171	0.0157
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	0.1319	0.7805	1.4539	0.0021	0.0602	0.0554
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.1285	1.3495	1.2299	0.0020	0.0326	0.0300
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	0.1089	0.5160	1.1890	0.0020	0.0397	0.0365
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.2196	1.7167	1.4035	0.0020	0.0618	0.0568
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.0647	0.4518	0.6070	0.0018	0.0221	0.0203
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.0540	0.4238	0.4346	0.0019	0.0142	0.0131
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.0647	0.4518	0.6070	0.0018	0.0221	0.0203
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.0647	0.4518	0.6070	0.0018	0.0221	0.0203
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.0792	1.2879	0.8076	0.0018	0.0358	0.0329
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	0.0701	0.4563	0.4719	0.0019	0.0169	0.0156
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	0.0988	0.6322	0.7900	0.0019	0.0302	0.0278
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	0.2006	1.9531	2.8770	0.0023	0.0988	0.0909
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.3113	1.6462	2.3694	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.0530	1.0924	0.4964	0.0018	0.0227	0.0209
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.0530	1.0924	0.4964	0.0018	0.0227	0.0209
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.0530	1.0924	0.4964	0.0018	0.0227	0.0209
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.0530	1.0924	0.4964	0.0018	0.0227	0.0209
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.0805	0.5711	0.8843	0.0018	0.0340	0.0313
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.0531	0.5317	0.5429	0.0018	0.0185	0.0170
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.1157	0.8239	0.3373	0.0047	0.0124	0.0114
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	0.1157	0.8239	0.3373	0.0047	0.0124	0.0114
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.1217	2.4188	0.4191	0.0047	0.0172	0.0159
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.3093	1.8191	2.3471	0.0048	0.0917	0.0843
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.0289	0.3075	0.2191	0.0015	0.0083	0.0076
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.0304	0.2998	0.2877	0.0015	0.0115	0.0106
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.4273	2.2253	3.2169	0.0060	0.1349	0.1241
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.0364	1.0249	0.5723	0.0015	0.0360	0.0332
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	3.0202	183.1939	2.3371	0.0080	0.1926	0.1455
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.0541	1.0313	0.3302	0.0015	0.0163	0.0150
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.0652	0.3751	0.4345	0.0015	0.0193	0.0177
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	0.0613	0.3656	0.3609	0.0015	0.0159	0.0146
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	4.5023	167.7216	3.3283	0.0090	1.8410	1.3910
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.2645	2.3156	1.8352	0.0035	0.0606	0.0558
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.0697	1.0678	0.9053	0.0015	0.0240	0.0221
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.0340	0.9244	0.3201	0.0015	0.0119	0.0110
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.0420	0.3408	0.3288	0.0015	0.0137	0.0126
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.2617	1.2652	1.9657	0.0035	0.0815	0.0750
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.2617	1.2652	1.9657	0.0035	0.0815	0.0750
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.2617	1.2652	1.9657	0.0035	0.0815	0.0750
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.2268	2.0240	1.6832	0.0033	0.0546	0.0502
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.1573	0.9680	1.3007	0.0025	0.0538	0.0495
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.1573	0.9680	1.3007	0.0025	0.0538	0.0495

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2025 (g/hp-hr or g/hr)						Emission Factors - 2026 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.2065	1.4576	1.7679	0.0019	0.1146	0.1054	0.1714	1.4131	1.4651	0.0019	0.0870	0.0800
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.2065	1.4576	1.7679	0.0019	0.1146	0.1054	0.1714	1.4131	1.4651	0.0019	0.0870	0.0800
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.1466	1.1472	1.3861	0.0019	0.0609	0.0560	0.1395	1.0777	1.2739	0.0019	0.0562	0.0517
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0648	0.4195	0.5400	0.0018	0.0180	0.0165	0.0633	0.4218	0.4838	0.0018	0.0162	0.0149
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0711	0.4564	0.5279	0.0018	0.0198	0.0182	0.0676	0.4468	0.4716	0.0018	0.0176	0.0162
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0731	0.5695	0.4535	0.0018	0.0167	0.0153	0.0710	0.5342	0.4102	0.0018	0.0144	0.0132
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.1188	0.7499	1.2582	0.0021	0.0525	0.0483	0.1138	0.7320	1.1683	0.0021	0.0491	0.0452
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.1255	1.3459	1.2169	0.0020	0.0309	0.0284	0.1221	1.3318	1.2035	0.0020	0.0294	0.0271
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0970	0.4957	0.9993	0.0020	0.0333	0.0306	0.0895	0.4891	0.8660	0.0020	0.0291	0.0268
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.2047	1.6972	1.3630	0.0020	0.0540	0.0497	0.2004	1.6970	1.3383	0.0020	0.0501	0.0461
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0602	0.4498	0.5156	0.0018	0.0195	0.0180	0.0584	0.4494	0.4702	0.0018	0.0184	0.0169
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0507	0.4198	0.3768	0.0019	0.0125	0.0115	0.0496	0.4198	0.3506	0.0019	0.0119	0.0109
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0602	0.4498	0.5156	0.0018	0.0195	0.0180	0.0584	0.4494	0.4702	0.0018	0.0184	0.0169
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0602	0.4498	0.5156	0.0018	0.0195	0.0180	0.0584	0.4494	0.4702	0.0018	0.0184	0.0169
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0722	1.2830	0.7405	0.0018	0.0285	0.0262	0.0678	1.2828	0.6945	0.0018	0.0234	0.0215
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0678	0.4484	0.4147	0.0019	0.0147	0.0135	0.0672	0.4500	0.3862	0.0019	0.0136	0.0125
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0884	0.6011	0.6377	0.0019	0.0244	0.0225	0.0900	0.6068	0.6338	0.0019	0.0243	0.0224
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.2025	1.9562	2.8802	0.0023	0.0990	0.0911	0.2043	1.9592	2.8827	0.0023	0.0992	0.0913
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0475	1.0903	0.4127	0.0018	0.0185	0.0170	0.0453	1.0922	0.3753	0.0018	0.0167	0.0154
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0475	1.0903	0.4127	0.0018	0.0185	0.0170	0.0453	1.0922	0.3753	0.0018	0.0167	0.0154
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0475	1.0903	0.4127	0.0018	0.0185	0.0170	0.0453	1.0922	0.3753	0.0018	0.0167	0.0154
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0475	1.0903	0.4127	0.0018	0.0185	0.0170	0.0453	1.0922	0.3753	0.0018	0.0167	0.0154
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0782	0.5712	0.8162	0.0018	0.0326	0.0300	0.0766	0.5698	0.7719	0.0018	0.0313	0.0288
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0536	0.5337	0.5359	0.0018	0.0186	0.0171	0.0552	0.5390	0.5447	0.0018	0.0190	0.0174
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1128	0.8240	0.2987	0.0047	0.0109	0.0101	0.1100	0.8238	0.2697	0.0047	0.0098	0.0090
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1128	0.8240	0.2987	0.0047	0.0109	0.0101	0.1100	0.8238	0.2697	0.0047	0.0098	0.0090
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1174	2.4187	0.3626	0.0047	0.0148	0.0136	0.1136	2.4157	0.3215	0.0047	0.0126	0.0116
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3089	1.8178	2.3450	0.0048	0.0914	0.0841	0.3088	1.8183	2.3451	0.0048	0.0912	0.0839
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0277	0.3108	0.1485	0.0015	0.0062	0.0057	0.0280	0.3142	0.1497	0.0015	0.0062	0.0057
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0284	0.3030	0.1960	0.0015	0.0086	0.0079	0.0287	0.3063	0.1998	0.0015	0.0088	0.0081
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4231	2.2180	3.1966	0.0060	0.1319	0.1213	0.4196	2.2123	3.1799	0.0060	0.1293	0.1190
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0335	1.0360	0.4718	0.0015	0.0307	0.0283	0.0337	1.0473	0.4716	0.0015	0.0307	0.0283
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.9963	183.0409	2.3311	0.0080	0.1924	0.1454	2.9767	182.9059	2.3252	0.0080	0.1923	0.1453
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0508	1.0425	0.2634	0.0015	0.0119	0.0109	0.0512	1.0539	0.2586	0.0015	0.0117	0.0107
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0617	0.3792	0.3575	0.0015	0.0164	0.0151	0.0612	0.3833	0.3354	0.0015	0.0157	0.0144
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0569	0.3696	0.2657	0.0015	0.0123	0.0113	0.0569	0.3736	0.2448	0.0015	0.0117	0.0108
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.5006	167.6948	3.3280	0.0090	1.8408	1.3908	4.4996	167.6712	3.3278	0.0090	1.8406	1.3906
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.2487	2.3028	1.7845	0.0035	0.0521	0.0479	0.2346	2.2887	1.7335	0.0035	0.0439	0.0404
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0702	1.0793	0.9105	0.0015	0.0238	0.0219	0.0710	1.0911	0.9191	0.0015	0.0236	0.0217
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0328	0.9344	0.2764	0.0015	0.0095	0.0087	0.0332	0.9446	0.2747	0.0015	0.0096	0.0088
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0389	0.3445	0.2185	0.0015	0.0103	0.0095	0.0394	0.3483	0.2159	0.0015	0.0103	0.0095
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2590	1.2606	1.9550	0.0035	0.0798	0.0734	0.2568	1.2567	1.9460	0.0035	0.0784	0.0721
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2590	1.2606	1.9550	0.0035	0.0798	0.0734	0.2568	1.2567	1.9460	0.0035	0.0784	0.0721
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2590	1.2606	1.9550	0.0035	0.0798	0.0734	0.2568	1.2567	1.9460	0.0035	0.0784	0.0721
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.2118	2.0106	1.6371	0.0033	0.0470	0.0432	0.1986	1.9975	1.5913	0.0033	0.0397	0.0366
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1564	0.9663	1.2934	0.0025	0.0530	0.0487	0.1552	0.9624	1.2839	0.0025	0.0521	0.0479
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1564	0.9663	1.2934	0.0025	0.0530	0.0487	0.1552	0.9624	1.2839	0.0025	0.0521	0.0479

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2027 (g/hp-hr or g/hr)						Emission Factors - 2028 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.1601	1.4136	1.3420	0.0019	0.0785	0.0722	0.1320	1.3972	1.0179	0.0019	0.0595	0.0547
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.1601	1.4136	1.3420	0.0019	0.0785	0.0722	0.1320	1.3972	1.0179	0.0019	0.0595	0.0547
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.1355	1.0501	1.2219	0.0019	0.0536	0.0493	0.1352	1.0529	1.2021	0.0019	0.0529	0.0486
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0578	0.4155	0.3891	0.0018	0.0133	0.0123	0.0569	0.4165	0.3489	0.0018	0.0120	0.0111
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0679	0.4510	0.4354	0.0018	0.0166	0.0153	0.0675	0.4472	0.4112	0.0018	0.0156	0.0144
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0639	0.4365	0.3410	0.0018	0.0107	0.0098	0.0653	0.4461	0.3041	0.0018	0.0098	0.0090
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.0960	0.5992	0.9385	0.0021	0.0381	0.0350	0.0940	0.6022	0.8791	0.0021	0.0366	0.0336
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.1189	1.3249	1.1908	0.0020	0.0278	0.0255	0.1133	1.3183	1.1786	0.0020	0.0254	0.0234
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0832	0.4823	0.7499	0.0020	0.0256	0.0235	0.0803	0.4800	0.6862	0.0020	0.0235	0.0217
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.1933	1.6910	1.3111	0.0020	0.0451	0.0415	0.1890	1.6971	1.2975	0.0020	0.0419	0.0385
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0574	0.4403	0.4353	0.0018	0.0172	0.0159	0.0545	0.4366	0.3802	0.0018	0.0154	0.0142
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0482	0.4192	0.3166	0.0019	0.0109	0.0100	0.0474	0.4198	0.2899	0.0019	0.0102	0.0094
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0574	0.4403	0.4353	0.0018	0.0172	0.0159	0.0545	0.4366	0.3802	0.0018	0.0154	0.0142
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0574	0.4403	0.4353	0.0018	0.0172	0.0159	0.0545	0.4366	0.3802	0.0018	0.0154	0.0142
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0653	1.2850	0.6660	0.0018	0.0200	0.0184	0.0637	1.2881	0.6447	0.0018	0.0176	0.0162
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0674	0.4501	0.3685	0.0019	0.0130	0.0120	0.0666	0.4470	0.3397	0.0019	0.0121	0.0111
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0879	0.5723	0.5878	0.0019	0.0221	0.0203	0.0892	0.5759	0.5954	0.0019	0.0224	0.0206
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.2060	1.9626	2.8854	0.0023	0.0994	0.0915	0.2075	1.9643	2.8850	0.0023	0.0995	0.0916
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0422	1.0947	0.3285	0.0018	0.0143	0.0131	0.0407	1.0974	0.2978	0.0018	0.0130	0.0119
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0422	1.0947	0.3285	0.0018	0.0143	0.0131	0.0407	1.0974	0.2978	0.0018	0.0130	0.0119
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0422	1.0947	0.3285	0.0018	0.0143	0.0131	0.0407	1.0974	0.2978	0.0018	0.0130	0.0119
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0422	1.0947	0.3285	0.0018	0.0143	0.0131	0.0407	1.0974	0.2978	0.0018	0.0130	0.0119
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0705	0.5549	0.6593	0.0018	0.0276	0.0254	0.0687	0.5534	0.6279	0.0018	0.0265	0.0244
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0567	0.5479	0.5641	0.0018	0.0197	0.0181	0.0539	0.5534	0.4854	0.0018	0.0178	0.0164
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1075	0.8213	0.2486	0.0047	0.0090	0.0083	0.1056	0.8200	0.2329	0.0047	0.0085	0.0078
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1075	0.8213	0.2486	0.0047	0.0090	0.0083	0.1056	0.8200	0.2329	0.0047	0.0085	0.0078
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1104	2.4117	0.2897	0.0047	0.0110	0.0101	0.1081	2.4101	0.2655	0.0047	0.0099	0.0091
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3089	1.8191	2.3456	0.0048	0.0911	0.0839	0.3088	1.8189	2.3449	0.0048	0.0910	0.0837
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0265	0.3177	0.0893	0.0015	0.0042	0.0039	0.0268	0.3211	0.0884	0.0016	0.0042	0.0039
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0260	0.3097	0.1043	0.0015	0.0051	0.0047	0.0262	0.3131	0.0983	0.0016	0.0049	0.0045
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4168	2.2079	3.1660	0.0060	0.1271	0.1170	0.4146	2.2043	3.1543	0.0060	0.1253	0.1152
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0321	1.0588	0.3866	0.0015	0.0263	0.0242	0.0317	1.0703	0.3647	0.0016	0.0258	0.0237
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.9623	182.8091	2.3214	0.0080	0.1922	0.1452	2.9529	182.7410	2.3192	0.0080	0.1922	0.1452
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0480	1.0654	0.1859	0.0015	0.0077	0.0071	0.0482	1.0770	0.1766	0.0016	0.0071	0.0065
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0567	0.3875	0.2522	0.0015	0.0123	0.0114	0.0572	0.3917	0.2514	0.0016	0.0124	0.0114
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0551	0.3777	0.2081	0.0015	0.0099	0.0091	0.0551	0.3818	0.1998	0.0016	0.0095	0.0088
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221	0.4483	2.8455	3.3972	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.4997	167.6690	3.3280	0.0090	1.8406	1.3907	4.4995	167.6658	3.3277	0.0090	1.8405	1.3906
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.2214	2.2706	1.6809	0.0035	0.0358	0.0329	0.2103	2.2552	1.6347	0.0035	0.0287	0.0264
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0717	1.1030	0.9279	0.0015	0.0234	0.0215	0.0725	1.1150	0.9312	0.0016	0.0218	0.0200
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0317	0.9549	0.2137	0.0015	0.0070	0.0064	0.0317	0.9653	0.2035	0.0016	0.0065	0.0060
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0388	0.3521	0.1824	0.0015	0.0092	0.0085	0.0393	0.3559	0.1796	0.0016	0.0092	0.0084
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2551	1.2537	1.9383	0.0035	0.0771	0.0709	0.2537	1.2514	1.9320	0.0035	0.0760	0.0699
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2551	1.2537	1.9383	0.0035	0.0771	0.0709	0.2537	1.2514	1.9320	0.0035	0.0760	0.0699
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2551	1.2537	1.9383	0.0035	0.0771	0.0709	0.2537	1.2514	1.9320	0.0035	0.0760	0.0699
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.1864	1.9814	1.5438	0.0033	0.0326	0.0300	0.1760	1.9678	1.5017	0.0033	0.0262	0.0241
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1546	0.9611	1.2784	0.0025	0.0514	0.0473	0.1539	0.9594	1.2728	0.0025	0.0508	0.0467
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1546	0.9611	1.2784	0.0025	0.0514	0.0473	0.1539	0.9594	1.2728	0.0025	0.0508	0.0467

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2029 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.1229	1.4048	0.9310	0.0019	0.0508	0.0468
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.1229	1.4048	0.9310	0.0019	0.0508	0.0468
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.1321	1.0383	1.1293	0.0019	0.0505	0.0465
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0573	0.4259	0.3278	0.0018	0.0115	0.0106
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0665	0.4385	0.3847	0.0018	0.0146	0.0134
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0648	0.4353	0.2574	0.0018	0.0083	0.0076
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.0899	0.5970	0.7968	0.0021	0.0337	0.0310
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.1118	1.3113	1.1717	0.0020	0.0247	0.0227
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0785	0.4804	0.6380	0.0020	0.0221	0.0203
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.1865	1.7009	1.2855	0.0020	0.0394	0.0362
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0563	0.4467	0.3776	0.0018	0.0157	0.0144
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0473	0.4208	0.2783	0.0019	0.0100	0.0092
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0563	0.4467	0.3776	0.0018	0.0157	0.0144
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0563	0.4467	0.3776	0.0018	0.0157	0.0144
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0629	1.2903	0.6292	0.0018	0.0160	0.0147
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0656	0.4411	0.3142	0.0019	0.0112	0.0103
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0856	0.5465	0.5498	0.0019	0.0203	0.0187
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.1909	1.7487	2.7037	0.0024	0.0896	0.0825
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6466	2.3698	0.0045	0.0907	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0402	1.0995	0.2810	0.0018	0.0124	0.0114
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0402	1.0995	0.2810	0.0018	0.0124	0.0114
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0402	1.0995	0.2810	0.0018	0.0124	0.0114
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0402	1.0995	0.2810	0.0018	0.0124	0.0114
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0687	0.5540	0.6214	0.0018	0.0266	0.0245
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0546	0.5562	0.4865	0.0018	0.0179	0.0165
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1046	0.8212	0.2224	0.0047	0.0082	0.0076
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1046	0.8212	0.2224	0.0047	0.0082	0.0076
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1062	2.4080	0.2454	0.0047	0.0092	0.0085
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3085	1.8173	2.3425	0.0048	0.0909	0.0836
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0259	0.3246	0.0651	0.0016	0.0036	0.0033
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0259	0.3165	0.0840	0.0016	0.0045	0.0041
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4130	2.2020	3.1453	0.0060	0.1238	0.1139
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0316	1.0820	0.3419	0.0016	0.0250	0.0230
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.9467	182.6911	2.3179	0.0080	0.1922	0.1453
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0478	1.0887	0.1571	0.0016	0.0061	0.0056
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0567	0.3960	0.2370	0.0016	0.0118	0.0108
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0554	0.3860	0.1988	0.0016	0.0095	0.0087
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8455	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.4997	167.6648	3.3279	0.0090	1.8405	1.3906
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.2014	2.2430	1.6076	0.0035	0.0240	0.0221
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0733	1.1271	0.9348	0.0016	0.0193	0.0178
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0316	0.9759	0.1983	0.0016	0.0062	0.0057
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0393	0.3598	0.1598	0.0016	0.0087	0.0080
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2527	1.2497	1.9269	0.0035	0.0752	0.0692
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2527	1.2497	1.9269	0.0035	0.0752	0.0692
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2527	1.2497	1.9269	0.0035	0.0752	0.0692
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.1678	1.9573	1.4769	0.0033	0.0219	0.0202
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1540	0.9616	1.2730	0.0025	0.0505	0.0464
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1540	0.9616	1.2730	0.0025	0.0505	0.0464

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Emission Factors - 2024 (g/hp-hr or g/hr)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.1134	0.9792	1.0919	0.0014	0.0590	0.0543
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.1134	0.9792	1.0919	0.0014	0.0590	0.0543
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.0847	0.4853	0.9076	0.0014	0.0379	0.0348
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.0606	0.4841	0.6138	0.0014	0.0247	0.0227
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.1134	0.9792	1.0919	0.0014	0.0590	0.0543
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.1134	0.9792	1.0919	0.0014	0.0590	0.0543
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.0606	0.4841	0.6138	0.0014	0.0247	0.0227
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.0339	0.9759	0.5060	0.0015	0.0113	0.0104
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	0.0582	0.5316	0.5618	0.0024	0.0182	0.0168
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.0582	0.5316	0.5618	0.0024	0.0182	0.0168
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.3090	2.1982	2.1110	0.0028	0.1112	0.1023
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.0339	0.9759	0.5060	0.0015	0.0113	0.0104
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.0792	1.2879	0.8076	0.0018	0.0358	0.0329
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	0.0573	0.4621	0.3801	0.0021	0.0130	0.0119
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	0.0573	0.4621	0.3801	0.0021	0.0130	0.0119
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.9261	19.0185	0.9953	0.0577	0.7878	0.3777

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from the San Joaquin Valley Air Basin was used to estimate emission factors for skidders.
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-road motor vehicles (e.g., flatbed trucks).

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2025 (g/hp-hr or g/hr)						Emission Factors - 2026 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.1026	0.9687	0.9569	0.0014	0.0520	0.0479	0.0931	0.9591	0.8462	0.0014	0.0456	0.0420
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.1026	0.9687	0.9569	0.0014	0.0520	0.0479	0.0931	0.9591	0.8462	0.0014	0.0456	0.0420
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0778	0.4427	0.7987	0.0014	0.0339	0.0312	0.0720	0.4274	0.7233	0.0014	0.0301	0.0277
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0579	0.4791	0.5617	0.0014	0.0228	0.0210	0.0569	0.4717	0.5291	0.0014	0.0217	0.0199
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.1026	0.9687	0.9569	0.0014	0.0520	0.0479	0.0931	0.9591	0.8462	0.0014	0.0456	0.0420
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.1026	0.9687	0.9569	0.0014	0.0520	0.0479	0.0931	0.9591	0.8462	0.0014	0.0456	0.0420
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0579	0.4791	0.5617	0.0014	0.0228	0.0210	0.0569	0.4717	0.5291	0.0014	0.0217	0.0199
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0301	0.9692	0.4723	0.0015	0.0086	0.0079	0.0317	0.9746	0.4787	0.0015	0.0094	0.0087
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0569	0.5303	0.5302	0.0024	0.0174	0.0160	0.0585	0.5332	0.5391	0.0024	0.0177	0.0163
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0569	0.5303	0.5302	0.0024	0.0174	0.0160	0.0585	0.5332	0.5391	0.0024	0.0177	0.0163
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.2988	2.1614	2.0122	0.0028	0.0977	0.0899	0.3013	2.1946	2.0138	0.0028	0.0957	0.0881
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0301	0.9692	0.4723	0.0015	0.0086	0.0079	0.0317	0.9746	0.4787	0.0015	0.0094	0.0087
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0722	1.2830	0.7405	0.0018	0.0285	0.0262	0.0678	1.2828	0.6945	0.0018	0.0234	0.0215
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
Lube Truck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
1000 Gallon Watertruck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
3000 Gallon Watertruck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
5000 Gallon Watertanker	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0548	0.4576	0.3265	0.0021	0.0112	0.0103	0.0562	0.4603	0.3215	0.0021	0.0111	0.0102
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0548	0.4576	0.3265	0.0021	0.0112	0.0103	0.0562	0.4603	0.3215	0.0021	0.0111	0.0102
5 Ton Boomtruck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
10 Ton Boomtruck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579
20 Ton Boomtruck	n/a - onroad	Diesel	0.8777	18.7445	0.9174	0.0558	0.7766	0.3670	0.8346	18.4902	0.8504	0.0542	0.7671	0.3579

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2027 (g/hp-hr or g/hr)						Emission Factors - 2028 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.0867	0.9539	0.7722	0.0014	0.0411	0.0378	0.0843	0.9552	0.7357	0.0014	0.0389	0.0358
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.0867	0.9539	0.7722	0.0014	0.0411	0.0378	0.0843	0.9552	0.7357	0.0014	0.0389	0.0358
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0673	0.4166	0.6485	0.0014	0.0271	0.0249	0.0651	0.4080	0.6060	0.0014	0.0254	0.0234
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0561	0.4692	0.5035	0.0014	0.0207	0.0190	0.0540	0.4690	0.4613	0.0014	0.0191	0.0175
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.0867	0.9539	0.7722	0.0014	0.0411	0.0378	0.0843	0.9552	0.7357	0.0014	0.0389	0.0358
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.0867	0.9539	0.7722	0.0014	0.0411	0.0378	0.0843	0.9552	0.7357	0.0014	0.0389	0.0358
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0561	0.4692	0.5035	0.0014	0.0207	0.0190	0.0540	0.4690	0.4613	0.0014	0.0191	0.0175
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0328	0.9805	0.4771	0.0015	0.0093	0.0086	0.0337	0.9856	0.4763	0.0015	0.0096	0.0089
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0576	0.5325	0.5166	0.0024	0.0172	0.0158	0.0564	0.5282	0.5066	0.0024	0.0166	0.0153
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0576	0.5325	0.5166	0.0024	0.0172	0.0158	0.0564	0.5282	0.5066	0.0024	0.0166	0.0153
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.2963	2.1646	1.9358	0.0028	0.0881	0.0811	0.2719	2.1352	1.8846	0.0028	0.0782	0.0720
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0328	0.9805	0.4771	0.0015	0.0093	0.0086	0.0337	0.9856	0.4763	0.0015	0.0096	0.0089
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0653	1.2850	0.6660	0.0018	0.0200	0.0184	0.0637	1.2881	0.6447	0.0018	0.0176	0.0162
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
Lube Truck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
1000 Gallon Watertruck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
3000 Gallon Watertruck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
5000 Gallon Watertanker	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0554	0.4620	0.2848	0.0021	0.0100	0.0092	0.0536	0.4619	0.2485	0.0021	0.0087	0.0080
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0554	0.4620	0.2848	0.0021	0.0100	0.0092	0.0536	0.4619	0.2485	0.0021	0.0087	0.0080
5 Ton Boomtruck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
10 Ton Boomtruck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329
20 Ton Boomtruck	n/a - onroad	Diesel	0.7890	18.2339	0.7784	0.0527	0.7528	0.3443	0.7507	17.9817	0.7171	0.0515	0.7409	0.3329

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-102. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2029 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.0830	0.9601	0.7128	0.0014	0.0371	0.0341
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.0830	0.9601	0.7128	0.0014	0.0371	0.0341
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0648	0.4066	0.5875	0.0014	0.0247	0.0227
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0523	0.4626	0.4275	0.0014	0.0179	0.0165
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.0830	0.9601	0.7128	0.0014	0.0371	0.0341
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.0830	0.9601	0.7128	0.0014	0.0371	0.0341
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0523	0.4626	0.4275	0.0014	0.0179	0.0165
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0369	0.9883	0.4988	0.0015	0.0123	0.0113
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0558	0.5296	0.4896	0.0024	0.0161	0.0148
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0558	0.5296	0.4896	0.0024	0.0161	0.0148
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.2904	2.1703	1.8962	0.0028	0.0817	0.0752
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0369	0.9883	0.4988	0.0015	0.0123	0.0113
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0629	1.2903	0.6292	0.0018	0.0160	0.0147
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
Lube Truck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
1000 Gallon Watertruck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
3000 Gallon Watertruck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
5000 Gallon Watertanker	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0525	0.4609	0.2358	0.0021	0.0082	0.0075
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0525	0.4609	0.2358	0.0021	0.0082	0.0075
5 Ton Boomtruck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
10 Ton Boomtruck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254
20 Ton Boomtruck	n/a - onroad	Diesel	0.7153	17.7375	0.6688	0.0503	0.7331	0.3254

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Maximum Daily Emissions - 2024 (pounds per day)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	1.12	7.21	9.90	0.01	0.64	0.59
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	3.47	22.30	30.61	0.03	1.97	1.82
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	6.52	51.87	63.96	0.08	2.85	2.62
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.62	3.77	5.75	0.02	0.19	0.18
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	2.61	16.04	21.37	0.06	0.81	0.74
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	2.20	17.16	14.55	0.05	0.53	0.48
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	1.12	6.64	12.37	0.02	0.51	0.47
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.20	2.14	1.95	0.00	0.05	0.05
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	1.92	9.10	20.97	0.04	0.70	0.64
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.26	2.04	1.67	0.00	0.07	0.07
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.67	4.68	6.29	0.02	0.23	0.21
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.56	4.39	4.50	0.02	0.15	0.14
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.82	5.70	7.65	0.02	0.28	0.26
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.83	5.78	7.76	0.02	0.28	0.26
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.28	4.54	2.85	0.01	0.13	0.12
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	6.30	41.04	42.45	0.17	1.52	1.40
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	5.93	37.91	47.37	0.11	1.81	1.67
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	6.92	67.43	99.32	0.08	3.41	3.14
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.28	5.78	2.63	0.01	0.12	0.11
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.34	6.98	3.17	0.01	0.14	0.13
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.34	6.98	3.17	0.01	0.14	0.13
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.39	7.95	3.61	0.01	0.16	0.15
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.67	4.78	7.41	0.02	0.28	0.26
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.74	7.39	7.54	0.03	0.26	0.24
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.92	6.54	2.68	0.04	0.10	0.09
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	1.07	7.63	3.12	0.04	0.11	0.11
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.80	16.00	2.77	0.03	0.11	0.10
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.14	0.80	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.28	2.98	2.13	0.01	0.08	0.07
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.44	4.36	4.19	0.02	0.17	0.15
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.34	1.77	2.55	0.00	0.11	0.10
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.16	4.52	2.52	0.01	0.16	0.15
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	1.73	105.01	1.34	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.32	6.09	1.95	0.01	0.10	0.09
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.77	4.43	5.13	0.02	0.23	0.21
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	1.16	6.92	6.83	0.03	0.30	0.28
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	3.57	133.11	2.64	0.01	1.46	1.10
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.41	3.57	2.83	0.01	0.09	0.09
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.19	2.87	2.43	0.00	0.06	0.06
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.19	5.30	1.83	0.01	0.07	0.06
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.49	4.00	3.86	0.02	0.16	0.15
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.22	1.06	1.65	0.00	0.07	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.25	1.23	1.91	0.00	0.08	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.28	1.34	2.08	0.00	0.09	0.08
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.33	2.94	2.45	0.00	0.08	0.07
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.15	0.90	1.20	0.00	0.05	0.05
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.15	0.90	1.20	0.00	0.05	0.05

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2025 (pounds per day)						Maximum Daily Emissions - 2026 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	1.00	7.07	8.57	0.01	0.56	0.51	0.83	6.85	7.11	0.01	0.42	0.39
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	3.10	21.85	26.50	0.03	1.72	1.58	2.57	21.18	21.96	0.03	1.30	1.20
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	5.91	46.28	55.92	0.08	2.46	2.26	5.63	43.48	51.39	0.08	2.27	2.08
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.58	3.74	4.81	0.02	0.16	0.15	0.56	3.76	4.31	0.02	0.14	0.13
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	2.34	15.01	17.36	0.06	0.65	0.60	2.22	14.70	15.51	0.06	0.58	0.53
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	2.25	17.55	13.98	0.05	0.51	0.47	2.19	16.46	12.64	0.05	0.44	0.41
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	1.01	6.38	10.71	0.02	0.45	0.41	0.97	6.23	9.94	0.02	0.42	0.38
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.20	2.14	1.93	0.00	0.05	0.05	0.19	2.11	1.91	0.00	0.05	0.04
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	1.71	8.74	17.62	0.04	0.59	0.54	1.58	8.63	15.27	0.04	0.51	0.47
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.24	2.02	1.62	0.00	0.06	0.06	0.24	2.02	1.59	0.00	0.06	0.05
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.62	4.66	5.34	0.02	0.20	0.19	0.61	4.66	4.87	0.02	0.19	0.18
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.52	4.35	3.90	0.02	0.13	0.12	0.51	4.35	3.63	0.02	0.12	0.11
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.76	5.67	6.50	0.02	0.25	0.23	0.74	5.67	5.93	0.02	0.23	0.21
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.77	5.75	6.59	0.02	0.25	0.23	0.75	5.75	6.01	0.02	0.23	0.22
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.25	4.53	2.61	0.01	0.10	0.09	0.24	4.52	2.45	0.01	0.08	0.08
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	6.10	40.33	37.30	0.17	1.32	1.22	6.04	40.47	34.74	0.17	1.22	1.13
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	5.30	36.05	38.24	0.11	1.46	1.35	5.40	36.39	38.01	0.11	1.46	1.34
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	6.99	67.53	99.43	0.08	3.42	3.14	7.05	67.64	99.52	0.08	3.43	3.15
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.25	5.77	2.18	0.01	0.10	0.09	0.24	5.78	1.99	0.01	0.09	0.08
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.30	6.97	2.64	0.01	0.12	0.11	0.29	6.98	2.40	0.01	0.11	0.10
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.30	6.97	2.64	0.01	0.12	0.11	0.29	6.98	2.40	0.01	0.11	0.10
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.35	7.93	3.00	0.01	0.13	0.12	0.33	7.95	2.73	0.01	0.12	0.11
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.66	4.79	6.84	0.02	0.27	0.25	0.64	4.77	6.47	0.02	0.26	0.24
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.75	7.41	7.44	0.03	0.26	0.24	0.77	7.49	7.57	0.03	0.26	0.24
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.89	6.54	2.37	0.04	0.09	0.08	0.87	6.54	2.14	0.04	0.08	0.07
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	1.04	7.63	2.77	0.04	0.10	0.09	1.02	7.63	2.50	0.04	0.09	0.08
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.78	16.00	2.40	0.03	0.10	0.09	0.75	15.98	2.13	0.03	0.08	0.08
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.80	1.03	0.00	0.04	0.04	0.14	0.80	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.27	3.02	1.44	0.01	0.06	0.06	0.27	3.05	1.45	0.01	0.06	0.06
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.41	4.41	2.85	0.02	0.13	0.12	0.42	4.46	2.91	0.02	0.13	0.12
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.34	1.76	2.54	0.00	0.10	0.10	0.33	1.76	2.52	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.15	4.57	2.08	0.01	0.14	0.12	0.15	4.62	2.08	0.01	0.14	0.12
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.72	104.92	1.34	0.00	0.11	0.08	1.71	104.84	1.33	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.30	6.16	1.56	0.01	0.07	0.06	0.30	6.23	1.53	0.01	0.07	0.06
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.73	4.48	4.22	0.02	0.19	0.18	0.72	4.53	3.96	0.02	0.19	0.17
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	1.08	6.99	5.03	0.03	0.23	0.21	1.08	7.07	4.63	0.03	0.22	0.20
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.57	133.09	2.64	0.01	1.46	1.10	3.57	133.07	2.64	0.01	1.46	1.10
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.38	3.55	2.75	0.01	0.08	0.07	0.36	3.53	2.68	0.01	0.07	0.06
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.19	2.90	2.45	0.00	0.06	0.06	0.19	2.93	2.47	0.00	0.06	0.06
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.19	5.36	1.58	0.01	0.05	0.05	0.19	5.41	1.57	0.01	0.05	0.05
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.46	4.04	2.56	0.02	0.12	0.11	0.46	4.08	2.53	0.02	0.12	0.11
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.22	1.06	1.64	0.00	0.07	0.06	0.22	1.05	1.63	0.00	0.07	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.25	1.22	1.90	0.00	0.08	0.07	0.25	1.22	1.89	0.00	0.08	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.33	2.07	0.00	0.08	0.08	0.27	1.33	2.06	0.00	0.08	0.08
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.31	2.93	2.38	0.00	0.07	0.06	0.29	2.91	2.32	0.00	0.06	0.05
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.20	0.00	0.05	0.05	0.14	0.89	1.19	0.00	0.05	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.20	0.00	0.05	0.05	0.14	0.89	1.19	0.00	0.05	0.04

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2027 (pounds per day)						Maximum Daily Emissions - 2028 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.78	6.86	6.51	0.01	0.38	0.35	0.64	6.78	4.94	0.01	0.29	0.27
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	2.40	21.19	20.12	0.03	1.18	1.08	1.98	20.95	15.26	0.03	0.89	0.82
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	5.47	42.37	49.30	0.08	2.16	1.99	5.46	42.48	48.50	0.08	2.13	1.96
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.51	3.70	3.47	0.02	0.12	0.11	0.51	3.71	3.11	0.02	0.11	0.10
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	2.23	14.83	14.32	0.06	0.55	0.50	2.22	14.71	13.53	0.06	0.51	0.47
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	1.97	13.45	10.51	0.05	0.33	0.30	2.01	13.75	9.37	0.05	0.30	0.28
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.82	5.10	7.99	0.02	0.32	0.30	0.80	5.12	7.48	0.02	0.31	0.29
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.19	2.10	1.89	0.00	0.04	0.04	0.18	2.09	1.87	0.00	0.04	0.04
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	1.47	8.51	13.23	0.04	0.45	0.41	1.42	8.47	12.10	0.04	0.42	0.38
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.23	2.01	1.56	0.00	0.05	0.05	0.23	2.02	1.54	0.00	0.05	0.05
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.59	4.56	4.51	0.02	0.18	0.16	0.56	4.52	3.94	0.02	0.16	0.15
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.50	4.34	3.28	0.02	0.11	0.10	0.49	4.35	3.00	0.02	0.11	0.10
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.72	5.55	5.49	0.02	0.22	0.20	0.69	5.51	4.79	0.02	0.19	0.18
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.73	5.63	5.57	0.02	0.22	0.20	0.70	5.58	4.86	0.02	0.20	0.18
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.23	4.53	2.35	0.01	0.07	0.07	0.22	4.54	2.27	0.01	0.06	0.06
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	6.06	40.49	33.15	0.17	1.17	1.08	5.99	40.20	30.55	0.17	1.08	1.00
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	5.27	34.32	35.25	0.11	1.32	1.22	5.35	34.53	35.70	0.11	1.34	1.24
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	7.11	67.76	99.62	0.08	3.43	3.16	7.16	67.81	99.60	0.08	3.44	3.16
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.22	5.79	1.74	0.01	0.08	0.07	0.22	5.81	1.58	0.01	0.07	0.06
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.27	7.00	2.10	0.01	0.09	0.08	0.26	7.02	1.90	0.01	0.08	0.08
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.27	7.00	2.10	0.01	0.09	0.08	0.26	7.02	1.90	0.01	0.08	0.08
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.31	7.96	2.39	0.01	0.10	0.10	0.30	7.98	2.17	0.01	0.09	0.09
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.59	4.65	5.52	0.02	0.23	0.21	0.58	4.64	5.26	0.02	0.22	0.20
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.79	7.61	7.83	0.03	0.27	0.25	0.75	7.69	6.74	0.03	0.25	0.23
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.85	6.52	1.97	0.04	0.07	0.07	0.84	6.51	1.85	0.04	0.07	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	1.00	7.60	2.30	0.04	0.08	0.08	0.98	7.59	2.16	0.04	0.08	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.73	15.95	1.92	0.03	0.07	0.07	0.71	15.94	1.76	0.03	0.07	0.06
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.80	1.03	0.00	0.04	0.04	0.14	0.80	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.26	3.08	0.87	0.01	0.04	0.04	0.26	3.11	0.86	0.02	0.04	0.04
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.38	4.51	1.52	0.02	0.07	0.07	0.38	4.56	1.43	0.02	0.07	0.07
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.33	1.75	2.51	0.00	0.10	0.09	0.33	1.75	2.50	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.14	4.67	1.70	0.01	0.12	0.11	0.14	4.72	1.61	0.01	0.11	0.10
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.70	104.78	1.33	0.00	0.11	0.08	1.69	104.75	1.33	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.28	6.29	1.10	0.01	0.05	0.04	0.28	6.36	1.04	0.01	0.04	0.04
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.67	4.58	2.98	0.02	0.15	0.13	0.68	4.63	2.97	0.02	0.15	0.13
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	1.04	7.14	3.94	0.03	0.19	0.17	1.04	7.22	3.78	0.03	0.18	0.17
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.57	133.07	2.64	0.01	1.46	1.10	3.57	133.07	2.64	0.01	1.46	1.10
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.34	3.50	2.59	0.01	0.06	0.05	0.32	3.48	2.52	0.01	0.04	0.04
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.19	2.97	2.50	0.00	0.06	0.06	0.20	3.00	2.50	0.00	0.06	0.05
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.18	5.47	1.23	0.01	0.04	0.04	0.18	5.53	1.17	0.01	0.04	0.03
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.46	4.13	2.14	0.02	0.11	0.10	0.46	4.17	2.11	0.02	0.11	0.10
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.21	1.05	1.62	0.00	0.06	0.06	0.21	1.05	1.62	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.25	1.22	1.88	0.00	0.07	0.07	0.25	1.21	1.87	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.33	2.05	0.00	0.08	0.08	0.27	1.32	2.04	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.27	2.88	2.25	0.00	0.05	0.04	0.26	2.86	2.18	0.00	0.04	0.04
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.18	0.00	0.05	0.04	0.14	0.89	1.18	0.00	0.05	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.18	0.00	0.05	0.04	0.14	0.89	1.18	0.00	0.05	0.04

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2029 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.60	6.81	4.52	0.01	0.25	0.23
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	1.84	21.06	13.96	0.03	0.76	0.70
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	5.33	41.89	45.56	0.08	2.04	1.87
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.51	3.79	2.92	0.02	0.10	0.09
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	2.19	14.42	12.65	0.06	0.48	0.44
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	2.00	13.42	7.93	0.05	0.25	0.23
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.76	5.08	6.78	0.02	0.29	0.26
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.18	2.08	1.86	0.00	0.04	0.04
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	1.38	8.47	11.25	0.04	0.39	0.36
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.22	2.02	1.53	0.00	0.05	0.04
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.58	4.63	3.91	0.02	0.16	0.15
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.49	4.36	2.88	0.02	0.10	0.10
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.71	5.63	4.76	0.02	0.20	0.18
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.72	5.71	4.83	0.02	0.20	0.18
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.22	4.55	2.22	0.01	0.06	0.05
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	5.90	39.68	28.26	0.17	1.01	0.93
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	5.13	32.77	32.97	0.11	1.22	1.12
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	6.59	60.37	93.34	0.08	3.09	2.85
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.21	5.82	1.49	0.01	0.07	0.06
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.26	7.03	1.80	0.01	0.08	0.07
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.26	7.03	1.80	0.01	0.08	0.07
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.29	8.00	2.04	0.01	0.09	0.08
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.58	4.64	5.21	0.02	0.22	0.21
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.76	7.72	6.76	0.03	0.25	0.23
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.83	6.52	1.77	0.04	0.07	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.97	7.60	2.06	0.04	0.08	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.70	15.93	1.62	0.03	0.06	0.06
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.80	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.25	3.15	0.63	0.02	0.03	0.03
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.38	4.60	1.22	0.02	0.07	0.06
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.33	1.75	2.50	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.14	4.77	1.51	0.01	0.11	0.10
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.69	104.72	1.33	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.28	6.43	0.93	0.01	0.04	0.03
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.67	4.68	2.80	0.02	0.14	0.13
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	1.05	7.30	3.76	0.03	0.18	0.16
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.57	133.07	2.64	0.01	1.46	1.10
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.31	3.46	2.48	0.01	0.04	0.03
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.20	3.03	2.51	0.00	0.05	0.05
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.18	5.59	1.14	0.01	0.04	0.03
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.46	4.22	1.87	0.02	0.10	0.09
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.21	1.05	1.61	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.25	1.21	1.87	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.32	2.04	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.24	2.85	2.15	0.00	0.03	0.03
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.18	0.00	0.05	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.18	0.00	0.05	0.04

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Maximum Daily Emissions - 2024 (pounds per day)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.62	5.31	5.92	0.01	0.32	0.29
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.85	7.34	8.18	0.01	0.44	0.41
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.66	3.81	7.12	0.01	0.30	0.27
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.82	6.57	8.34	0.02	0.34	0.31
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.62	5.31	5.92	0.01	0.32	0.29
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.65	5.61	6.26	0.01	0.34	0.31
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.95	7.58	9.61	0.02	0.39	0.36
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.09	2.71	1.41	0.00	0.03	0.03
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	1.13	10.36	10.95	0.05	0.36	0.33
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.57	5.18	5.47	0.02	0.18	0.16
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.60	4.26	4.10	0.01	0.22	0.20
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.09	2.71	1.41	0.00	0.03	0.03
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.34	5.56	3.49	0.01	0.15	0.14
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.41	8.39	0.44	0.03	0.35	0.17
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.12	2.52	0.13	0.01	0.10	0.05
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.12	2.52	0.13	0.01	0.10	0.05
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.08	1.68	0.09	0.01	0.07	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	2.52	20.38	16.76	0.09	0.57	0.53
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	1.26	10.19	8.38	0.05	0.29	0.26
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.04	0.84	0.04	0.00	0.03	0.02
		Total	**2,461,102**	**n/a**	**n/a**	**n/a**	**2,099.53**	**2,847.58**	**2,639.92**	**2,025.58**	**2,051.43**	**2,048.45**

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2025 (pounds per day)						Maximum Daily Emissions - 2026 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.56	5.25	5.19	0.01	0.28	0.26	0.50	5.20	4.59	0.01	0.25	0.23
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.77	7.26	7.17	0.01	0.39	0.36	0.70	7.19	6.34	0.01	0.34	0.31
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.61	3.47	6.27	0.01	0.27	0.24	0.57	3.35	5.68	0.01	0.24	0.22
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.79	6.51	7.63	0.02	0.31	0.28	0.77	6.41	7.19	0.02	0.29	0.27
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.56	5.25	5.19	0.01	0.28	0.26	0.50	5.20	4.59	0.01	0.25	0.23
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.59	5.55	5.48	0.01	0.30	0.27	0.53	5.50	4.85	0.01	0.26	0.24
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.91	7.50	8.79	0.02	0.36	0.33	0.89	7.38	8.28	0.02	0.34	0.31
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.08	2.69	1.31	0.00	0.02	0.02	0.09	2.71	1.33	0.00	0.03	0.02
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	1.11	10.34	10.33	0.05	0.34	0.31	1.14	10.39	10.51	0.05	0.34	0.32
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.55	5.17	5.17	0.02	0.17	0.16	0.57	5.20	5.25	0.02	0.17	0.16
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.58	4.19	3.90	0.01	0.19	0.17	0.58	4.26	3.91	0.01	0.19	0.17
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.08	2.69	1.31	0.00	0.02	0.02	0.09	2.71	1.33	0.00	0.03	0.02
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.31	5.54	3.20	0.01	0.12	0.11	0.29	5.54	3.00	0.01	0.10	0.09
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.39	8.26	0.40	0.02	0.34	0.16	0.37	8.15	0.37	0.02	0.34	0.16
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.12	2.48	0.12	0.01	0.10	0.05	0.11	2.45	0.11	0.01	0.10	0.05
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.12	2.48	0.12	0.01	0.10	0.05	0.11	2.45	0.11	0.01	0.10	0.05
Lube Truck	n/a - onroad	Diesel	0.08	1.65	0.08	0.00	0.07	0.03	0.07	1.63	0.07	0.00	0.07	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
1000 Gallon Watertruck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
3000 Gallon Watertruck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
5000 Gallon Watertanker	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	2.42	20.17	14.39	0.09	0.49	0.45	2.48	20.30	14.17	0.09	0.49	0.45
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	1.21	10.09	7.20	0.05	0.25	0.23	1.24	10.15	7.09	0.05	0.25	0.23
5 Ton Boomtruck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
10 Ton Boomtruck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
20 Ton Boomtruck	n/a - onroad	Diesel	0.04	0.83	0.04	0.00	0.03	0.02	0.04	0.82	0.04	0.00	0.03	0.02
		Total	**2,096.57**	**2,837.15**	**2,576.55**	**2,026.57**	**2,049.68**	**2,046.93**	**2,095.81**	**2,833.15**	**2,548.05**	**2,027.57**	**2,049.13**	**2,046.50**

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2027 (pounds per day)						Maximum Daily Emissions - 2028 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.47	5.17	4.19	0.01	0.22	0.21	0.46	5.18	3.99	0.01	0.21	0.19
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.65	7.15	5.79	0.01	0.31	0.28	0.63	7.16	5.51	0.01	0.29	0.27
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.53	3.27	5.09	0.01	0.21	0.20	0.51	3.20	4.76	0.01	0.20	0.18
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.76	6.37	6.84	0.02	0.28	0.26	0.73	6.37	6.27	0.02	0.26	0.24
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.47	5.17	4.19	0.01	0.22	0.21	0.46	5.18	3.99	0.01	0.21	0.19
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.50	5.47	4.43	0.01	0.24	0.22	0.48	5.47	4.22	0.01	0.22	0.21
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.88	7.34	7.88	0.02	0.32	0.30	0.85	7.34	7.22	0.02	0.30	0.27
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.09	2.72	1.33	0.00	0.03	0.02	0.09	2.74	1.32	0.00	0.03	0.02
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	1.12	10.38	10.07	0.05	0.34	0.31	1.10	10.29	9.87	0.05	0.32	0.30
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.56	5.19	5.03	0.02	0.17	0.15	0.55	5.15	4.94	0.02	0.16	0.15
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.57	4.20	3.76	0.01	0.17	0.16	0.53	4.14	3.66	0.01	0.15	0.14
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.09	2.72	1.33	0.00	0.03	0.02	0.09	2.74	1.32	0.00	0.03	0.02
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.28	5.55	2.88	0.01	0.09	0.08	0.28	5.57	2.79	0.01	0.08	0.07
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.35	8.04	0.34	0.02	0.33	0.15	0.33	7.93	0.32	0.02	0.33	0.15
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.10	2.41	0.10	0.01	0.10	0.05	0.10	2.38	0.09	0.01	0.10	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.10	2.41	0.10	0.01	0.10	0.05	0.10	2.38	0.09	0.01	0.10	0.04
Lube Truck	n/a - onroad	Diesel	0.07	1.61	0.07	0.00	0.07	0.03	0.07	1.59	0.06	0.00	0.07	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	2.44	20.37	12.56	0.09	0.44	0.41	2.36	20.37	10.96	0.09	0.38	0.35
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	1.22	10.18	6.28	0.05	0.22	0.20	1.18	10.18	5.48	0.05	0.19	0.18
5 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.80	0.03	0.00	0.03	0.02	0.03	0.79	0.03	0.00	0.03	0.01
		Total	**2,095.01**	**2,826.33**	**2,515.94**	**2,028.57**	**2,048.63**	**2,046.12**	**2,094.76**	**2,827.05**	**2,492.61**	**2,029.57**	**2,048.55**	**2,046.13**

Table A-103. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2029 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.45	5.21	3.87	0.01	0.20	0.19
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.62	7.20	5.34	0.01	0.28	0.26
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.51	3.19	4.61	0.01	0.19	0.18
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.71	6.28	5.81	0.02	0.24	0.22
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.45	5.21	3.87	0.01	0.20	0.19
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.48	5.50	4.09	0.01	0.21	0.20
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.82	7.24	6.69	0.02	0.28	0.26
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.10	2.75	1.39	0.00	0.03	0.03
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	1.09	10.32	9.54	0.05	0.31	0.29
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.54	5.16	4.77	0.02	0.16	0.14
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.56	4.21	3.68	0.01	0.16	0.15
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.10	2.75	1.39	0.00	0.03	0.03
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.27	5.58	2.72	0.01	0.07	0.06
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.32	7.82	0.29	0.02	0.32	0.14
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.09	2.35	0.09	0.01	0.10	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.09	2.35	0.09	0.01	0.10	0.04
Lube Truck	n/a - onroad	Diesel	0.06	1.56	0.06	0.00	0.06	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	2.32	20.32	10.40	0.09	0.36	0.33
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	1.16	10.16	5.20	0.05	0.18	0.17
5 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.78	0.03	0.00	0.03	0.01
		Total	**2,094.26**	**2,817.82**	**2,468.34**	**2,030.57**	**2,048.39**	**2,046.06**

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Annual Emissions - 2024 (tons per year)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	0.20	1.32	1.81	0.00	0.12	0.11
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	0.63	4.07	5.59	0.01	0.36	0.33
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	1.19	9.47	11.67	0.01	0.52	0.48
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.11	0.69	1.05	0.00	0.03	0.03
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	0.48	2.93	3.90	0.01	0.15	0.14
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	0.40	3.13	2.66	0.01	0.10	0.09
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	0.20	1.21	2.26	0.00	0.09	0.09
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.04	0.39	0.36	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	0.35	1.66	3.83	0.01	0.13	0.12
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.05	0.37	0.30	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.12	0.85	1.15	0.00	0.04	0.04
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.10	0.80	0.82	0.00	0.03	0.02
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.15	1.04	1.40	0.00	0.05	0.05
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.15	1.05	1.42	0.00	0.05	0.05
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.05	0.83	0.52	0.00	0.02	0.02
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	1.15	7.49	7.75	0.03	0.28	0.26
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	1.08	6.92	8.65	0.02	0.33	0.30
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	1.26	12.31	18.13	0.01	0.62	0.57
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.05	1.05	0.48	0.00	0.02	0.02
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.06	1.27	0.58	0.00	0.03	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.06	1.27	0.58	0.00	0.03	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.07	1.45	0.66	0.00	0.03	0.03
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.12	0.87	1.35	0.00	0.05	0.05
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.13	1.35	1.38	0.00	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.17	1.19	0.49	0.01	0.02	0.02
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	0.20	1.39	0.57	0.01	0.02	0.02
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.15	2.92	0.51	0.01	0.02	0.02
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.05	0.54	0.39	0.00	0.01	0.01
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.08	0.80	0.76	0.00	0.03	0.03
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.06	0.32	0.47	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.03	0.82	0.46	0.00	0.03	0.03
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	0.32	19.16	0.24	0.00	0.02	0.02
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.06	1.11	0.36	0.00	0.02	0.02
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.14	0.81	0.94	0.00	0.04	0.04
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	0.21	1.26	1.25	0.01	0.05	0.05
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	0.65	24.29	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.07	0.65	0.52	0.00	0.02	0.02
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.03	0.52	0.44	0.00	0.01	0.01
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.04	0.97	0.33	0.00	0.01	0.01
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.09	0.73	0.70	0.00	0.03	0.03
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.04	0.19	0.30	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.05	0.22	0.35	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.05	0.24	0.38	0.00	0.02	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.06	0.54	0.45	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.03	0.16	0.22	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.03	0.16	0.22	0.00	0.01	0.01

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2025 (tons per year)						Annual Emissions - 2026 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.18	1.29	1.56	0.00	0.10	0.09	0.15	1.25	1.30	0.00	0.08	0.07
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.56	3.99	4.84	0.01	0.31	0.29	0.47	3.87	4.01	0.01	0.24	0.22
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	1.08	8.45	10.21	0.01	0.45	0.41	1.03	7.93	9.38	0.01	0.41	0.38
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.11	0.68	0.88	0.00	0.03	0.03	0.10	0.69	0.79	0.00	0.03	0.02
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.43	2.74	3.17	0.01	0.12	0.11	0.41	2.68	2.83	0.01	0.11	0.10
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.41	3.20	2.55	0.01	0.09	0.09	0.40	3.00	2.31	0.01	0.08	0.07
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.18	1.16	1.95	0.00	0.08	0.07	0.18	1.14	1.81	0.00	0.08	0.07
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.04	0.39	0.35	0.00	0.01	0.01	0.04	0.39	0.35	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.31	1.60	3.22	0.01	0.11	0.10	0.29	1.57	2.79	0.01	0.09	0.09
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.37	0.30	0.00	0.01	0.01	0.04	0.37	0.29	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.11	0.85	0.97	0.00	0.04	0.03	0.11	0.85	0.89	0.00	0.03	0.03
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.10	0.79	0.71	0.00	0.02	0.02	0.09	0.79	0.66	0.00	0.02	0.02
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.14	1.04	1.19	0.00	0.04	0.04	0.13	1.03	1.08	0.00	0.04	0.04
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.14	1.05	1.20	0.00	0.05	0.04	0.14	1.05	1.10	0.00	0.04	0.04
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.05	0.83	0.48	0.00	0.02	0.02	0.04	0.83	0.45	0.00	0.02	0.01
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	1.11	7.36	6.81	0.03	0.24	0.22	1.10	7.39	6.34	0.03	0.22	0.21
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.97	6.58	6.98	0.02	0.27	0.25	0.99	6.64	6.94	0.02	0.27	0.24
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.28	12.33	18.15	0.01	0.62	0.57	1.29	12.34	18.16	0.01	0.63	0.58
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.05	1.05	0.40	0.00	0.02	0.02	0.04	1.05	0.36	0.00	0.02	0.01
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.06	1.27	0.48	0.00	0.02	0.02	0.05	1.27	0.44	0.00	0.02	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.06	1.27	0.48	0.00	0.02	0.02	0.05	1.27	0.44	0.00	0.02	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.06	1.45	0.55	0.00	0.02	0.02	0.06	1.45	0.50	0.00	0.02	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.12	0.87	1.25	0.00	0.05	0.05	0.12	0.87	1.18	0.00	0.05	0.04
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.14	1.35	1.36	0.00	0.05	0.04	0.14	1.37	1.38	0.00	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.16	1.19	0.43	0.01	0.02	0.01	0.16	1.19	0.39	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.19	1.39	0.50	0.01	0.02	0.02	0.19	1.39	0.46	0.01	0.02	0.02
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.14	2.92	0.44	0.01	0.02	0.02	0.14	2.92	0.39	0.01	0.02	0.01
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.05	0.55	0.26	0.00	0.01	0.01	0.05	0.56	0.27	0.00	0.01	0.01
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.08	0.80	0.52	0.00	0.02	0.02	0.08	0.81	0.53	0.00	0.02	0.02
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.46	0.00	0.02	0.02	0.06	0.32	0.46	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.03	0.83	0.38	0.00	0.02	0.02	0.03	0.84	0.38	0.00	0.02	0.02
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.31	19.15	0.24	0.00	0.02	0.02	0.31	19.13	0.24	0.00	0.02	0.02
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.12	0.28	0.00	0.01	0.01	0.06	1.14	0.28	0.00	0.01	0.01
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.13	0.82	0.77	0.00	0.04	0.03	0.13	0.83	0.72	0.00	0.03	0.03
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.20	1.28	0.92	0.01	0.04	0.04	0.20	1.29	0.85	0.01	0.04	0.04
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.29	0.48	0.00	0.27	0.20	0.65	24.29	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.07	0.65	0.50	0.00	0.01	0.01	0.07	0.64	0.49	0.00	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.53	0.45	0.00	0.01	0.01	0.03	0.54	0.45	0.00	0.01	0.01
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.98	0.29	0.00	0.01	0.01	0.03	0.99	0.29	0.00	0.01	0.01
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.08	0.74	0.47	0.00	0.02	0.02	0.08	0.75	0.46	0.00	0.02	0.02
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.30	0.00	0.01	0.01	0.04	0.19	0.30	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.22	0.35	0.00	0.01	0.01	0.05	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.38	0.00	0.02	0.01	0.05	0.24	0.38	0.00	0.02	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.06	0.53	0.43	0.00	0.01	0.01	0.05	0.53	0.42	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01	0.03	0.16	0.22	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01	0.03	0.16	0.22	0.00	0.01	0.01

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2027 (tons per year)						Annual Emissions - 2028 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.14	1.25	1.19	0.00	0.07	0.06	0.12	1.24	0.90	0.00	0.05	0.05
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.44	3.87	3.67	0.01	0.21	0.20	0.36	3.82	2.78	0.01	0.16	0.15
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	1.00	7.73	9.00	0.01	0.39	0.36	1.00	7.75	8.85	0.01	0.39	0.36
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.09	0.68	0.63	0.00	0.02	0.02	0.09	0.68	0.57	0.00	0.02	0.02
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.41	2.71	2.61	0.01	0.10	0.09	0.41	2.68	2.47	0.01	0.09	0.09
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.36	2.46	1.92	0.01	0.06	0.06	0.37	2.51	1.71	0.01	0.06	0.05
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.15	0.93	1.46	0.00	0.06	0.05	0.15	0.94	1.37	0.00	0.06	0.05
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.03	0.38	0.34	0.00	0.01	0.01	0.03	0.38	0.34	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.27	1.55	2.41	0.01	0.08	0.08	0.26	1.55	2.21	0.01	0.08	0.07
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.37	0.28	0.00	0.01	0.01	0.04	0.37	0.28	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.11	0.83	0.82	0.00	0.03	0.03	0.10	0.83	0.72	0.00	0.03	0.03
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.09	0.79	0.60	0.00	0.02	0.02	0.09	0.79	0.55	0.00	0.02	0.02
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.13	1.01	1.00	0.00	0.04	0.04	0.13	1.00	0.87	0.00	0.04	0.03
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.13	1.03	1.02	0.00	0.04	0.04	0.13	1.02	0.89	0.00	0.04	0.03
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.83	0.43	0.00	0.01	0.01	0.04	0.83	0.42	0.00	0.01	0.01
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	1.11	7.39	6.05	0.03	0.21	0.20	1.09	7.34	5.58	0.03	0.20	0.18
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.96	6.26	6.43	0.02	0.24	0.22	0.98	6.30	6.52	0.02	0.25	0.23
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.30	12.37	18.18	0.01	0.63	0.58	1.31	12.38	18.18	0.01	0.63	0.58
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.04	1.06	0.32	0.00	0.01	0.01	0.04	1.06	0.29	0.00	0.01	0.01
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.05	1.28	0.38	0.00	0.02	0.02	0.05	1.28	0.35	0.00	0.02	0.01
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.05	1.28	0.38	0.00	0.02	0.02	0.05	1.28	0.35	0.00	0.02	0.01
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.06	1.45	0.44	0.00	0.02	0.02	0.05	1.46	0.40	0.00	0.02	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.11	0.85	1.01	0.00	0.04	0.04	0.11	0.85	0.96	0.00	0.04	0.04
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.14	1.39	1.43	0.00	0.05	0.05	0.14	1.40	1.23	0.00	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.16	1.19	0.36	0.01	0.01	0.01	0.15	1.19	0.34	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.18	1.39	0.42	0.01	0.02	0.01	0.18	1.39	0.39	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.13	2.91	0.35	0.01	0.01	0.01	0.13	2.91	0.32	0.01	0.01	0.01
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.05	0.56	0.16	0.00	0.01	0.01	0.05	0.57	0.16	0.00	0.01	0.01
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.07	0.82	0.28	0.00	0.01	0.01	0.07	0.83	0.26	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.46	0.00	0.02	0.02	0.06	0.32	0.46	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.03	0.85	0.31	0.00	0.02	0.02	0.03	0.86	0.29	0.00	0.02	0.02
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.31	19.12	0.24	0.00	0.02	0.02	0.31	19.12	0.24	0.00	0.02	0.02
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.15	0.20	0.00	0.01	0.01	0.05	1.16	0.19	0.00	0.01	0.01
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.12	0.84	0.54	0.00	0.03	0.02	0.12	0.84	0.54	0.00	0.03	0.02
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.19	1.30	0.72	0.01	0.03	0.03	0.19	1.32	0.69	0.01	0.03	0.03
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.29	0.48	0.00	0.27	0.20	0.65	24.28	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.06	0.64	0.47	0.00	0.01	0.01	0.06	0.64	0.46	0.00	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.04	0.54	0.46	0.00	0.01	0.01	0.04	0.55	0.46	0.00	0.01	0.01
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	1.00	0.22	0.00	0.01	0.01	0.03	1.01	0.21	0.00	0.01	0.01
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.08	0.75	0.39	0.00	0.02	0.02	0.08	0.76	0.38	0.00	0.02	0.02
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.30	0.00	0.01	0.01	0.04	0.19	0.30	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.22	0.34	0.00	0.01	0.01	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.37	0.00	0.01	0.01	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.05	0.53	0.41	0.00	0.01	0.01	0.05	0.52	0.40	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01	0.03	0.16	0.22	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01	0.03	0.16	0.22	0.00	0.01	0.01

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2029 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.11	1.24	0.82	0.00	0.05	0.04
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.34	3.84	2.55	0.01	0.14	0.13
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.97	7.64	8.31	0.01	0.37	0.34
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.09	0.69	0.53	0.00	0.02	0.02
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.40	2.63	2.31	0.01	0.09	0.08
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.36	2.45	1.45	0.01	0.05	0.04
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.14	0.93	1.24	0.00	0.05	0.05
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.03	0.38	0.34	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.25	1.55	2.05	0.01	0.07	0.07
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.37	0.28	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.11	0.84	0.71	0.00	0.03	0.03
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.09	0.80	0.53	0.00	0.02	0.02
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.13	1.03	0.87	0.00	0.04	0.03
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.13	1.04	0.88	0.00	0.04	0.03
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.83	0.41	0.00	0.01	0.01
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	1.08	7.24	5.16	0.03	0.18	0.17
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.94	5.98	6.02	0.02	0.22	0.20
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.20	11.02	17.04	0.01	0.56	0.52
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.04	1.06	0.27	0.00	0.01	0.01
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.05	1.28	0.33	0.00	0.01	0.01
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.05	1.28	0.33	0.00	0.01	0.01
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.05	1.46	0.37	0.00	0.02	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.11	0.85	0.95	0.00	0.04	0.04
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.14	1.41	1.23	0.00	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.15	1.19	0.32	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.18	1.39	0.38	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.13	2.91	0.30	0.01	0.01	0.01
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.05	0.57	0.12	0.00	0.01	0.01
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.07	0.84	0.22	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.46	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.03	0.87	0.28	0.00	0.02	0.02
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.31	19.11	0.24	0.00	0.02	0.02
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.17	0.17	0.00	0.01	0.01
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.12	0.85	0.51	0.00	0.03	0.02
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.19	1.33	0.69	0.01	0.03	0.03
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.28	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.06	0.63	0.45	0.00	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.04	0.55	0.46	0.00	0.01	0.01
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	1.02	0.21	0.00	0.01	0.01
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.08	0.77	0.34	0.00	0.02	0.02
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.29	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.04	0.52	0.39	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.22	0.00	0.01	0.01

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Annual Emissions - 2024 (tons per year)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.11	0.97	1.08	0.00	0.06	0.05
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.16	1.34	1.49	0.00	0.08	0.07
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.12	0.70	1.30	0.00	0.05	0.05
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.15	1.20	1.52	0.00	0.06	0.06
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.11	0.97	1.08	0.00	0.06	0.05
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.12	1.02	1.14	0.00	0.06	0.06
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.17	1.38	1.75	0.00	0.07	0.06
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.02	0.49	0.26	0.00	0.01	0.01
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	0.21	1.89	2.00	0.01	0.06	0.06
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.10	0.95	1.00	0.00	0.03	0.03
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.11	0.78	0.75	0.00	0.04	0.04
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.02	0.49	0.26	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.06	1.02	0.64	0.00	0.03	0.03
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.07	1.53	0.08	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.02	0.46	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.02	0.46	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.01	0.31	0.02	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	0.46	3.72	3.06	0.02	0.10	0.10
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	0.23	1.86	1.53	0.01	0.05	0.05
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.01	0.15	0.01	0.00	0.01	0.00
		Total	**2,461,104**	**n/a**	**n/a**	**n/a**	**2,037.78**	**2,174.30**	**2,136.41**	**2,024.29**	**2,029.01**	**2,028.46**

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2025 (tons per year)						Annual Emissions - 2026 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.10	0.96	0.95	0.00	0.05	0.05	0.09	0.95	0.84	0.00	0.05	0.04
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.14	1.33	1.31	0.00	0.07	0.07	0.13	1.31	1.16	0.00	0.06	0.06
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.11	0.63	1.14	0.00	0.05	0.04	0.10	0.61	1.04	0.00	0.04	0.04
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.14	1.19	1.39	0.00	0.06	0.05	0.14	1.17	1.31	0.00	0.05	0.05
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.10	0.96	0.95	0.00	0.05	0.05	0.09	0.95	0.84	0.00	0.05	0.04
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.11	1.01	1.00	0.00	0.05	0.05	0.10	1.00	0.89	0.00	0.05	0.04
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.17	1.37	1.60	0.00	0.07	0.06	0.16	1.35	1.51	0.00	0.06	0.06
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.02	0.49	0.24	0.00	0.00	0.00	0.02	0.49	0.24	0.00	0.00	0.00
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.20	1.89	1.89	0.01	0.06	0.06	0.21	1.90	1.92	0.01	0.06	0.06
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.10	0.94	0.94	0.00	0.03	0.03	0.10	0.95	0.96	0.00	0.03	0.03
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.11	0.77	0.71	0.00	0.03	0.03	0.11	0.78	0.71	0.00	0.03	0.03
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.02	0.49	0.24	0.00	0.00	0.00	0.02	0.49	0.24	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.06	1.01	0.58	0.00	0.02	0.02	0.05	1.01	0.55	0.00	0.02	0.02
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.07	1.51	0.07	0.00	0.06	0.03	0.07	1.49	0.07	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.02	0.45	0.02	0.00	0.02	0.01	0.02	0.45	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.02	0.45	0.02	0.00	0.02	0.01	0.02	0.45	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.30	0.01	0.00	0.01	0.01	0.01	0.30	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.44	3.68	2.63	0.02	0.09	0.08	0.45	3.70	2.59	0.02	0.09	0.08
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.22	1.84	1.31	0.01	0.05	0.04	0.23	1.85	1.29	0.01	0.04	0.04
5 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.15	0.01	0.00	0.01	0.00
		Total	**2,038.06**	**2,173.22**	**2,125.66**	**2,025.29**	**2,029.50**	**2,029.00**	**2,038.74**	**2,173.30**	**2,121.27**	**2,026.29**	**2,030.22**	**2,029.74**

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2027 (tons per year)						Annual Emissions - 2028 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.09	0.94	0.76	0.00	0.04	0.04	0.08	0.95	0.73	0.00	0.04	0.04
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.12	1.30	1.06	0.00	0.06	0.05	0.12	1.31	1.01	0.00	0.05	0.05
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.10	0.60	0.93	0.00	0.04	0.04	0.09	0.58	0.87	0.00	0.04	0.03
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.14	1.16	1.25	0.00	0.05	0.05	0.13	1.16	1.14	0.00	0.05	0.04
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.09	0.94	0.76	0.00	0.04	0.04	0.08	0.95	0.73	0.00	0.04	0.04
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.09	1.00	0.81	0.00	0.04	0.04	0.09	1.00	0.77	0.00	0.04	0.04
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.16	1.34	1.44	0.00	0.06	0.05	0.15	1.34	1.32	0.00	0.05	0.05
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.02	0.50	0.24	0.00	0.00	0.00	0.02	0.50	0.24	0.00	0.00	0.00
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.20	1.89	1.84	0.01	0.06	0.06	0.20	1.88	1.80	0.01	0.06	0.05
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.10	0.95	0.92	0.00	0.03	0.03	0.10	0.94	0.90	0.00	0.03	0.03
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.10	0.77	0.69	0.00	0.03	0.03	0.10	0.76	0.67	0.00	0.03	0.03
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.02	0.50	0.24	0.00	0.00	0.00	0.02	0.50	0.24	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.05	1.01	0.53	0.00	0.02	0.01	0.05	1.02	0.51	0.00	0.01	0.01
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.06	1.47	0.06	0.00	0.06	0.03	0.06	1.45	0.06	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.02	0.44	0.02	0.00	0.02	0.01	0.02	0.43	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.02	0.44	0.02	0.00	0.02	0.01	0.02	0.43	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.29	0.01	0.00	0.01	0.01	0.01	0.29	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.45	3.72	2.29	0.02	0.08	0.07	0.43	3.72	2.00	0.02	0.07	0.06
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.22	1.86	1.15	0.01	0.04	0.04	0.22	1.86	1.00	0.01	0.03	0.03
5 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.15	0.01	0.00	0.01	0.00	0.01	0.14	0.01	0.00	0.01	0.00
		Total	**2,039.41**	**2,172.88**	**2,116.23**	**2,027.29**	**2,030.95**	**2,030.49**	**2,040.18**	**2,173.83**	**2,112.79**	**2,028.29**	**2,031.75**	**2,031.31**

Table A-104. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2029 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.08	0.95	0.71	0.00	0.04	0.03
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.11	1.31	0.98	0.00	0.05	0.05
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.09	0.58	0.84	0.00	0.04	0.03
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.13	1.15	1.06	0.00	0.04	0.04
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.08	0.95	0.71	0.00	0.04	0.03
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.09	1.00	0.75	0.00	0.04	0.04
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.15	1.32	1.22	0.00	0.05	0.05
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.02	0.50	0.25	0.00	0.01	0.01
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.20	1.88	1.74	0.01	0.06	0.05
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.10	0.94	0.87	0.00	0.03	0.03
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.10	0.77	0.67	0.00	0.03	0.03
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.02	0.50	0.25	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.05	1.02	0.50	0.00	0.01	0.01
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.06	1.43	0.05	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.02	0.43	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.02	0.43	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.29	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.42	3.71	1.90	0.02	0.07	0.06
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.21	1.85	0.95	0.01	0.03	0.03
5 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.14	0.01	0.00	0.01	0.00
		Total	**2,040.91**	**2,172.96**	**2,109.18**	**2,029.29**	**2,032.54**	**2,032.11**

Pacheco Reservoir Expansion Alternative
Offsite Construction Emissions

Table A-105. Construction Worker Commuting Emissions

Year	Maximum Daily Trips	Annual Trips	Emission Factors, grams per mile						Maximum Daily Emissions, pounds per day						Annual Emissions, tons per year					
			ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5
2024	600	159,250	0.0093	0.0475	0.5237	0.0025	0.1469	0.0444	0.49	2.51	27.71	0.13	7.77	2.35	0.07	0.33	3.68	0.02	1.03	0.31
2025	600	191,889	0.0085	0.0435	0.4900	0.0024	0.1469	0.0444	0.45	2.30	25.93	0.13	7.77	2.35	0.07	0.37	4.15	0.02	1.24	0.38
2026	900	291,261	0.0078	0.0402	0.4617	0.0023	0.1468	0.0444	0.62	3.19	36.64	0.19	11.65	3.52	0.10	0.52	5.93	0.03	1.89	0.57
2027	950	309,400	0.0072	0.0372	0.4367	0.0023	0.1468	0.0443	0.60	3.12	36.58	0.19	12.29	3.71	0.10	0.51	5.96	0.03	2.00	0.60
2028	950	309,400	0.0066	0.0346	0.4144	0.0022	0.1466	0.0442	0.56	2.90	34.72	0.18	12.28	3.70	0.09	0.47	5.65	0.03	2.00	0.60
2029	550	142,567	0.0062	0.0323	0.3939	0.0021	0.1465	0.0441	0.30	1.57	19.10	0.10	7.11	2.14	0.04	0.20	2.48	0.01	0.92	0.28
								Maximum	**0.62**	**3.19**	**36.64**	**0.19**	**12.29**	**3.71**	**0.10**	**0.52**	**5.96**	**0.03**	**2.00**	**0.60**

Note: Particulate matter (PM10 and PM2.5) emissions contain exhaust, tire wear, brake wear, and paved road dust.

Table A-106. Unmitigated Haul Trucks Emissions

Year	Maximum Daily Trips	Annual Trips	Emission Factors, grams per mile						Maximum Daily Emissions, pounds per day						Annual Emissions, tons per year					
			ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5
2024	245	48,230	0.0654	1.3103	0.3823	0.0147	0.2029	0.0650	1.41	28.31	8.26	0.32	4.38	1.41	0.14	2.79	0.81	0.03	0.43	0.14
2025	430	132,253	0.0658	1.2988	0.3852	0.0146	0.2028	0.0650	2.49	49.25	14.60	0.55	7.69	2.47	0.38	7.57	2.25	0.09	1.18	0.38
2026	430	156,520	0.0661	1.2883	0.3877	0.0146	0.2028	0.0650	2.51	48.85	14.70	0.55	7.69	2.46	0.46	8.89	2.68	0.10	1.40	0.45
2027	430	144,387	0.0664	1.2757	0.3896	0.0145	0.2028	0.0650	2.52	48.37	14.77	0.55	7.69	2.46	0.42	8.12	2.48	0.09	1.29	0.41
2028	30	10,920	0.0666	1.2655	0.3915	0.0145	0.2028	0.0650	0.18	3.35	1.04	0.04	0.54	0.17	0.03	0.61	0.19	0.01	0.10	0.03
2029	30	4,550	0.0669	1.2558	0.3930	0.0145	0.2028	0.0649	0.18	3.32	1.04	0.04	0.54	0.17	0.01	0.25	0.08	0.00	0.04	0.01
								Maximum	**2.52**	**49.25**	**14.77**	**0.55**	**7.69**	**2.47**	**0.46**	**8.89**	**2.68**	**0.10**	**1.40**	**0.45**

Note: Particulate matter (PM10 and PM2.5) emissions contain exhaust, tire wear, brake wear, and paved road dust.

One-way trip distance
Workers 40 miles
Trucks 40 miles

Conversions
453.6 grams per pound
2,000 pounds per ton

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-107. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed July 17, 2012].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Offsite Construction Vehicles

Number precipitation days >0.1 inches
Santa Clara County 58

Road silt loading 0.03 g/m^2 (AP-42, Table 13.2.1-2, ADT > 10,000, ubiquitous baseline)
Average vehicle weight 2.4 tons

Source: CAPCOA. 2017. California Emissions Estimator Model User's Guide, Version 2016.3.2, Appendix D: Default Data Tables. Prepared by BREEZE Software, A Division of Trinity Consultants. October. Available online at: http://www.caleemod.com/ [Accessed on November 9, 2018].

Table A-108. Paved Road Dust Emission Factors - Offsite Construction Vehicles

County	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	0.100	0.025	0.096	0.024

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

EMFAC2014 Emission Factors
On-Road Motor Vehicles

Table A-109. Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Francisco Bay Area	2024	0.0093	0.0135	0.0475	0.5237	0.0025	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2025	0.0085	0.0123	0.0435	0.4900	0.0024	0.0017	0.0080	0.0368	0.0464	0.0016	0.0020	0.0158	0.0193
	2026	0.0078	0.0113	0.0402	0.4617	0.0023	0.0016	0.0080	0.0368	0.0464	0.0015	0.0020	0.0158	0.0193
	2027	0.0072	0.0104	0.0372	0.4367	0.0023	0.0015	0.0080	0.0368	0.0463	0.0014	0.0020	0.0158	0.0192
	2028	0.0066	0.0097	0.0346	0.4144	0.0022	0.0014	0.0080	0.0368	0.0462	0.0013	0.0020	0.0158	0.0191
	2029	0.0062	0.0090	0.0323	0.3939	0.0021	0.0013	0.0080	0.0368	0.0461	0.0012	0.0020	0.0158	0.0190

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Table A-110. Unmitigated Emission Factors for Haul and Delivery Trucks

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Francisco Bay Area	2024	0.065	0.074	1.310	0.382	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2025	0.066	0.075	1.299	0.385	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2026	0.066	0.075	1.288	0.388	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2027	0.066	0.076	1.276	0.390	0.015	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2028	0.067	0.076	1.266	0.391	0.014	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040
	2029	0.067	0.076	1.256	0.393	0.014	0.005	0.036	0.062	0.102	0.004	0.009	0.026	0.040

Table A-111. Unmitigated Emission Factors for On-Site Heavy-Duty Vehicles (San Francisco Bay Area Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2024	5	0.167	0.190	0.112	3.443	0.004	0.012	0.008	0.037	0.057	0.011	0.002	0.016	0.029
2024	10	0.124	0.141	0.094	2.576	0.004	0.009	0.008	0.037	0.054	0.009	0.002	0.016	0.027
2024	15	0.062	0.070	0.066	1.268	0.004	0.008	0.008	0.037	0.053	0.007	0.002	0.016	0.025
2024	20	0.025	0.028	0.046	0.493	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2024	25	0.015	0.017	0.037	0.299	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	30	0.012	0.013	0.033	0.227	0.004	0.005	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2024	35	0.010	0.011	0.031	0.182	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2024	40	0.008	0.009	0.029	0.151	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2024	45	0.007	0.008	0.027	0.129	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	50	0.006	0.007	0.026	0.113	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	55	0.006	0.006	0.026	0.102	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	60	0.005	0.006	0.024	0.097	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	65	0.006	0.007	0.027	0.101	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	5	0.158	0.180	0.104	3.399	0.004	0.010	0.008	0.037	0.055	0.010	0.002	0.016	0.028
2025	10	0.118	0.134	0.087	2.541	0.004	0.008	0.008	0.037	0.053	0.008	0.002	0.016	0.026
2025	15	0.059	0.067	0.061	1.250	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.024
2025	20	0.023	0.027	0.042	0.486	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2025	25	0.014	0.016	0.034	0.294	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2025	30	0.011	0.013	0.030	0.223	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2025	35	0.009	0.010	0.028	0.179	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2025	40	0.008	0.009	0.026	0.148	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	45	0.006	0.007	0.024	0.126	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021

Table A-111. Unmitigated Emission Factors for On-Site Heavy-Duty Vehicles (San Francisco Bay Area Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2025	50	0.006	0.006	0.023	0.110	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	55	0.005	0.006	0.023	0.099	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	60	0.005	0.006	0.022	0.094	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	65	0.005	0.006	0.024	0.098	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2026	5	0.151	0.172	0.097	3.358	0.004	0.010	0.008	0.037	0.054	0.009	0.002	0.016	0.027
2026	10	0.112	0.128	0.081	2.509	0.004	0.008	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2026	15	0.056	0.063	0.057	1.233	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2026	20	0.022	0.025	0.039	0.479	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2026	25	0.014	0.015	0.031	0.290	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2026	30	0.010	0.012	0.027	0.220	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2026	35	0.008	0.010	0.026	0.176	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2026	40	0.007	0.008	0.024	0.146	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2026	45	0.006	0.007	0.022	0.124	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2026	50	0.005	0.006	0.021	0.108	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2026	55	0.005	0.006	0.021	0.097	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2026	60	0.005	0.005	0.020	0.092	0.004	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2026	65	0.005	0.006	0.021	0.095	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2027	5	0.143	0.163	0.090	3.318	0.004	0.008	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2027	10	0.106	0.121	0.075	2.478	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2027	15	0.053	0.060	0.052	1.216	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2027	20	0.021	0.024	0.035	0.472	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2027	25	0.013	0.014	0.028	0.285	0.004	0.004	0.008	0.037	0.048	0.004	0.002	0.016	0.021
2027	30	0.010	0.011	0.024	0.216	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2027	35	0.008	0.009	0.022	0.172	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2027	40	0.006	0.007	0.020	0.143	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2027	45	0.006	0.006	0.019	0.122	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	50	0.005	0.005	0.018	0.106	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	55	0.004	0.005	0.017	0.094	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	60	0.004	0.005	0.016	0.089	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	65	0.004	0.005	0.018	0.091	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	5	0.136	0.155	0.084	3.278	0.003	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2028	10	0.102	0.116	0.070	2.447	0.003	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2028	15	0.050	0.057	0.048	1.199	0.003	0.005	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2028	20	0.020	0.022	0.032	0.465	0.003	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2028	25	0.012	0.014	0.025	0.280	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2028	30	0.009	0.010	0.021	0.212	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2028	35	0.007	0.008	0.019	0.169	0.003	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2028	40	0.006	0.007	0.018	0.140	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	45	0.005	0.006	0.016	0.119	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	50	0.004	0.005	0.015	0.103	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	55	0.004	0.005	0.015	0.092	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	60	0.004	0.004	0.014	0.087	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	65	0.004	0.004	0.015	0.088	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	5	0.130	0.148	0.079	3.238	0.003	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2029	10	0.097	0.111	0.065	2.416	0.003	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2029	15	0.048	0.054	0.045	1.183	0.003	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2029	20	0.019	0.021	0.030	0.459	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2029	25	0.011	0.013	0.023	0.276	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2029	30	0.009	0.010	0.020	0.209	0.003	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	35	0.007	0.008	0.017	0.166	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	40	0.006	0.006	0.016	0.137	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	45	0.005	0.005	0.015	0.117	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	50	0.004	0.005	0.014	0.101	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	55	0.004	0.004	0.013	0.089	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2029	60	0.003	0.004	0.012	0.084	0.003	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2029	65	0.004	0.004	0.013	0.085	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019

Criteria Pollutant Emissions Summary
Off-Road Construction Equipment

Table A-112. Summary of Peak Daily Mitigated Emissions by Alternative

	Daily Emissions (lbs/day)					
Alternative	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Lower San Felipe Intake Alternative						
Tunnel Option	10.70	25.65	99.89	0.47	1.62	1.33
Pipeline Option	8.94	20.53	90.06	0.45	1.65	1.18

Table A-113. Summary of Annual Mitigated Emissions by Alternative

	Annual Emissions (tons per year)					
Alternative	**VOC**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
	2020					
Lower San Felipe Intake Alternative						
Tunnel Option	1.64	4.55	16.85	0.08	0.28	0.22
Pipeline Option	1.11	3.17	12.32	0.06	0.21	0.16
	2021					
Lower San Felipe Intake Alternative						
Tunnel Option	1.67	4.36	17.01	0.08	0.27	0.21
Pipeline Option	1.14	3.07	12.46	0.06	0.21	0.15
	2022					
Lower San Felipe Intake Alternative						
Tunnel Option	1.73	5.47	17.17	0.08	0.32	0.25
Pipeline Option	1.17	3.70	12.55	0.06	0.23	0.18
	2023					
Lower San Felipe Intake Alternative						
Tunnel Option	1.79	5.35	17.44	0.08	0.31	0.25
Pipeline Option	-	-	-	-	-	-
	Annual Maximum					
Lower San Felipe Intake Alternative						
Tunnel Option	1.79	5.47	17.44	0.08	0.32	0.25
Pipeline Option	1.17	3.70	12.55	0.06	0.23	0.18

Lower San Felipe Intake Alternative - Tunnel Option

Table A-114. Equipment List

Equipment	Quantity	Mobilization	Site Improvements	Construct Vertical Shaft	Set up TBM	Tunneling and Spreading of Soils	Cofferdam and TBM Out	Connect to Existing Intake	Fabricate Inlet	Set Inlet and Flood Tunnel	Construct Aeration Facility	Fab and Set Air Tubing	Final Work and Testing	Demobilization
Bulldozer	2	X	X											
Concrete Pumpers	2			X				X	X		X			
Cranes	4			X	X		X		X	X	X			
Drill Rig	1			X										
Excavator	1		X	X							X			
Flatbed Trucks (on site)	3	X	X	X	X	X	X	X	X	X	X	X	X	X
Grader	2		X			X					X			X
Loaders	2	X	X								X			
Portable Diesel Generators	7	X	X	X	X	X	X	X	X	X	X	X	X	X
Scraper	1		X			X					X			
Water Truck	2	X	X			X					X			X

Source: Equipment Tables_08012012.docx; EngineeringDataNeeds_July30_2012.xlsx

Table A-115. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Mobilization	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	0.74	2.33	8.78	0.04	0.08	0.08
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.52	1.72	6.47	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.54	11.09	56.01	0.25	0.77	0.71
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
Mobilization Subtotal							**8.80**	**15.14**	**71.29**	**0.36**	**1.31**	**1.00**
Site Improvements	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	0.74	2.33	8.78	0.04	0.08	0.08
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.18	0.71	7.67	0.01	0.03	0.02
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.47	1.79	6.63	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.52	1.72	6.47	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.54	11.09	56.01	0.25	0.77	0.71
	Scraper	ConstMin - Scrapers	1	20	367		0.52	2.07	7.52	0.04	0.07	0.07
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
Site Improvements Subtotal							**9.98**	**19.71**	**93.12**	**0.44**	**1.47**	**1.15**

Table A-115. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Construct Vertical Shaft	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.65	4.96	3.49	0.01	0.19	0.17
	Cranes	ConstMin - Cranes	4	20	231		0.73	3.08	11.32	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	1	20	221		0.31	1.28	4.73	0.02	0.04	0.04
	Excavator	ConstMin - Excavators	1	20	158		0.18	0.71	7.67	0.01	0.03	0.02
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.54	11.09	56.01	0.25	0.77	0.71
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Construct Vertical Shaft Subtotal							**9.42**	**21.12**	**83.24**	**0.37**	**1.37**	**1.14**
Set Up TBM	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		0.79	3.10	11.46	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.44	9.35	56.29	0.25	0.70	0.65
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Set Up TBM Subtotal							**8.23**	**12.46**	**67.77**	**0.33**	**1.05**	**0.84**
Tunneling and Spreading of Soils	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.50	1.80	6.68	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.44	9.35	56.29	0.25	0.70	0.65
	Scraper	ConstMin - Scrapers	1	20	367		0.54	2.08	7.57	0.04	0.07	0.07
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
Tunneling and Spreading of Soils Subtotal							**8.49**	**13.23**	**70.57**	**0.36**	**1.23**	**0.93**
Cofferdam and TBM Out	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		0.84	3.12	11.59	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Cofferdam and TBM Out Subtotal							**8.99**	**20.69**	**70.10**	**0.33**	**1.39**	**1.15**

Table A-115. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Connect to Existing Intake	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.65	4.96	3.49	0.01	0.19	0.17
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Connect to Existing Intake Subtotal							**8.80**	**22.53**	**62.00**	**0.29**	**1.47**	**1.22**
Fabricate Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.65	4.96	3.49	0.01	0.19	0.17
	Cranes	ConstMin - Cranes	4	20	231		0.84	3.12	11.59	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fabricate Inlet Subtotal							**9.64**	**25.65**	**73.59**	**0.34**	**1.58**	**1.33**
Set Inlet and Flood Tunnel	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	4	20	231		0.84	3.12	11.59	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Set Inlet and Flood Tunnel Subtotal							**8.99**	**20.69**	**70.10**	**0.33**	**1.39**	**1.15**
Construct Aeration Facility	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18		0.65	4.96	3.49	0.01	0.19	0.17
	Cranes	ConstMin - Cranes	4	20	231		0.79	3.10	11.46	0.06	0.11	0.10
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.19	0.71	7.75	0.01	0.03	0.02
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.50	1.80	6.68	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.58	1.74	6.61	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.44	9.35	56.29	0.25	0.70	0.65
	Scraper	ConstMin - Scrapers	1	20	367		0.54	2.08	7.57	0.04	0.07	0.07
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
Construct Aeration Facility Subtotal							**10.70**	**23.75**	**99.89**	**0.47**	**1.62**	**1.29**

Table A-115. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Fab and Set Air Tubing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		7.44	9.35	56.29	0.25	0.70	0.65
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fab and Set Air Tubing Subtotal							**7.44**	**9.36**	**56.31**	**0.27**	**0.94**	**0.74**
Final Work and Testing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Final Work and Testing Subtotal							**8.15**	**17.57**	**58.51**	**0.28**	**1.28**	**1.05**
Demobilization	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2023	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Drill Rig	ConstMin - Bore/Drill Rigs	-	20	221		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.53	1.82	6.80	0.03	0.07	0.06
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	559		8.15	17.56	58.49	0.25	1.04	0.96
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.01	0.16	0.06
Demobilization Subtotal							**8.68**	**19.39**	**65.32**	**0.32**	**1.50**	**1.17**

Peak Day Analysis (Overlapping Phases)						
Mobilization + Site Improvements	9.98	19.71	93.12	0.44	1.47	1.15
Tunneling and Spreading of Soils + Construct Aeration Facility	10.70	23.75	99.89	0.47	1.62	1.29
Tunneling and Spreading of Soils + Construct Aeration Facility + Fab and Set Air Tubing	10.70	23.75	99.89	0.47	1.62	1.29
Cofferdam and TBM Out + Connect to Existing Intake + Fabricate Inlet	9.64	25.65	73.59	0.34	1.58	1.33
Maximum Daily Emissions (lbs/day)	**10.70**	**25.65**	**99.89**	**0.47**	**1.62**	**1.33**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Peak daily emissions based on construction start year because that would represent worst-case (highest) emissions. Emissions typically decrease in future years with improvements in engine technology and as older vehicles are rotated out of service.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound

Lower San Felipe Intake Alternative - Pipeline Option

Table A-116. Annual Mitigated Emissions from Construction Equipment

Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Annual Emissions - 2020 (tons per year)					
					VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	0.13	0.42	1.58	0.01	0.02	0.01
Concrete Pumpers	OFF - Light Commercial - Pumps	2	20	18	0.12	0.89	0.63	0.00	0.03	0.03
Cranes	ConstMin - Cranes	4	20	231	0.13	0.55	2.04	0.01	0.02	0.02
Drill Rig	ConstMin - Bore/Drill Rigs	1	20	221	0.06	0.23	0.85	0.00	0.01	0.01
Excavator	ConstMin - Excavators	1	20	158	0.03	0.13	1.38	0.00	0.00	0.00
Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a	0.00	0.00	0.00	0.00	0.04	0.02
Grader	ConstMin - Graders	2	20	188	0.09	0.32	1.19	0.01	0.01	0.01
Loaders	ConstMin - Rubber Tired Loaders	2	20	202	0.09	0.31	1.16	0.01	0.01	0.01
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	7	20	369	0.90	1.32	6.66	0.03	0.09	0.08
Scraper	ConstMin - Scrapers	1	20	367	0.09	0.37	1.35	0.01	0.01	0.01
Water Truck	N/A - Onroad engine	2	20	n/a	0.00	0.00	0.00	0.00	0.03	0.01
				Grand Total (tons per year)	**1.64**	**4.55**	**16.85**	**0.08**	**0.28**	**0.22**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given time, regardless of the phase.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound
2,000 pounds per ton
7 days per week
30 days per month

Lower San Felipe Intake Alternative - Pipeline Option

Table A-116. Annual Mitigated Emissions from Construction Equipment

Equipment	OFFROAD Description	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	0.15	0.43	1.62	0.01	0.02	0.01	0.13	0.42	1.59	0.01	0.02	0.01
Concrete Pumpers	OFF - Light Commercial - Pumps	0.12	0.89	0.63	0.00	0.03	0.03	0.12	0.89	0.63	0.00	0.03	0.03
Cranes	ConstMin - Cranes	0.14	0.56	2.06	0.01	0.02	0.02	0.14	0.56	2.07	0.01	0.02	0.02
Drill Rig	ConstMin - Bore/Drill Rigs	0.06	0.23	0.85	0.00	0.01	0.01	0.06	0.23	0.85	0.00	0.01	0.01
Excavator	ConstMin - Excavators	0.04	0.13	1.39	0.00	0.00	0.00	0.04	0.13	1.40	0.00	0.00	0.00
Flatbed Trucks (on site)	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.04	0.02
Grader	ConstMin - Graders	0.09	0.32	1.20	0.01	0.01	0.01	0.09	0.33	1.21	0.01	0.01	0.01
Loaders	ConstMin - Rubber Tired Loaders	0.10	0.31	1.19	0.01	0.01	0.01	0.10	0.31	1.19	0.01	0.01	0.01
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	0.88	1.11	6.69	0.03	0.08	0.08	0.95	2.22	6.86	0.03	0.13	0.12
Scraper	ConstMin - Scrapers	0.10	0.37	1.36	0.01	0.01	0.01	0.10	0.37	1.37	0.01	0.01	0.01
Water Truck	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.03	0.01
		1.67	**4.36**	**17.01**	**0.08**	**0.27**	**0.21**	**1.73**	**5.47**	**17.17**	**0.08**	**0.32**	**0.25**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a giv

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound
2,000 pounds per ton
7 days per week
30 days per month

Lower San Felipe Intake Alternative - Pipeline Option

Table A-116. Annual Mitigated Emissions from Construction Equipment

Equipment	OFFROAD Description	Annual Emissions - 2023 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	0.15	0.43	1.71	0.01	0.02	0.01
Concrete Pumpers	OFF - Light Commercial - Pumps	0.12	0.89	0.63	0.00	0.03	0.03
Cranes	ConstMin - Cranes	0.15	0.56	2.09	0.01	0.02	0.02
Drill Rig	ConstMin - Bore/Drill Rigs	0.06	0.23	0.85	0.00	0.01	0.01
Excavator	ConstMin - Excavators	0.04	0.13	1.41	0.00	0.00	0.00
Flatbed Trucks (on site)	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.04	0.02
Grader	ConstMin - Graders	0.10	0.33	1.22	0.01	0.01	0.01
Loaders	ConstMin - Rubber Tired Loaders	0.11	0.32	1.20	0.01	0.01	0.01
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	0.97	2.09	6.95	0.03	0.12	0.11
Scraper	ConstMin - Scrapers	0.10	0.38	1.38	0.01	0.01	0.01
Water Truck	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.03	0.01
		1.79	**5.35**	**17.44**	**0.08**	**0.31**	**0.25**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a giv

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6 grams per pound
2,000 pounds per ton
7 days per week
30 days per month

Lower San Felipe Intake Alternative - Pipeline Option

Table A-117. Equipment List

Equipment	Quantity	Mobilization	Site Improvements	Fabricate Inlet	Build Cofferdam and Set Lower Inlet	Lay Pipe	Connect to Existing Intake	Construct Aeration Facility	Fab and Set Air Tubing	Final Work and Testing	Demobilization
Bulldozer	2	X	X								
Concrete Pumpers	1		X					X			
Cranes	3			X	X	X	X	X			
Excavator	1		X					X			
Flatbed Trucks (on site)	3	X	X	X	X	X	X	X	X	X	X
Grader	2	X	X					X			X
Loaders	2	X	X					X			
Portable Diesel Generators	4	X	X	X	X	X	X	X	X	X	X
Scraper	1		X					X			
Water Truck	2	X	X					X			X

Source: Equipment Tables_08012012.docx; EngineeringDataNeeds_July30_2012.xlsx

Table A-118. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Mobilization	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	0.74	2.33	8.78	0.04	0.08	0.08
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.47	1.79	6.63	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.52	1.72	6.47	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.85	4.18	21.13	0.09	0.29	0.27
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
						Mobilization Subtotal	**4.58**	**10.03**	**43.04**	**0.24**	**0.90**	**0.62**
Site Improvements	Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	2020	0.74	2.33	8.78	0.04	0.08	0.08
	Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18		0.33	2.48	1.75	0.00	0.10	0.09
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	1	20	158		0.18	0.71	7.67	0.01	0.03	0.02
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.47	1.79	6.63	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.52	1.72	6.47	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.85	4.18	21.13	0.09	0.29	0.27
	Scraper	ConstMin - Scrapers	1	20	367		0.52	2.07	7.52	0.04	0.07	0.07
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
						Site Improvements Subtotal	**5.61**	**15.29**	**59.98**	**0.29**	**1.09**	**0.80**
Fabricate Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		0.54	2.31	8.49	0.04	0.08	0.07
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.85	4.18	21.13	0.09	0.29	0.27
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
						Fabricate Inlet Subtotal	**3.39**	**6.50**	**29.63**	**0.16**	**0.61**	**0.44**

Table A-118. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Build Cofferdam and Set Lower Inlet	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2020	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		0.54	2.31	8.49	0.04	0.08	0.07
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.85	4.18	21.13	0.09	0.29	0.27
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Build Cofferdam and Set Lower Inlet Subtotal							**3.39**	**6.50**	**29.63**	**0.16**	**0.61**	**0.44**
Lay Pipe	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		0.59	2.33	8.60	0.04	0.08	0.07
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.81	3.53	21.23	0.09	0.26	0.24
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Lay Pipe Subtotal							**3.40**	**5.86**	**29.85**	**0.16**	**0.58**	**0.41**
Connect to Existing Intake	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	3	20	231		0.60	2.33	8.62	0.04	0.08	0.08
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		3.01	7.05	21.78	0.09	0.41	0.37
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Connect to Existing Intake Subtotal							**3.62**	**9.38**	**30.42**	**0.16**	**0.73**	**0.54**
Construct Aeration Facility	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18		0.33	2.48	1.75	0.00	0.10	0.09
	Cranes	ConstMin - Cranes	3	20	231		0.59	2.33	8.60	0.04	0.08	0.07
	Excavator	ConstMin - Excavators	1	20	158		0.19	0.71	7.75	0.01	0.03	0.02
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.50	1.80	6.68	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	2	20	202		0.58	1.74	6.61	0.03	0.06	0.06
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.81	3.53	21.23	0.09	0.26	0.24
	Scraper	ConstMin - Scrapers	1	20	367		0.54	2.08	7.57	0.04	0.07	0.07
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.02	0.16	0.06
Construct Aeration Facility Subtotal							**5.54**	**14.67**	**60.22**	**0.29**	**1.06**	**0.77**
Fab and Set Air Tubing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2021	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		2.81	3.53	21.23	0.09	0.26	0.24
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Fab and Set Air Tubing Subtotal							**2.81**	**3.53**	**21.25**	**0.12**	**0.50**	**0.34**

Table A-118. Peak Daily Mitigated Emissions from Construction Equipment

Phase	Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Start Year	Peak Daily Emissions (lbs/day)					
							VOC	NOx	CO	SO2	PM10	PM2.5
Final Work and Testing	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	-	20	188		-	-	-	-	-	-
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		3.01	7.05	21.78	0.09	0.41	0.37
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	-	20	n/a		-	-	-	-	-	-
Final Work and Testing Subtotal							**3.01**	**7.05**	**21.80**	**0.12**	**0.64**	**0.47**
Demobilization	Bulldozer	ConstMin - Rubber Tired Dozers	-	20	249	2022	-	-	-	-	-	-
	Concrete Pumpers	OFF - Light Commercial - Pumps	-	20	18		-	-	-	-	-	-
	Cranes	ConstMin - Cranes	-	20	231		-	-	-	-	-	-
	Excavator	ConstMin - Excavators	-	20	158		-	-	-	-	-	-
	Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a		0.00	0.00	0.02	0.02	0.24	0.09
	Grader	ConstMin - Graders	2	20	188		0.51	1.81	6.73	0.03	0.06	0.06
	Loaders	ConstMin - Rubber Tired Loaders	-	20	202		-	-	-	-	-	-
	Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369		3.01	7.05	21.78	0.09	0.41	0.37
	Scraper	ConstMin - Scrapers	-	20	367		-	-	-	-	-	-
	Water Truck	N/A - Onroad engine	2	20	n/a		0.00	0.00	0.01	0.01	0.16	0.06
Demobilization Subtotal							**3.53**	**8.86**	**28.54**	**0.16**	**0.87**	**0.59**

Peak Day Analysis (Overlapping Phases)						
Mobilization + Site Improvements	5.61	15.29	59.98	0.29	1.09	0.80
Site Improvements + Fabricate Inlet	6.15	17.60	68.47	0.34	1.17	0.87
Fabricate Inlet + Build Cofferdam and Set Lower Inlet	3.39	6.50	29.63	0.16	0.61	0.44
Lay Pipe + Construct Aeration Facility	8.94	20.53	90.06	0.45	1.65	1.18
Lay Pipe + Construct Aeration Facility + Fab and Set Air Tubing	8.94	20.53	90.06	0.45	1.65	1.18
Maximum Daily Emissions (lbs/day)	**8.94**	**20.53**	**90.06**	**0.45**	**1.65**	**1.18**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Peak daily emissions based on construction start year because that would represent worst-case (highest) emissions. Emissions typically decrease in future years with improvements in engine technology and as older vehicles are rotated out of service.

Onroad Vehicle Speed
40 mph

Air Basin
San Joaquin Valley

Conversions
453.6 grams per pound

Lower San Felipe Intake Alternative - Tunnel Option

Table A-119. Annual Mitigated Emissions from Construction Equipment

Equipment	OFFROAD Description	Quantity	Hours/ Day	Size (HP)	Annual Emissions - 2020 (tons per year)					
					VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	2	20	249	0.13	0.42	1.58	0.01	0.02	0.01
Concrete Pumpers	OFF - Light Commercial - Pumps	1	20	18	0.06	0.45	0.31	0.00	0.02	0.02
Cranes	ConstMin - Cranes	3	20	231	0.10	0.42	1.53	0.01	0.01	0.01
Excavator	ConstMin - Excavators	1	20	158	0.03	0.13	1.38	0.00	0.00	0.00
Flatbed Trucks (on site)	N/A - Onroad engine	3	20	n/a	0.00	0.00	0.00	0.00	0.04	0.02
Grader	ConstMin - Graders	2	20	188	0.09	0.32	1.19	0.01	0.01	0.01
Loaders	ConstMin - Rubber Tired Loaders	2	20	202	0.09	0.31	1.16	0.01	0.01	0.01
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	4	20	369	0.51	0.75	3.80	0.02	0.05	0.05
Scraper	ConstMin - Scrapers	1	20	367	0.09	0.37	1.35	0.01	0.01	0.01
Water Truck	N/A - Onroad engine	2	20	n/a	0.00	0.00	0.00	0.00	0.03	0.01
Grand Total (tons per year)					**1.11**	**3.17**	**12.32**	**0.06**	**0.21**	**0.16**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per hour (g/hr). Emission factors from EMFAC2014 for diesel-fueled medium-duty vehicles in San Joaquin Valley Air Basin.
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given time, regardless of the phase.

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6	grams per pound
2,000	pounds per ton
7	days per week
30	days per month

Lower San Felipe Intake Alternative - Tunnel Option

Table A-119. Annual Mitigated Emissions from Construction Equipment

Equipment	OFFROAD Description	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
Bulldozer	ConstMin - Rubber Tired Dozers	0.15	0.43	1.62	0.01	0.02	0.01	0.13	0.42	1.59	0.01	0.02	0.01
Concrete Pumpers	OFF - Light Commercial - Pumps	0.06	0.45	0.31	0.00	0.02	0.02	0.06	0.45	0.31	0.00	0.02	0.02
Cranes	ConstMin - Cranes	0.11	0.42	1.55	0.01	0.01	0.01	0.11	0.42	1.55	0.01	0.01	0.01
Excavator	ConstMin - Excavators	0.04	0.13	1.39	0.00	0.00	0.00	0.04	0.13	1.40	0.00	0.00	0.00
Flatbed Trucks (on site)	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.04	0.02
Grader	ConstMin - Graders	0.09	0.32	1.20	0.01	0.01	0.01	0.09	0.33	1.21	0.01	0.01	0.01
Loaders	ConstMin - Rubber Tired Loaders	0.10	0.31	1.19	0.01	0.01	0.01	0.10	0.31	1.19	0.01	0.01	0.01
Portable Diesel Generators	Portable Equipment - Non-Rental Generator	0.51	0.64	3.82	0.02	0.05	0.04	0.54	1.27	3.92	0.02	0.07	0.07
Scraper	ConstMin - Scrapers	0.10	0.37	1.36	0.01	0.01	0.01	0.10	0.37	1.37	0.01	0.01	0.01
Water Truck	N/A - Onroad engine	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.03	0.01
		1.14	**3.07**	**12.46**	**0.06**	**0.21**	**0.15**	**1.17**	**3.70**	**12.55**	**0.06**	**0.23**	**0.18**

Notes:
Emission factors for onroad engines (spreader, flatbed trucks, and water trucks) shown in units of grams per h
Calculations assume that equipment quantity is the total pieces of equipment that could operate at a given tim

Onroad Vehicle Speed

40 mph

Air Basin
San Joaquin Valley

Conversions

453.6	grams per pound
2,000	pounds per ton
7	days per week
30	days per month

San Luis Low Point Improvement Project
OFFROAD2017 Emission Factor Summary

Table A-120. Mitigated In-Use Off-Road Construction Equipment Emission Factors (San Joaquin Valley Air Basin)

Equipment Type	Average HP	Emission Factors - 2020 (g/bhp-hr)						Emission Factors - 2021 (g/bhp-hr)						Emission Factors - 2022 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0320	0.1317	0.4850	0.0024	0.0046	0.0042	0.0323	0.1316	0.4848	0.0024	0.0046	0.0042	0.0325	0.1311	0.4835	0.0024	0.0046	0.0042
ConstMin - Cranes	231	0.0178	0.0756	0.2778	0.0014	0.0026	0.0024	0.0193	0.0762	0.2813	0.0014	0.0027	0.0025	0.0197	0.0763	0.2822	0.0014	0.0027	0.0025
ConstMin - Crawler Tractors	212	0.0276	0.1128	0.4156	0.0021	0.0039	0.0036	0.0286	0.1132	0.4183	0.0021	0.0040	0.0036	0.0292	0.1135	0.4197	0.0021	0.0040	0.0037
ConstMin - Excavators	158	0.0265	0.1013	1.1017	0.0019	0.0037	0.0034	0.0280	0.1018	1.1118	0.0019	0.0037	0.0034	0.0288	0.1021	1.1171	0.0019	0.0038	0.0035
ConstMin - Graders	188	0.0286	0.1081	0.3999	0.0020	0.0038	0.0035	0.0302	0.1085	0.4032	0.0020	0.0039	0.0036	0.0310	0.1091	0.4059	0.0020	0.0039	0.0036
ConstMin - Off-Highway Tractors	124	0.0296	0.1150	1.2488	0.0021	0.0042	0.0038	0.0308	0.1156	1.2587	0.0021	0.0042	0.0039	0.0314	0.1158	1.2632	0.0021	0.0042	0.0039
ConstMin - Off-Highway Trucks	403	0.0398	0.1061	0.3935	0.0019	0.0040	0.0037	0.0427	0.1072	0.3990	0.0019	0.0041	0.0038	0.0438	0.1075	0.4009	0.0019	0.0041	0.0038
ConstMin - Other Construction Equipment	172	0.0269	0.1091	1.1805	0.0020	0.0039	0.0036	0.0278	0.1095	1.1872	0.0020	0.0039	0.0036	0.0285	0.1096	1.1909	0.0020	0.0040	0.0036
ConstMin - Pavers	129	0.0248	0.1089	1.1709	0.0020	0.0038	0.0035	0.0260	0.1092	1.1782	0.0020	0.0039	0.0036	0.0262	0.1093	1.1796	0.0020	0.0039	0.0036
ConstMin - Paving Equipment	131	0.0217	0.0929	1.0011	0.0017	0.0033	0.0030	0.0231	0.0935	1.0111	0.0017	0.0033	0.0031	0.0242	0.0939	1.0195	0.0017	0.0034	0.0031
ConstMin - Rollers	80	0.0302	0.5072	1.1847	0.0018	0.0036	0.0033	0.0313	0.5088	1.1914	0.0018	0.0037	0.0034	0.0319	0.5090	1.1935	0.0018	0.0037	0.0034
ConstMin - Rough Terrain Forklifts	100	0.0299	0.5402	1.2555	0.0020	0.0037	0.0034	0.0309	0.5412	1.2607	0.0020	0.0038	0.0035	0.0318	0.5422	1.2653	0.0020	0.0039	0.0035
ConstMin - Rubber Tired Dozers	249	0.0337	0.1061	0.4001	0.0019	0.0039	0.0036	0.0374	0.1079	0.4106	0.0019	0.0040	0.0037	0.0330	0.1070	0.4022	0.0019	0.0039	0.0036
ConstMin - Rubber Tired Loaders	202	0.0291	0.0967	0.3632	0.0018	0.0035	0.0032	0.0323	0.0979	0.3713	0.0018	0.0036	0.0033	0.0320	0.0978	0.3704	0.0018	0.0036	0.0033
ConstMin - Scrapers	367	0.0320	0.1277	0.4649	0.0024	0.0045	0.0041	0.0337	0.1283	0.4678	0.0024	0.0045	0.0042	0.0342	0.1285	0.4689	0.0024	0.0045	0.0042
ConstMin - Skid Steer Loaders	65	0.0297	0.4979	1.1632	0.0018	0.0036	0.0033	0.0307	0.4991	1.1688	0.0018	0.0036	0.0033	0.0312	0.4996	1.1711	0.0018	0.0037	0.0034
ConstMin - Surfacing Equipment	263	0.0161	0.0781	0.2842	0.0015	0.0027	0.0024	0.0164	0.0782	0.2847	0.0015	0.0027	0.0025	0.0167	0.0784	0.2859	0.0015	0.0027	0.0025
ConstMin - Sweepers/Scrubbers	64	0.0323	0.6100	1.4138	0.0022	0.0041	0.0038	0.0323	0.6100	1.4138	0.0022	0.0041	0.0038	0.0368	0.6153	1.4380	0.0022	0.0044	0.0041
ConstMin - Tractors/Loaders/Backhoes	98	0.0359	0.5058	1.1978	0.0018	0.0039	0.0036	0.0376	0.5078	1.2066	0.0018	0.0040	0.0037	0.0389	0.5099	1.2150	0.0018	0.0041	0.0038
ConstMin - Trenchers	79	0.0423	0.6914	1.6182	0.0025	0.0050	0.0046	0.0429	0.6914	1.6199	0.0025	0.0050	0.0046	0.0446	0.6906	1.6231	0.0025	0.0051	0.0047
Industrial - Aerial Lifts	63	0.0231	0.4141	0.9630	0.0015	0.0029	0.0026	0.0235	0.4144	0.9648	0.0015	0.0029	0.0027	0.0244	0.4156	0.9700	0.0015	0.0030	0.0027
Industrial - Forklifts	89	0.0196	0.2752	0.6517	0.0010	0.0021	0.0020	0.0207	0.2765	0.6577	0.0010	0.0022	0.0020	0.0218	0.2778	0.6635	0.0010	0.0023	0.0021
Industrial - Other General Industrial Equipment	88	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	0.0000	0.0000
Industrial - Other Material Handling Equipment	167	0.0281	0.1049	1.1429	0.0019	0.0038	0.0035	0.0301	0.1056	1.1573	0.0019	0.0039	0.0036	0.0306	0.1058	1.1608	0.0019	0.0039	0.0036
OFF - ConstMin - Bore/Drill Rigs	15	0.4236	3.2336	1.9286	0.0057	0.1219	0.1121	0.4230	3.2294	1.9191	0.0057	0.1217	0.1119	0.4237	3.2344	1.9176	0.0057	0.1218	0.1121
OFF - ConstMin - Cement and Mortar Mixers	10	0.3080	2.3366	1.8693	0.0048	0.0908	0.0835	0.3078	2.3352	1.8669	0.0048	0.0907	0.0835	0.3078	2.3356	1.8615	0.0048	0.0907	0.0835
OFF - ConstMin - Concrete/Industrial Saws	31	0.1294	2.0790	2.3732	0.0053	0.0077	0.0070	0.1376	2.0951	2.4331	0.0053	0.0079	0.0072	0.1446	2.0959	2.4745	0.0053	0.0080	0.0074
OFF - ConstMin - Dumpers/Tenders	16	0.2159	1.6506	0.8915	0.0027	0.0617	0.0567	0.2140	1.6364	0.8839	0.0027	0.0611	0.0563	0.2140	1.6366	0.8840	0.0027	0.0612	0.0563
OFF - ConstMin - Excavators	23	0.3225	2.4662	1.3320	0.0041	0.0921	0.0848	0.3233	2.4719	1.3351	0.0041	0.0924	0.0850	0.3229	2.4688	1.3335	0.0041	0.0922	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3410	2.5881	2.0372	0.0053	0.1004	0.0923	0.3410	2.5881	2.0319	0.0053	0.1003	0.0923	0.3412	2.5899	2.0297	0.0053	0.1004	0.0924
OFF - ConstMin - Pavers	24	0.3549	2.7139	1.4659	0.0045	0.1014	0.0933	0.3530	2.6994	1.4580	0.0045	0.1009	0.0928	0.3537	2.7048	1.4609	0.0045	0.1011	0.0930
OFF - ConstMin - Paving Equipment	19	0.3026	2.3136	1.2496	0.0039	0.0864	0.0795	0.3019	2.3087	1.2470	0.0038	0.0863	0.0794	0.3001	2.2946	1.2394	0.0038	0.0857	0.0789
OFF - ConstMin - Plate Compactors	8	0.2350	1.7809	1.4917	0.0038	0.0696	0.0640	0.2350	1.7808	1.4916	0.0038	0.0696	0.0640	0.2352	1.7819	1.4925	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3110	2.3659	1.6656	0.0046	0.0906	0.0834	0.3112	2.3677	1.6584	0.0045	0.0907	0.0834	0.3113	2.3688	1.6536	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3035	2.3208	1.2535	0.0039	0.0867	0.0798	0.3061	2.3406	1.2642	0.0039	0.0875	0.0805	0.3074	2.3506	1.2696	0.0039	0.0878	0.0808
OFF - ConstMin - Signal Boards	6	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3970	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3116	2.3828	1.2870	0.0040	0.0890	0.0819	0.3116	2.3829	1.2871	0.0040	0.0890	0.0819	0.3116	2.3829	1.2870	0.0040	0.0890	0.0819
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3118	2.3839	1.2876	0.0040	0.0891	0.0819	0.3117	2.3833	1.2873	0.0040	0.0891	0.0819	0.3116	2.3826	1.2869	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4222	3.2222	1.9325	0.0057	0.1215	0.1118	0.4216	3.2183	1.9247	0.0057	0.1213	0.1116	0.4220	3.2214	1.9234	0.0057	0.1214	0.1117
OFF - Industrial - Aerial Lifts	17	0.2561	1.9495	1.3359	0.0037	0.0745	0.0685	0.2565	1.9528	1.3202	0.0037	0.0745	0.0685	0.2566	1.9547	1.3081	0.0037	0.0745	0.0685
OFF - Industrial - Other General Industrial Equipment	18	0.2791	2.1854	1.3321	0.0039	0.0825	0.0759	0.2791	2.1849	1.3296	0.0039	0.0825	0.0759	0.2792	2.1852	1.3292	0.0039	0.0825	0.0759
OFF - Industrial - Sweepers/Scrubbers	18	0.3637	2.8940	1.8953	0.0053	0.1100	0.1012	0.3652	2.9028	1.8931	0.0053	0.1103	0.1015	0.3634	2.8867	1.8781	0.0053	0.1097	0.1009
OFF - Light Commercial - Air Compressors	35	0.1019	1.3965	1.6815	0.0035	0.0055	0.0050	0.1066	1.4038	1.7144	0.0035	0.0056	0.0052	0.1150	1.4160	1.7730	0.0035	0.0058	0.0054
OFF - Light Commercial - Generator Sets	21	0.3933	3.1442	2.1012	0.0059	0.1198	0.1102	0.3933	3.1440	2.1011	0.0059	0.1198	0.1102	0.3933	3.1441	2.1011	0.0059	0.1198	0.1102
OFF - Light Commercial - Pressure Washers	21	0.1510	1.2476	0.9475	0.0025	0.0482	0.0443	0.1512	1.2492	0.9487	0.0025	0.0483	0.0444	0.1519	1.2551	0.9532	0.0025	0.0485	0.0446
OFF - Light Commercial - Pumps	18	0.4109	3.1266	2.1998	0.0060	0.1198	0.1102	0.4110	3.1272	2.2002	0.0060	0.1198	0.1102	0.4110	3.1270	2.2001	0.0060	0.1198	0.1102
OFF - Light Commercial - Welders	33	0.0849	1.2947	1.5029	0.0033	0.0049	0.0045	0.0883	1.2993	1.5262	0.0033	0.0050	0.0046	0.0945	1.3084	1.5696	0.0033	0.0051	0.0047
Portable Equipment - Non-Rental Compressor	210	0.0486	0.2849	0.3547	0.0014	0.0107	0.0099	0.0332	0.1743	0.3207	0.0014	0.0075	0.0069	0.0284	0.1208	0.3119	0.0015	0.0054	0.0050
Portable Equipment - Non-Rental Generator	559	0.0437	0.0643	0.3246	0.0014	0.0045	0.0041	0.0431	0.0542	0.3263	0.0014	0.0041	0.0037	0.0463	0.1083	0.3346	0.0015	0.0063	0.0058
Portable Equipment - Non-Rental Other Portable Equipment	382	0.0258	0.0870	0.2926	0.0014	0.0053	0.0048	0.0256	0.0958	0.2949	0.0014	0.0056	0.0051	0.0266	0.0642	0.2995	0.0015	0.0037	0.0034
Portable Equipment - Non-Rental Pump	593	0.0230	0.1263	0.2876	0.0014	0.0066	0.0061	0.0231	0.1374	0.2905	0.0014	0.0068	0.0062	0.0243	0.1046	0.2954	0.0015	0.0055	0.0051
Portable Equipment - Rental Compressor	233	0.0259	0.0436	0.3008	0.0014	0.0027	0.0025	0.0262	0.0441	0.3041	0.0014	0.0027	0.0025	0.0263	0.0428	0.3068	0.0015	0.0028	0.0025
Portable Equipment - Rental Generator	232	0.0473	0.0417	0.3517	0.0014	0.0033	0.0031	0.0477	0.0410	0.3553	0.0014	0.0034	0.0031	0.0482	0.0400	0.3590	0.0015	0.0034	0.0031
Portable Equipment - Rental Other Portable Equipment	169	0.0381	0.2249	0.9681	0.0014	0.0039	0.0036	0.0386	0.2001	0.9793	0.0014	0.0038	0.0035	0.0409	0.1491	1.0028	0.0015	0.0040	0.0037
Portable Equipment - Rental Pump	212	0.0411	0.0555	0.3370	0.0014	0.0036	0.0033	0.0399	0.0529	0.3367	0.0014	0.0035	0.0032	0.0386	0.0499	0.3362	0.0015	0.0034	0.0031

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Database. Available online at https://www.arb.ca.gov/orion/ [Accessesd October 17, 2018].
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "Horsepower_Hours_hhpy" divided by "Total_Activity_hpy.")

San Luis Low Point Improvement Project
OFFROAD2017 Emission Factor Summary

Table A-120. Mitigated In-Use Off-Road Construction Equipment Emiss

Equipment Type	Average HP	Emission Factors - 2023 (g/bhp-hr)						Emission Factors - 2024 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0336	0.1315	0.4862	0.0024	0.0046	0.0042	0.0340	0.1320	0.4884	0.0024	0.0046	0.0043
ConstMin - Cranes	231	0.0206	0.0766	0.2844	0.0014	0.0027	0.0025	0.0213	0.0768	0.2861	0.0014	0.0027	0.0025
ConstMin - Crawler Tractors	212	0.0299	0.1136	0.4210	0.0021	0.0040	0.0037	0.0315	0.1143	0.4253	0.0021	0.0041	0.0037
ConstMin - Excavators	158	0.0301	0.1025	1.1259	0.0019	0.0038	0.0035	0.0311	0.1028	1.1326	0.0019	0.0039	0.0035
ConstMin - Graders	188	0.0321	0.1099	0.4099	0.0020	0.0039	0.0036	0.0337	0.1103	0.4133	0.0020	0.0040	0.0037
ConstMin - Off-Highway Tractors	124	0.0314	0.1157	1.2616	0.0021	0.0042	0.0039	0.0328	0.1162	1.2713	0.0021	0.0043	0.0039
ConstMin - Off-Highway Trucks	403	0.0450	0.1080	0.4032	0.0019	0.0042	0.0038	0.0467	0.1084	0.4056	0.0019	0.0042	0.0039
ConstMin - Other Construction Equipment	172	0.0294	0.1100	1.1977	0.0020	0.0040	0.0037	0.0309	0.1105	1.2085	0.0020	0.0041	0.0037
ConstMin - Pavers	129	0.0271	0.1096	1.1861	0.0020	0.0039	0.0036	0.0283	0.1100	1.1944	0.0020	0.0040	0.0037
ConstMin - Paving Equipment	131	0.0256	0.0943	1.0283	0.0017	0.0034	0.0032	0.0269	0.0948	1.0381	0.0017	0.0035	0.0032
ConstMin - Rollers	80	0.0327	0.5102	1.1983	0.0018	0.0038	0.0035	0.0337	0.5112	1.2033	0.0018	0.0038	0.0035
ConstMin - Rough Terrain Forklifts	100	0.0325	0.5433	1.2697	0.0020	0.0039	0.0036	0.0333	0.5444	1.2742	0.0020	0.0039	0.0036
ConstMin - Rubber Tired Dozers	249	0.0369	0.1081	0.4316	0.0019	0.0040	0.0037	0.0407	0.1094	0.4198	0.0019	0.0041	0.0038
ConstMin - Rubber Tired Loaders	202	0.0336	0.0984	0.3744	0.0018	0.0036	0.0033	0.0351	0.0989	0.3779	0.0018	0.0037	0.0034
ConstMin - Scrapers	367	0.0359	0.1292	0.4722	0.0024	0.0046	0.0042	0.0374	0.1296	0.4747	0.0024	0.0046	0.0043
ConstMin - Skid Steer Loaders	65	0.0318	0.5002	1.1740	0.0018	0.0037	0.0034	0.0322	0.5009	1.1768	0.0018	0.0037	0.0034
ConstMin - Surfacing Equipment	263	0.0173	0.0787	0.2874	0.0015	0.0027	0.0025	0.0178	0.0789	0.2889	0.0015	0.0027	0.0025
ConstMin - Sweepers/Scrubbers	64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ConstMin - Tractors/Loaders/Backhoes	98	0.0406	0.5120	1.2243	0.0018	0.0042	0.0039	0.0428	0.5148	1.2366	0.0018	0.0043	0.0040
ConstMin - Trenchers	79	0.0465	0.6928	1.6331	0.0025	0.0052	0.0048	0.0479	0.6932	1.6380	0.0025	0.0053	0.0049
Industrial - Aerial Lifts	63	0.0215	0.4121	0.9542	0.0015	0.0028	0.0026	0.0229	0.4137	0.9616	0.0015	0.0029	0.0026
Industrial - Forklifts	89	0.0228	0.2790	0.6692	0.0010	0.0023	0.0021	0.0239	0.2803	0.6751	0.0010	0.0024	0.0022
Industrial - Other General Industrial Equipment	88	0.0248	0.4583	1.0637	0.0017	0.0031	0.0029	0.0277	0.4618	1.0794	0.0017	0.0033	0.0031
Industrial - Other Material Handling Equipment	167	0.0314	0.1061	1.1661	0.0019	0.0040	0.0036	0.0366	0.1623	1.2057	0.0019	0.0042	0.0039
OFF - ConstMin - Bore/Drill Rigs	15	0.4204	3.2098	1.9000	0.0056	0.1209	0.1112	0.4216	3.2184	1.9032	0.0056	0.1212	0.1115
OFF - ConstMin - Cement and Mortar Mixers	10	0.3081	2.3377	1.8569	0.0048	0.0908	0.0835	0.3084	2.3400	1.8524	0.0048	0.0908	0.0836
OFF - ConstMin - Concrete/Industrial Saws	31	0.1527	2.1137	2.5355	0.0053	0.0083	0.0076	0.1602	2.1235	2.5868	0.0053	0.0085	0.0078
OFF - ConstMin - Dumpers/Tenders	16	0.2139	1.6354	0.8833	0.0027	0.0611	0.0562	0.2143	1.6389	0.8852	0.0027	0.0612	0.0563
OFF - ConstMin - Excavators	23	0.3241	2.4778	1.3383	0.0041	0.0926	0.0852	0.3233	2.4722	1.3353	0.0041	0.0924	0.0850
OFF - ConstMin - Other Construction Equipment	14	0.3412	2.5896	2.0270	0.0053	0.1004	0.0923	0.3411	2.5892	2.0250	0.0053	0.1003	0.0923
OFF - ConstMin - Pavers	24	0.3552	2.7157	1.4668	0.0045	0.1015	0.0934	0.3535	2.7030	1.4599	0.0045	0.1010	0.0929
OFF - ConstMin - Paving Equipment	19	0.3003	2.2958	1.2400	0.0038	0.0858	0.0789	0.3004	2.2966	1.2404	0.0038	0.0858	0.0789
OFF - ConstMin - Plate Compactors	8	0.2351	1.7812	1.4920	0.0038	0.0696	0.0640	0.2352	1.7819	1.4926	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3114	2.3697	1.6504	0.0045	0.0907	0.0834	0.3114	2.3698	1.6481	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3045	2.3285	1.2577	0.0039	0.0870	0.0800	0.3062	2.3409	1.2644	0.0039	0.0875	0.0805
OFF - ConstMin - Signal Boards	6	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3116	2.3824	1.2868	0.0040	0.0890	0.0819	0.3117	2.3830	1.2871	0.0040	0.0890	0.0819
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3115	2.3817	1.2864	0.0040	0.0890	0.0819	0.3117	2.3831	1.2872	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4223	3.2232	1.9229	0.0057	0.1215	0.1118	0.4228	3.2273	1.9248	0.0057	0.1216	0.1119
OFF - Industrial - Aerial Lifts	17	0.2564	1.9534	1.2947	0.0036	0.0744	0.0684	0.2566	1.9552	1.2850	0.0036	0.0744	0.0684
OFF - Industrial - Other General Industrial Equipment	18	0.2793	2.1864	1.3300	0.0039	0.0826	0.0759	0.2791	2.1848	1.3290	0.0039	0.0825	0.0759
OFF - Industrial - Sweepers/Scrubbers	18	0.3653	2.9010	1.8851	0.0053	0.1102	0.1014	0.3657	2.9041	1.8864	0.0053	0.1103	0.1015
OFF - Light Commercial - Air Compressors	35	0.1234	1.4276	1.8307	0.0035	0.0060	0.0056	0.1317	1.4401	1.8887	0.0035	0.0062	0.0057
OFF - Light Commercial - Generator Sets	21	0.3933	3.1440	2.1011	0.0059	0.1198	0.1102	0.3933	3.1439	2.1010	0.0059	0.1198	0.1102
OFF - Light Commercial - Pressure Washers	21	0.1525	1.2595	0.9566	0.0025	0.0487	0.0448	0.1515	1.2513	0.9503	0.0025	0.0483	0.0445
OFF - Light Commercial - Pumps	18	0.4110	3.1270	2.2001	0.0060	0.1198	0.1102	0.4111	3.1277	2.2005	0.0060	0.1198	0.1102
OFF - Light Commercial - Welders	33	0.1007	1.3172	1.6126	0.0033	0.0053	0.0049	0.1068	1.3260	1.6550	0.0033	0.0054	0.0050
Portable Equipment - Non-Rental Compressor	210	0.0289	0.1129	0.3156	0.0015	0.0052	0.0048	0.0281	0.0945	0.3165	0.0015	0.0046	0.0042
Portable Equipment - Non-Rental Generator	559	0.0472	0.1018	0.3390	0.0015	0.0060	0.0055	0.0475	0.1114	0.3423	0.0015	0.0065	0.0060
Portable Equipment - Non-Rental Other Portable Equipment	382	0.0269	0.0640	0.3028	0.0015	0.0037	0.0034	0.0270	0.0663	0.3057	0.0015	0.0038	0.0035
Portable Equipment - Non-Rental Pump	593	0.0246	0.1052	0.2986	0.0015	0.0056	0.0051	0.0245	0.1003	0.3012	0.0015	0.0055	0.0051
Portable Equipment - Rental Compressor	233	0.0268	0.0366	0.3107	0.0015	0.0028	0.0026	0.0271	0.0370	0.3141	0.0015	0.0028	0.0026
Portable Equipment - Rental Generator	232	0.0483	0.0404	0.3620	0.0015	0.0034	0.0031	0.0489	0.0408	0.3661	0.0015	0.0035	0.0032
Portable Equipment - Rental Other Portable Equipment	169	0.0417	0.1434	1.0164	0.0015	0.0043	0.0039	0.0425	0.1382	1.0298	0.0015	0.0046	0.0043
Portable Equipment - Rental Pump	212	0.0377	0.0477	0.3367	0.0015	0.0034	0.0031	0.0379	0.0491	0.3400	0.0015	0.0034	0.0032

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Databa
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "H

Table A-121. Mitigated In-Use Off-Road Construction Equipment Emission Factors (San Francisco Bay Area Air Basin)

Equipment Type	Average HP	Emission Factors - 2020 (g/bhp-hr)						Emission Factors - 2021 (g/bhp-hr)						Emission Factors - 2022 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0320	0.1317	0.4850	0.0024	0.0046	0.0042	0.0323	0.1316	0.4848	0.0024	0.0046	0.0042	0.0325	0.1311	0.4835	0.0024	0.0046	0.0042
ConstMin - Cranes	231	0.0178	0.0756	0.2778	0.0014	0.0026	0.0024	0.0193	0.0762	0.2813	0.0014	0.0027	0.0025	0.0197	0.0763	0.2822	0.0014	0.0027	0.0025
ConstMin - Crawler Tractors	212	0.0276	0.1128	0.4156	0.0021	0.0039	0.0036	0.0286	0.1132	0.4183	0.0021	0.0040	0.0036	0.0292	0.1135	0.4197	0.0021	0.0040	0.0037
ConstMin - Excavators	158	0.0265	0.1013	1.1017	0.0019	0.0037	0.0034	0.0280	0.1018	1.1118	0.0019	0.0037	0.0034	0.0288	0.1021	1.1171	0.0019	0.0038	0.0035
ConstMin - Graders	188	0.0286	0.1081	0.3999	0.0020	0.0038	0.0035	0.0302	0.1085	0.4032	0.0020	0.0039	0.0036	0.0310	0.1091	0.4059	0.0020	0.0039	0.0036
ConstMin - Off-Highway Tractors	124	0.0296	0.1150	1.2488	0.0021	0.0042	0.0038	0.0308	0.1156	1.2587	0.0021	0.0042	0.0039	0.0314	0.1158	1.2632	0.0021	0.0042	0.0039
ConstMin - Off-Highway Trucks	403	0.0398	0.1061	0.3935	0.0019	0.0040	0.0037	0.0427	0.1072	0.3990	0.0019	0.0041	0.0038	0.0438	0.1075	0.4009	0.0019	0.0041	0.0038
ConstMin - Other Construction Equipment	172	0.0269	0.1091	1.1805	0.0020	0.0039	0.0036	0.0278	0.1095	1.1872	0.0020	0.0039	0.0036	0.0285	0.1096	1.1909	0.0020	0.0040	0.0036
ConstMin - Pavers	129	0.0248	0.1089	1.1709	0.0020	0.0038	0.0035	0.0260	0.1092	1.1782	0.0020	0.0039	0.0036	0.0262	0.1093	1.1796	0.0020	0.0039	0.0036
ConstMin - Paving Equipment	131	0.0217	0.0929	1.0011	0.0017	0.0033	0.0030	0.0231	0.0935	1.0111	0.0017	0.0033	0.0031	0.0242	0.0939	1.0195	0.0017	0.0034	0.0031
ConstMin - Rollers	80	0.0302	0.5072	1.1847	0.0018	0.0036	0.0033	0.0313	0.5088	1.1914	0.0018	0.0037	0.0034	0.0319	0.5090	1.1935	0.0018	0.0037	0.0034
ConstMin - Rough Terrain Forklifts	100	0.0299	0.5402	1.2555	0.0020	0.0037	0.0034	0.0309	0.5412	1.2607	0.0020	0.0038	0.0035	0.0318	0.5422	1.2653	0.0020	0.0039	0.0035
ConstMin - Rubber Tired Dozers	249	0.0337	0.1061	0.4001	0.0019	0.0039	0.0036	0.0374	0.1079	0.4106	0.0019	0.0040	0.0037	0.0330	0.1070	0.4022	0.0019	0.0039	0.0036
ConstMin - Rubber Tired Loaders	202	0.0291	0.0967	0.3632	0.0018	0.0035	0.0032	0.0323	0.0979	0.3713	0.0018	0.0036	0.0033	0.0320	0.0978	0.3704	0.0018	0.0036	0.0033
ConstMin - Scrapers	367	0.0320	0.1277	0.4649	0.0024	0.0045	0.0041	0.0337	0.1283	0.4678	0.0024	0.0045	0.0042	0.0342	0.1285	0.4689	0.0024	0.0045	0.0042
ConstMin - Skid Steer Loaders	65	0.0297	0.4979	1.1632	0.0018	0.0036	0.0033	0.0307	0.4991	1.1688	0.0018	0.0036	0.0033	0.0312	0.4996	1.1711	0.0018	0.0037	0.0034
ConstMin - Surfacing Equipment	263	0.0161	0.0781	0.2842	0.0015	0.0027	0.0024	0.0164	0.0782	0.2847	0.0015	0.0027	0.0025	0.0167	0.0784	0.2859	0.0015	0.0027	0.0025
ConstMin - Sweepers/Scrubbers	64	0.0323	0.6100	1.4138	0.0022	0.0041	0.0038	0.0323	0.6100	1.4138	0.0022	0.0041	0.0038	0.0368	0.6153	1.4380	0.0022	0.0044	0.0041
ConstMin - Tractors/Loaders/Backhoes	98	0.0359	0.5058	1.1978	0.0018	0.0039	0.0036	0.0376	0.5078	1.2066	0.0018	0.0040	0.0037	0.0389	0.5099	1.2150	0.0018	0.0041	0.0038
ConstMin - Trenchers	79	0.0423	0.6914	1.6182	0.0025	0.0050	0.0046	0.0429	0.6914	1.6199	0.0025	0.0050	0.0046	0.0446	0.6906	1.6231	0.0025	0.0051	0.0047
Industrial - Aerial Lifts	63	0.0231	0.4141	0.9630	0.0015	0.0029	0.0026	0.0235	0.4144	0.9648	0.0015	0.0029	0.0027	0.0244	0.4156	0.9700	0.0015	0.0030	0.0027
Industrial - Forklifts	89	0.0196	0.2752	0.6517	0.0010	0.0021	0.0020	0.0207	0.2765	0.6577	0.0010	0.0022	0.0020	0.0218	0.2778	0.6635	0.0010	0.0023	0.0021
Industrial - Other General Industrial Equipment	88	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	0.0000	0.0000
Industrial - Other Material Handling Equipment	167	0.0281	0.1049	1.1429	0.0019	0.0038	0.0035	0.0301	0.1056	1.1573	0.0019	0.0039	0.0036	0.0306	0.1058	1.1608	0.0019	0.0039	0.0036
OFF - ConstMin - Bore/Drill Rigs	16	0.4222	3.2230	1.9223	0.0057	0.1215	0.1118	0.4221	3.2220	1.9148	0.0056	0.1214	0.1117	0.4230	3.2295	1.9147	0.0056	0.1217	0.1119
OFF - ConstMin - Cement and Mortar Mixers	10	0.3076	2.3335	1.8668	0.0048	0.0907	0.0834	0.3077	2.3341	1.8661	0.0048	0.0907	0.0834	0.3078	2.3351	1.8611	0.0048	0.0907	0.0834
OFF - ConstMin - Concrete/Industrial Saws	31	0.1301	2.0890	2.3846	0.0054	0.0077	0.0071	0.1377	2.0973	2.4357	0.0054	0.0079	0.0073	0.1455	2.1093	2.4903	0.0054	0.0081	0.0074
OFF - ConstMin - Dumpers/Tenders	16	0.2148	1.6426	0.8872	0.0027	0.0614	0.0565	0.2155	1.6474	0.8898	0.0027	0.0616	0.0566	0.2155	1.6481	0.8902	0.0027	0.0616	0.0567
OFF - ConstMin - Excavators	23	0.3229	2.4692	1.3337	0.0041	0.0923	0.0849	0.3227	2.4673	1.3326	0.0041	0.0922	0.0848	0.3230	2.4696	1.3339	0.0041	0.0923	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3410	2.5879	2.0370	0.0053	0.1004	0.0923	0.3411	2.5889	2.0325	0.0053	0.1004	0.0924	0.3411	2.5891	2.0291	0.0053	0.1004	0.0923
OFF - ConstMin - Pavers	24	0.3506	2.6811	1.4481	0.0045	0.1002	0.0922	0.3510	2.6839	1.4496	0.0045	0.1003	0.0923	0.3512	2.6855	1.4505	0.0045	0.1003	0.0923
OFF - ConstMin - Paving Equipment	19	0.3000	2.2938	1.2390	0.0038	0.0857	0.0789	0.3008	2.3000	1.2423	0.0038	0.0859	0.0791	0.3008	2.2996	1.2421	0.0038	0.0859	0.0791
OFF - ConstMin - Plate Compactors	8	0.2351	1.7813	1.4921	0.0038	0.0696	0.0640	0.2351	1.7818	1.4924	0.0038	0.0696	0.0641	0.2351	1.7817	1.4923	0.0038	0.0696	0.0641
OFF - ConstMin - Rollers	12	0.3111	2.3666	1.6661	0.0046	0.0907	0.0834	0.3112	2.3676	1.6584	0.0045	0.0906	0.0834	0.3113	2.3686	1.6535	0.0045	0.0907	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3061	2.3408	1.2643	0.0039	0.0875	0.0805	0.3067	2.3454	1.2668	0.0039	0.0876	0.0806	0.3066	2.3441	1.2661	0.0039	0.0876	0.0806
OFF - ConstMin - Signal Boards	6	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3116	2.3829	1.2871	0.0040	0.0890	0.0819	0.3116	2.3828	1.2870	0.0040	0.0890	0.0819	0.3116	2.3828	1.2870	0.0040	0.0890	0.0819
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3116	2.3822	1.2867	0.0040	0.0890	0.0819	0.3117	2.3833	1.2873	0.0040	0.0891	0.0819	0.3116	2.3828	1.2870	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4220	3.2206	1.9316	0.0057	0.1214	0.1117	0.4222	3.2228	1.9274	0.0057	0.1215	0.1118	0.4219	3.2200	1.9226	0.0056	0.1214	0.1117
OFF - Industrial - Aerial Lifts	17	0.2562	1.9508	1.3302	0.0037	0.0745	0.0685	0.2564	1.9525	1.3174	0.0037	0.0745	0.0685	0.2566	1.9545	1.3057	0.0036	0.0745	0.0685
OFF - Industrial - Other General Industrial Equipment	18	0.2792	2.1863	1.3325	0.0039	0.0826	0.0760	0.2793	2.1864	1.3305	0.0039	0.0826	0.0760	0.2794	2.1867	1.3302	0.0039	0.0826	0.0760
OFF - Industrial - Sweepers/Scrubbers	18	0.3637	2.8934	1.8940	0.0053	0.1100	0.1012	0.3644	2.8965	1.8887	0.0053	0.1101	0.1013	0.3644	2.8950	1.8834	0.0053	0.1100	0.1012
OFF - Light Commercial - Air Compressors	35	0.1016	1.3968	1.6797	0.0035	0.0055	0.0050	0.1087	1.4069	1.7292	0.0035	0.0057	0.0052	0.1161	1.4175	1.7803	0.0035	0.0058	0.0054
OFF - Light Commercial - Generator Sets	21	0.3933	3.1441	2.1011	0.0059	0.1198	0.1102	0.3933	3.1441	2.1012	0.0059	0.1198	0.1102	0.3933	3.1441	2.1012	0.0059	0.1198	0.1102
OFF - Light Commercial - Pressure Washers	21	0.1521	1.2566	0.9544	0.0025	0.0485	0.0447	0.1529	1.2630	0.9592	0.0025	0.0488	0.0449	0.1527	1.2619	0.9584	0.0025	0.0487	0.0448
OFF - Light Commercial - Pumps	18	0.4110	3.1273	2.2003	0.0060	0.1198	0.1102	0.4111	3.1277	2.2006	0.0060	0.1198	0.1102	0.4110	3.1274	2.2004	0.0060	0.1198	0.1102
OFF - Light Commercial - Welders	33	0.0846	1.2941	1.5006	0.0033	0.0049	0.0045	0.0899	1.3018	1.5374	0.0033	0.0050	0.0046	0.0953	1.3095	1.5751	0.0033	0.0051	0.0047
Portable Equipment - Non-Rental Compressor	167	0.0301	0.2014	0.9121	0.0014	0.0038	0.0035	0.0294	0.1996	0.9149	0.0014	0.0039	0.0036	0.0292	0.1598	0.9212	0.0015	0.0034	0.0031
Portable Equipment - Non-Rental Generator	369	0.0374	0.0545	0.3133	0.0014	0.0048	0.0045	0.0371	0.0548	0.3156	0.0014	0.0048	0.0044	0.0414	0.0522	0.3258	0.0015	0.0042	0.0039
Portable Equipment - Non-Rental Other Portable Equipment	407	0.0296	0.0412	0.2994	0.0014	0.0033	0.0031	0.0296	0.0418	0.3021	0.0014	0.0034	0.0031	0.0278	0.0708	0.3016	0.0015	0.0042	0.0038
Portable Equipment - Non-Rental Pump	197	0.0257	0.0438	0.3002	0.0014	0.0027	0.0025	0.0256	0.0439	0.3027	0.0014	0.0027	0.0025	0.0250	0.0547	0.3038	0.0015	0.0031	0.0028
Portable Equipment - Rental Compressor	361	0.0250	0.0454	0.2911	0.0014	0.0043	0.0039	0.0253	0.0447	0.2944	0.0014	0.0042	0.0039	0.0253	0.0445	0.2972	0.0015	0.0041	0.0038
Portable Equipment - Rental Generator	406	0.0403	0.0779	0.3186	0.0014	0.0055	0.0051	0.0414	0.0756	0.3232	0.0014	0.0053	0.0049	0.0413	0.0606	0.3258	0.0015	0.0045	0.0041
Portable Equipment - Rental Other Portable Equipment	657	0.0486	0.0609	0.3333	0.0014	0.0065	0.0060	0.0488	0.0586	0.3364	0.0014	0.0061	0.0056	0.0494	0.0508	0.3401	0.0015	0.0051	0.0047
Portable Equipment - Rental Pump	165	0.0378	0.2560	0.9659	0.0014	0.0060	0.0055	0.0376	0.2504	0.9724	0.0014	0.0059	0.0054	0.0382	0.1886	0.9840	0.0015	0.0042	0.0038

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Database. Available online at https://www.arb.ca.gov/orion/ [Accessesd October 17, 2018].
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "Horsepower_Hours_hhpy" divided by "Total_Activity_hpy.")

Table A-121. Mitigated In-Use Off-Road Construction Equipment Emiss

Equipment Type	Average HP	Emission Factors - 2023 (g/bhp-hr)						Emission Factors - 2024 (g/bhp-hr)					
		VOC	NOx	CO	SO2	PM10	PM2.5	VOC	NOx	CO	SO2	PM10	PM2.5
ConstMin - Bore/Drill Rigs	221	0.0336	0.1315	0.4862	0.0024	0.0046	0.0042	0.0340	0.1320	0.4884	0.0024	0.0046	0.0043
ConstMin - Cranes	231	0.0206	0.0766	0.2844	0.0014	0.0027	0.0025	0.0213	0.0768	0.2861	0.0014	0.0027	0.0025
ConstMin - Crawler Tractors	212	0.0299	0.1136	0.4210	0.0021	0.0040	0.0037	0.0315	0.1143	0.4253	0.0021	0.0041	0.0037
ConstMin - Excavators	158	0.0301	0.1025	1.1259	0.0019	0.0038	0.0035	0.0311	0.1028	1.1326	0.0019	0.0039	0.0035
ConstMin - Graders	188	0.0321	0.1099	0.4099	0.0020	0.0039	0.0036	0.0337	0.1103	0.4133	0.0020	0.0040	0.0037
ConstMin - Off-Highway Tractors	124	0.0314	0.1157	1.2616	0.0021	0.0042	0.0039	0.0328	0.1162	1.2713	0.0021	0.0043	0.0039
ConstMin - Off-Highway Trucks	403	0.0450	0.1080	0.4032	0.0019	0.0042	0.0038	0.0467	0.1084	0.4056	0.0019	0.0042	0.0039
ConstMin - Other Construction Equipment	172	0.0294	0.1100	1.1977	0.0020	0.0040	0.0037	0.0309	0.1105	1.2085	0.0020	0.0041	0.0037
ConstMin - Pavers	129	0.0271	0.1096	1.1861	0.0020	0.0039	0.0036	0.0283	0.1100	1.1944	0.0020	0.0040	0.0037
ConstMin - Paving Equipment	131	0.0256	0.0943	1.0283	0.0017	0.0034	0.0032	0.0269	0.0948	1.0381	0.0017	0.0035	0.0032
ConstMin - Rollers	80	0.0327	0.5102	1.1983	0.0018	0.0038	0.0035	0.0337	0.5112	1.2033	0.0018	0.0038	0.0035
ConstMin - Rough Terrain Forklifts	100	0.0325	0.5433	1.2697	0.0020	0.0039	0.0036	0.0333	0.5444	1.2742	0.0020	0.0039	0.0036
ConstMin - Rubber Tired Dozers	249	0.0369	0.1081	0.4316	0.0019	0.0040	0.0037	0.0407	0.1094	0.4198	0.0019	0.0041	0.0038
ConstMin - Rubber Tired Loaders	202	0.0336	0.0984	0.3744	0.0018	0.0036	0.0033	0.0351	0.0989	0.3779	0.0018	0.0037	0.0034
ConstMin - Scrapers	367	0.0359	0.1292	0.4722	0.0024	0.0046	0.0042	0.0374	0.1296	0.4747	0.0024	0.0046	0.0043
ConstMin - Skid Steer Loaders	65	0.0318	0.5002	1.1740	0.0018	0.0037	0.0034	0.0322	0.5009	1.1768	0.0018	0.0037	0.0034
ConstMin - Surfacing Equipment	263	0.0173	0.0787	0.2874	0.0015	0.0027	0.0025	0.0178	0.0789	0.2889	0.0015	0.0027	0.0025
ConstMin - Sweepers/Scrubbers	64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ConstMin - Tractors/Loaders/Backhoes	98	0.0406	0.5120	1.2243	0.0018	0.0042	0.0039	0.0428	0.5148	1.2366	0.0018	0.0043	0.0040
ConstMin - Trenchers	79	0.0465	0.6928	1.6331	0.0025	0.0052	0.0048	0.0479	0.6932	1.6380	0.0025	0.0053	0.0049
Industrial - Aerial Lifts	63	0.0215	0.4121	0.9542	0.0015	0.0028	0.0026	0.0229	0.4137	0.9616	0.0015	0.0029	0.0026
Industrial - Forklifts	89	0.0228	0.2790	0.6692	0.0010	0.0023	0.0021	0.0239	0.2803	0.6751	0.0010	0.0024	0.0022
Industrial - Other General Industrial Equipment	88	0.0248	0.4583	1.0637	0.0017	0.0031	0.0029	0.0277	0.4618	1.0794	0.0017	0.0033	0.0031
Industrial - Other Material Handling Equipment	167	0.0314	0.1061	1.1661	0.0019	0.0040	0.0036	0.0366	0.1623	1.2057	0.0019	0.0042	0.0039
OFF - ConstMin - Bore/Drill Rigs	16	0.4235	3.2328	1.9136	0.0056	0.1218	0.1120	0.4226	3.2261	1.9078	0.0056	0.1215	0.1118
OFF - ConstMin - Cement and Mortar Mixers	10	0.3078	2.3357	1.8553	0.0048	0.0907	0.0834	0.3080	2.3368	1.8498	0.0048	0.0907	0.0834
OFF - ConstMin - Concrete/Industrial Saws	31	0.1531	2.1193	2.5423	0.0054	0.0083	0.0076	0.1606	2.1297	2.5945	0.0054	0.0085	0.0078
OFF - ConstMin - Dumpers/Tenders	16	0.2153	1.6461	0.8891	0.0027	0.0615	0.0566	0.2158	1.6497	0.8911	0.0027	0.0616	0.0567
OFF - ConstMin - Excavators	23	0.3228	2.4683	1.3332	0.0041	0.0922	0.0849	0.3231	2.4707	1.3345	0.0041	0.0923	0.0849
OFF - ConstMin - Other Construction Equipment	14	0.3412	2.5895	2.0269	0.0053	0.1004	0.0923	0.3411	2.5891	2.0249	0.0053	0.1003	0.0923
OFF - ConstMin - Pavers	24	0.3529	2.6984	1.4574	0.0045	0.1008	0.0928	0.3506	2.6809	1.4480	0.0045	0.1002	0.0922
OFF - ConstMin - Paving Equipment	19	0.2997	2.2917	1.2378	0.0038	0.0856	0.0788	0.3004	2.2968	1.2405	0.0038	0.0858	0.0790
OFF - ConstMin - Plate Compactors	8	0.2351	1.7814	1.4921	0.0038	0.0696	0.0640	0.2351	1.7814	1.4921	0.0038	0.0696	0.0640
OFF - ConstMin - Rollers	12	0.3113	2.3691	1.6500	0.0045	0.0907	0.0834	0.3113	2.3691	1.6476	0.0045	0.0906	0.0834
OFF - ConstMin - Rubber Tired Loaders	25	0.3055	2.3357	1.2616	0.0039	0.0873	0.0803	0.3061	2.3408	1.2643	0.0039	0.0875	0.0805
OFF - ConstMin - Signal Boards	6	0.4483	3.3972	2.8455	0.0073	0.1327	0.1221	0.4483	3.3971	2.8454	0.0073	0.1327	0.1221
OFF - ConstMin - Skid Steer Loaders	20	0.3116	2.3828	1.2870	0.0040	0.0890	0.0819	0.3116	2.3827	1.2870	0.0040	0.0890	0.0819
OFF - ConstMin - Tractors/Loaders/Backhoes	23	0.3116	2.3824	1.2868	0.0040	0.0890	0.0819	0.3116	2.3827	1.2870	0.0040	0.0890	0.0819
OFF - ConstMin - Trenchers	22	0.4219	3.2201	1.9210	0.0056	0.1214	0.1117	0.4215	3.2174	1.9189	0.0056	0.1213	0.1116
OFF - Industrial - Aerial Lifts	17	0.2568	1.9564	1.2950	0.0036	0.0745	0.0685	0.2570	1.9582	1.2846	0.0036	0.0745	0.0685
OFF - Industrial - Other General Industrial Equipment	18	0.2794	2.1869	1.3303	0.0039	0.0826	0.0760	0.2794	2.1866	1.3301	0.0039	0.0826	0.0760
OFF - Industrial - Sweepers/Scrubbers	18	0.3652	2.9005	1.8847	0.0053	0.1102	0.1014	0.3647	2.8959	1.8811	0.0053	0.1100	0.1012
OFF - Light Commercial - Air Compressors	35	0.1235	1.4281	1.8315	0.0035	0.0060	0.0056	0.1308	1.4386	1.8824	0.0035	0.0062	0.0057
OFF - Light Commercial - Generator Sets	21	0.3933	3.1440	2.1011	0.0059	0.1198	0.1102	0.3933	3.1440	2.1011	0.0059	0.1198	0.1102
OFF - Light Commercial - Pressure Washers	21	0.1524	1.2588	0.9560	0.0025	0.0486	0.0447	0.1523	1.2584	0.9557	0.0025	0.0486	0.0447
OFF - Light Commercial - Pumps	18	0.4110	3.1273	2.2003	0.0060	0.1198	0.1102	0.4110	3.1272	2.2002	0.0060	0.1198	0.1102
OFF - Light Commercial - Welders	33	0.1008	1.3174	1.6130	0.0033	0.0053	0.0049	0.1062	1.3250	1.6505	0.0033	0.0054	0.0050
Portable Equipment - Non-Rental Compressor	167	0.0294	0.1346	0.9299	0.0015	0.0032	0.0030	0.0295	0.1430	0.9386	0.0015	0.0037	0.0034
Portable Equipment - Non-Rental Generator	369	0.0424	0.0529	0.3304	0.0015	0.0040	0.0036	0.0428	0.0592	0.3339	0.0015	0.0042	0.0039
Portable Equipment - Non-Rental Other Portable Equipment	407	0.0280	0.0667	0.3048	0.0015	0.0040	0.0037	0.0274	0.0661	0.3064	0.0015	0.0040	0.0037
Portable Equipment - Non-Rental Pump	197	0.0252	0.0599	0.3070	0.0015	0.0033	0.0031	0.0248	0.0703	0.3087	0.0015	0.0036	0.0033
Portable Equipment - Rental Compressor	361	0.0252	0.0443	0.2997	0.0015	0.0040	0.0037	0.0252	0.0444	0.3025	0.0015	0.0039	0.0036
Portable Equipment - Rental Generator	406	0.0416	0.0606	0.3290	0.0015	0.0044	0.0041	0.0421	0.0688	0.3326	0.0015	0.0048	0.0044
Portable Equipment - Rental Other Portable Equipment	657	0.0499	0.0513	0.3439	0.0015	0.0051	0.0047	0.0505	0.0519	0.3476	0.0015	0.0052	0.0048
Portable Equipment - Rental Pump	165	0.0382	0.1858	0.9922	0.0015	0.0042	0.0039	0.0379	0.1768	0.9980	0.0015	0.0041	0.0038

Source:
California Air Resources Board (CARB). 2017. OFFROAD2017 - ORION Web Databa
Notes:
1. Horsepower used in modeling is average calculated from OFFROAD2017 (e.g., "H

San Luis Low Point Improvement Project
EMFAC2014 Emission Factor Summary

Table A-122. Mitigated On-Road Medium-Duty Vehicle Diesel Emission Factors (San Joaquin Valley Air Basin), grams per hour

Calendar Year	Speed	VOC	NOx	CO	SO2	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	0.1852	0.1414	3.2060	0.0219	0.0075	0.0400	0.1838	0.2312	0.0071	0.0100	0.0788	0.0959
2020	10	0.1385	0.1175	2.3976	0.0439	0.0070	0.0800	0.3675	0.4545	0.0067	0.0200	0.1575	0.1842
2020	15	0.0676	0.0786	1.1697	0.0658	0.0061	0.1200	0.5513	0.6774	0.0058	0.0300	0.2363	0.2721
2020	20	0.0263	0.0516	0.4553	0.0878	0.0052	0.1600	0.7350	0.9002	0.0050	0.0400	0.3150	0.3600
2020	25	0.0158	0.0391	0.2731	0.1097	0.0045	0.2000	0.9188	1.1232	0.0043	0.0500	0.3938	0.4480
2020	30	0.0119	0.0325	0.2063	0.1317	0.0040	0.2400	1.1025	1.3465	0.0038	0.0600	0.4725	0.5363
2020	35	0.0095	0.0281	0.1641	0.1536	0.0036	0.2800	1.2863	1.5698	0.0034	0.0700	0.5513	0.6247
2020	40	0.0078	0.0249	0.1354	0.1756	0.0033	0.3200	1.4700	1.7933	0.0031	0.0800	0.6300	0.7131
2020	45	0.0066	0.0226	0.1145	0.1975	0.0030	0.3600	1.6538	2.0168	0.0029	0.0900	0.7088	0.8017
2020	50	0.0057	0.0207	0.0989	0.2195	0.0028	0.4000	1.8375	2.2403	0.0027	0.1000	0.7875	0.8902
2020	55	0.0050	0.0192	0.0869	0.2414	0.0027	0.4400	2.0213	2.4639	0.0026	0.1100	0.8663	0.9788
2020	60	0.0047	0.0186	0.0819	0.2634	0.0026	0.4800	2.2050	2.6876	0.0025	0.1200	0.9450	1.0675
2020	65	0.0047	0.0186	0.0818	0.2853	0.0026	0.5200	2.3888	2.9114	0.0025	0.1300	1.0238	1.1562
2020	70	0.0047	0.0186	0.0819	0.3073	0.0026	0.5600	2.5725	3.1351	0.0025	0.1400	1.1025	1.2450
2021	5	0.1703	0.1251	3.1454	0.0214	0.0068	0.0400	0.1838	0.2306	0.0065	0.0100	0.0788	0.0953
2021	10	0.1273	0.1038	2.3513	0.0427	0.0064	0.0800	0.3675	0.4539	0.0061	0.0200	0.1575	0.1836
2021	15	0.0620	0.0693	1.1462	0.0641	0.0056	0.1200	0.5513	0.6768	0.0053	0.0300	0.2363	0.2716
2021	20	0.0242	0.0456	0.4463	0.0855	0.0048	0.1600	0.7350	0.8998	0.0046	0.0400	0.3150	0.3596
2021	25	0.0145	0.0345	0.2677	0.1068	0.0041	0.2000	0.9188	1.1228	0.0039	0.0500	0.3938	0.4477
2021	30	0.0109	0.0287	0.2023	0.1282	0.0036	0.2400	1.1025	1.3461	0.0035	0.0600	0.4725	0.5360
2021	35	0.0087	0.0248	0.1610	0.1496	0.0033	0.2800	1.2863	1.5695	0.0031	0.0700	0.5513	0.6244
2021	40	0.0072	0.0221	0.1328	0.1710	0.0030	0.3200	1.4700	1.7930	0.0029	0.0800	0.6300	0.7129
2021	45	0.0061	0.0199	0.1123	0.1923	0.0028	0.3600	1.6538	2.0165	0.0027	0.0900	0.7088	0.8014
2021	50	0.0052	0.0183	0.0970	0.2137	0.0026	0.4000	1.8375	2.2401	0.0025	0.1000	0.7875	0.8900
2021	55	0.0046	0.0170	0.0852	0.2351	0.0025	0.4400	2.0213	2.4637	0.0023	0.1100	0.8663	0.9786
2021	60	0.0043	0.0164	0.0803	0.2564	0.0024	0.4800	2.2050	2.6874	0.0023	0.1200	0.9450	1.0673
2021	65	0.0043	0.0164	0.0803	0.2778	0.0024	0.5200	2.3888	2.9111	0.0023	0.1300	1.0238	1.1560
2021	70	0.0043	0.0164	0.0803	0.2992	0.0024	0.5600	2.5725	3.1349	0.0023	0.1400	1.1025	1.2448
2022	5	0.1583	0.1121	3.1035	0.0208	0.0063	0.0400	0.1838	0.2300	0.0060	0.0100	0.0788	0.0948
2022	10	0.1182	0.0929	2.3190	0.0416	0.0059	0.0800	0.3675	0.4534	0.0056	0.0200	0.1575	0.1831
2022	15	0.0576	0.0620	1.1298	0.0624	0.0051	0.1200	0.5513	0.6764	0.0049	0.0300	0.2363	0.2711
2022	20	0.0224	0.0408	0.4402	0.0832	0.0044	0.1600	0.7350	0.8994	0.0042	0.0400	0.3150	0.3592
2022	25	0.0135	0.0309	0.2640	0.1040	0.0037	0.2000	0.9188	1.1225	0.0036	0.0500	0.3938	0.4473
2022	30	0.0102	0.0257	0.1995	0.1248	0.0033	0.2400	1.1025	1.3458	0.0032	0.0600	0.4725	0.5357
2022	35	0.0081	0.0223	0.1588	0.1456	0.0030	0.2800	1.2863	1.5693	0.0029	0.0700	0.5513	0.6241
2022	40	0.0067	0.0198	0.1311	0.1663	0.0028	0.3200	1.4700	1.7928	0.0026	0.0800	0.6300	0.7126
2022	45	0.0056	0.0179	0.1108	0.1871	0.0026	0.3600	1.6538	2.0163	0.0025	0.0900	0.7088	0.8012
2022	50	0.0049	0.0164	0.0956	0.2079	0.0024	0.4000	1.8375	2.2399	0.0023	0.1000	0.7875	0.8898
2022	55	0.0043	0.0152	0.0840	0.2287	0.0023	0.4400	2.0213	2.4635	0.0022	0.1100	0.8663	0.9784
2022	60	0.0040	0.0147	0.0792	0.2495	0.0022	0.4800	2.2050	2.6872	0.0021	0.1200	0.9450	1.0671
2022	65	0.0040	0.0147	0.0792	0.2703	0.0022	0.5200	2.3888	2.9109	0.0021	0.1300	1.0238	1.1558
2022	70	0.0040	0.0147	0.0792	0.2911	0.0022	0.5600	2.5725	3.1347	0.0021	0.1400	1.1025	1.2446
2023	5	0.1496	0.1026	3.0846	0.0202	0.0059	0.0400	0.1838	0.2296	0.0056	0.0100	0.0788	0.0944
2023	10	0.1117	0.0850	2.3041	0.0404	0.0055	0.0800	0.3675	0.4530	0.0052	0.0200	0.1575	0.1827
2023	15	0.0543	0.0567	1.1221	0.0606	0.0048	0.1200	0.5513	0.6760	0.0046	0.0300	0.2363	0.2708
2023	20	0.0212	0.0374	0.4374	0.0808	0.0041	0.1600	0.7350	0.8991	0.0039	0.0400	0.3150	0.3589
2023	25	0.0127	0.0283	0.2623	0.1010	0.0035	0.2000	0.9188	1.1222	0.0033	0.0500	0.3938	0.4471
2023	30	0.0096	0.0235	0.1982	0.1212	0.0031	0.2400	1.1025	1.3456	0.0030	0.0600	0.4725	0.5355
2023	35	0.0076	0.0204	0.1578	0.1414	0.0028	0.2800	1.2863	1.5691	0.0027	0.0700	0.5513	0.6239
2023	40	0.0063	0.0181	0.1303	0.1616	0.0026	0.3200	1.4700	1.7926	0.0025	0.0800	0.6300	0.7125
2023	45	0.0053	0.0163	0.1101	0.1818	0.0024	0.3600	1.6538	2.0161	0.0023	0.0900	0.7088	0.8010
2023	50	0.0046	0.0150	0.0950	0.2020	0.0022	0.4000	1.8375	2.2397	0.0021	0.1000	0.7875	0.8896
2023	55	0.0040	0.0139	0.0835	0.2221	0.0021	0.4400	2.0213	2.4633	0.0020	0.1100	0.8663	0.9783
2023	60	0.0038	0.0135	0.0788	0.2423	0.0020	0.4800	2.2050	2.6870	0.0020	0.1200	0.9450	1.0670
2023	65	0.0038	0.0135	0.0787	0.2625	0.0020	0.5200	2.3888	2.9108	0.0020	0.1300	1.0238	1.1557
2023	70	0.0038	0.0135	0.0787	0.2827	0.0020	0.5600	2.5725	3.1345	0.0020	0.1400	1.1025	1.2445

Table A-123. Mitigated On-Road Medium-Duty Vehicle Diesel Emission Factors (San Francisco Bay Area Air Basin), grams per hour

Calendar Year	Speed	VOC	NOx	CO	SO2	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	0.1843	0.1402	3.1812	0.0217	0.0074	0.0400	0.1838	0.2312	0.0071	0.0100	0.0788	0.0958
2020	10	0.1378	0.1166	2.3786	0.0433	0.0070	0.0800	0.3675	0.4545	0.0067	0.0200	0.1575	0.1842
2020	15	0.0673	0.0780	1.1613	0.0650	0.0061	0.1200	0.5513	0.6773	0.0058	0.0300	0.2363	0.2721
2020	20	0.0262	0.0512	0.4516	0.0867	0.0052	0.1600	0.7350	0.9002	0.0050	0.0400	0.3150	0.3600
2020	25	0.0157	0.0389	0.2711	0.1084	0.0044	0.2000	0.9188	1.1232	0.0042	0.0500	0.3938	0.4480
2020	30	0.0119	0.0323	0.2048	0.1300	0.0039	0.2400	1.1025	1.3464	0.0038	0.0600	0.4725	0.5363
2020	35	0.0094	0.0279	0.1628	0.1517	0.0036	0.2800	1.2863	1.5698	0.0034	0.0700	0.5513	0.6247
2020	40	0.0078	0.0248	0.1342	0.1734	0.0033	0.3200	1.4700	1.7933	0.0031	0.0800	0.6300	0.7131
2020	45	0.0066	0.0224	0.1138	0.1950	0.0030	0.3600	1.6538	2.0168	0.0029	0.0900	0.7088	0.8016
2020	50	0.0057	0.0206	0.0982	0.2167	0.0028	0.4000	1.8375	2.2403	0.0027	0.1000	0.7875	0.8902
2020	55	0.0050	0.0191	0.0863	0.2384	0.0027	0.4400	2.0213	2.4639	0.0025	0.1100	0.8663	0.9788
2020	60	0.0047	0.0184	0.0812	0.2600	0.0026	0.4800	2.2050	2.6876	0.0025	0.1200	0.9450	1.0675
2020	65	0.0047	0.0184	0.0811	0.2817	0.0026	0.5200	2.3888	2.9113	0.0025	0.1300	1.0238	1.1562
2021	5	0.1675	0.1223	3.1000	0.0211	0.0067	0.0400	0.1838	0.2304	0.0064	0.0100	0.0788	0.0952
2021	10	0.1251	0.1016	2.3152	0.0422	0.0063	0.0800	0.3675	0.4538	0.0060	0.0200	0.1575	0.1835
2021	15	0.0610	0.0679	1.1302	0.0632	0.0055	0.1200	0.5513	0.6767	0.0052	0.0300	0.2363	0.2715
2021	20	0.0238	0.0446	0.4397	0.0843	0.0047	0.1600	0.7350	0.8997	0.0045	0.0400	0.3150	0.3595
2021	25	0.0143	0.0339	0.2639	0.1054	0.0040	0.2000	0.9188	1.1228	0.0038	0.0500	0.3938	0.4476
2021	30	0.0108	0.0281	0.1995	0.1265	0.0035	0.2400	1.1025	1.3460	0.0034	0.0600	0.4725	0.5359
2021	35	0.0086	0.0243	0.1584	0.1475	0.0032	0.2800	1.2863	1.5695	0.0031	0.0700	0.5513	0.6243
2021	40	0.0071	0.0216	0.1306	0.1686	0.0029	0.3200	1.4700	1.7929	0.0028	0.0800	0.6300	0.7128
2021	45	0.0060	0.0196	0.1109	0.1897	0.0027	0.3600	1.6538	2.0165	0.0026	0.0900	0.7088	0.8014
2021	50	0.0052	0.0179	0.0956	0.2108	0.0026	0.4000	1.8375	2.2401	0.0024	0.1000	0.7875	0.8899
2021	55	0.0045	0.0166	0.0840	0.2319	0.0024	0.4400	2.0213	2.4637	0.0023	0.1100	0.8663	0.9786
2021	60	0.0043	0.0161	0.0791	0.2529	0.0023	0.4800	2.2050	2.6873	0.0022	0.1200	0.9450	1.0672
2021	65	0.0043	0.0160	0.0790	0.2740	0.0023	0.5200	2.3888	2.9111	0.0022	0.1300	1.0238	1.1560
2022	5	0.1546	0.1088	3.0466	0.0205	0.0061	0.0400	0.1838	0.2299	0.0058	0.0100	0.0788	0.0946
2022	10	0.1153	0.0902	2.2736	0.0409	0.0057	0.0800	0.3675	0.4532	0.0055	0.0200	0.1575	0.1830
2022	15	0.0563	0.0603	1.1098	0.0614	0.0050	0.1200	0.5513	0.6762	0.0048	0.0300	0.2363	0.2710
2022	20	0.0219	0.0396	0.4318	0.0819	0.0043	0.1600	0.7350	0.8993	0.0041	0.0400	0.3150	0.3591
2022	25	0.0131	0.0301	0.2592	0.1024	0.0036	0.2000	0.9188	1.1224	0.0035	0.0500	0.3938	0.4472
2022	30	0.0099	0.0250	0.1960	0.1228	0.0032	0.2400	1.1025	1.3457	0.0031	0.0600	0.4725	0.5356
2022	35	0.0079	0.0216	0.1555	0.1433	0.0029	0.2800	1.2863	1.5692	0.0028	0.0700	0.5513	0.6240
2022	40	0.0065	0.0192	0.1283	0.1638	0.0027	0.3200	1.4700	1.7927	0.0026	0.0800	0.6300	0.7126
2022	45	0.0055	0.0174	0.1090	0.1843	0.0025	0.3600	1.6538	2.0162	0.0024	0.0900	0.7088	0.8011
2022	50	0.0048	0.0159	0.0939	0.2047	0.0023	0.4000	1.8375	2.2398	0.0022	0.1000	0.7875	0.8897
2022	55	0.0042	0.0148	0.0826	0.2252	0.0022	0.4400	2.0213	2.4634	0.0021	0.1100	0.8663	0.9783
2022	60	0.0039	0.0143	0.0777	0.2457	0.0021	0.4800	2.2050	2.6871	0.0020	0.1200	0.9450	1.0670
2022	65	0.0039	0.0142	0.0775	0.2662	0.0021	0.5200	2.3888	2.9109	0.0020	0.1300	1.0238	1.1558
2023	5	0.1453	0.0989	3.0180	0.0199	0.0056	0.0400	0.1838	0.2294	0.0054	0.0100	0.0788	0.0942
2023	10	0.1082	0.0819	2.2509	0.0397	0.0053	0.0800	0.3675	0.4528	0.0050	0.0200	0.1575	0.1825
2023	15	0.0528	0.0548	1.0985	0.0596	0.0046	0.1200	0.5513	0.6758	0.0044	0.0300	0.2363	0.2706
2023	20	0.0206	0.0360	0.4275	0.0794	0.0039	0.1600	0.7350	0.8989	0.0038	0.0400	0.3150	0.3588
2023	25	0.0123	0.0273	0.2566	0.0993	0.0034	0.2000	0.9188	1.1221	0.0032	0.0500	0.3938	0.4470
2023	30	0.0093	0.0227	0.1940	0.1191	0.0030	0.2400	1.1025	1.3455	0.0029	0.0600	0.4725	0.5354
2023	35	0.0074	0.0196	0.1540	0.1390	0.0027	0.2800	1.2863	1.5689	0.0026	0.0700	0.5513	0.6238
2023	40	0.0061	0.0174	0.1270	0.1588	0.0025	0.3200	1.4700	1.7925	0.0024	0.0800	0.6300	0.7124
2023	45	0.0052	0.0158	0.1080	0.1787	0.0023	0.3600	1.6538	2.0161	0.0022	0.0900	0.7088	0.8010
2023	50	0.0045	0.0145	0.0930	0.1985	0.0021	0.4000	1.8375	2.2396	0.0021	0.1000	0.7875	0.8896
2023	55	0.0039	0.0134	0.0818	0.2184	0.0020	0.4400	2.0213	2.4633	0.0019	0.1100	0.8663	0.9782
2023	60	0.0037	0.0130	0.0770	0.2382	0.0020	0.4800	2.2050	2.6870	0.0019	0.1200	0.9450	1.0669
2023	65	0.0037	0.0129	0.0767	0.2581	0.0020	0.5200	2.3888	2.9107	0.0019	0.1300	1.0238	1.1556

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Emissions

Construction Duration 47 months
3.9 years
Months in Final Year 11

Table A-124. Trip Rate Information

Vehicle Type	Round Trips		One-Way Trips		One-Way Distance	VMT		Annual VMT	
	Max Day Trips	Total Trips	Max Day Trips	Total Trips	(miles)	Daily	Total	2020 - 2022	2023
Dump Truck	6	100	12	200	40	480	8,000	2,043	1,872
Concrete Trucks	15	7,500	30	15,000	40	1,200	600,000	153,191	140,426
Delivery Trucks (non-soil)	5	1,300	10	2,600	40	400	104,000	26,553	24,340
Gravel/paving trucks	3	250	6	500	40	240	20,000	5,106	4,681
Haul trucks (soil)	40	19,420	80	38,840	5	400	194,200	49,583	45,451
Total Truck Trips	69	28,570	138	57,140	165	2,720	926,200	236,476	216,770
Workers	100	43,800	200	87,600	40	8,000	3,504,000	894,638	820,085
Grand Total	**169**	**72,370**	**338**	**144,740**	**205**	**10,720**	**4,430,200**	**1,131,114**	**1,036,855**

Source: EngineeringDataNeeds_July30_2012.xlsx

Table A-125. Maximum Mitigated Daily Emissions

Truck Emission Factors (g/mi)		0.053	0.755	0.311	0.014	0.193	0.062
Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.139	0.042
	Maximum Daily VMT	Peak Daily Emissions (lbs/day)					
Truck Type	(miles/day)	ROG	NOx	CO	SOx	PM10	PM2.5
Dump Truck	480	0.06	0.80	0.33	0.01	0.20	0.07
Concrete Trucks	1,200	0.14	2.00	0.82	0.04	0.51	0.16
Delivery Trucks (non-soil)	400	0.05	0.67	0.27	0.01	0.17	0.05
Gravel/paving trucks	240	0.03	0.40	0.16	0.01	0.10	0.03
Haul trucks (soil)	400	0.05	0.67	0.27	0.01	0.17	0.05
Truck Subtotal	2,720	0.32	4.53	1.86	0.08	1.16	0.37
Workers	8,000	0.27	1.37	13.29	0.05	2.44	0.75
Grand Total	**10,720**	**0.59**	**5.90**	**15.15**	**0.14**	**3.60**	**1.12**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust).

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Emissions

Table A-126. Annual Mitigated Emissions

	Truck Emission Factors (g/mi)		0.053	0.755	0.311	0.014	0.190	0.061	0.053	0.774	0.315	0.014	0.190	0.061
	Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.136	0.042	0.014	0.069	0.692	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2020 (tons/year)**						**Annual Emissions - 2021 (tons/year)**					
Truck Type	**2020 - 2022**	**2023**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,043	1,872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	153,191	140,426	0.01	0.13	0.05	0.00	0.03	0.01	0.01	0.13	0.05	0.00	0.03	0.01
Delivery Trucks (non-soil)	26,553	24,340	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00
Gravel/paving trucks	5,106	4,681	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haul trucks (soil)	49,583	45,451	0.00	0.04	0.02	0.00	0.01	0.00	0.00	0.04	0.02	0.00	0.01	0.00
Truck Subtotal	236,476	216,770	0.01	0.20	0.08	0.00	0.05	0.02	0.01	0.20	0.08	0.00	0.05	0.02
Workers	894,638	820,085	0.02	0.08	0.74	0.00	0.13	0.04	0.01	0.07	0.68	0.00	0.13	0.04
Grand Total	**1,131,114**	**1,036,855**	**0.03**	**0.27**	**0.82**	**0.01**	**0.18**	**0.06**	**0.03**	**0.27**	**0.76**	**0.01**	**0.18**	**0.06**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust). Annual emissions include natural control efficiency from precipitation.

Start Year: 2020
Air Basin: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Lower San Felipe Intake Alternative - Tunnel Option
Haul Truck and Construction Worker Commuting Em

Table A-126. Annual Mitigated Emissions

	Truck Emission Factors (g/mi)		0.054	0.797	0.321	0.014	0.190	0.061	0.056	0.840	0.332	0.014	0.190	0.061
	Worker Emission Factors (g/mi)		0.012	0.062	0.640	0.003	0.136	0.042	0.011	0.056	0.594	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2022 (tons/year)**						**Annual Emissions - 2023 (tons/year)**					
Truck Type	**2020 - 2022**	**2023**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,043	1,872	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	153,191	140,426	0.01	0.13	0.05	0.00	0.03	0.01	0.01	0.13	0.05	0.00	0.03	0.01
Delivery Trucks (non-soil)	26,553	24,340	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.02	0.01	0.00	0.01	0.00
Gravel/paving trucks	5,106	4,681	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haul trucks (soil)	49,583	45,451	0.00	0.04	0.02	0.00	0.01	0.00	0.00	0.04	0.02	0.00	0.01	0.00
Truck Subtotal	236,476	216,770	0.01	0.21	0.08	0.00	0.05	0.02	0.01	0.20	0.08	0.00	0.05	0.01
Workers	894,638	820,085	0.01	0.06	0.63	0.00	0.13	0.04	0.01	0.06	0.59	0.00	0.13	0.04
Grand Total	**1,131,114**	**1,036,855**	**0.03**	**0.27**	**0.71**	**0.01**	**0.18**	**0.06**	**0.02**	**0.26**	**0.67**	**0.01**	**0.18**	**0.06**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and r

Start Year: 2020
Air Basin: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Lower San Felipe Intake Alternative - Pipeline Option
Haul Truck and Construction Worker Commuting Emissions

Construction Duration 33 months
2.8 years
Months in Final Year 9

Table A-127. Trip Rate Information

Vehicle Type	Round Trips		One-Way Trips		One-Way Distance	VMT		Annual VMT	
	Max Day Trips	Total Trips	Max Day Trips	Total Trips	(miles)	Daily	Total	2020 - 2021	2022
Dump Truck	6	100	12	200	40	480	8,000	2,909	2,182
Concrete Trucks	2	5	4	10	40	160	400	145	109
Delivery Trucks (non-soil)	5	1,950	10	3,900	40	400	156,000	56,727	42,545
Gravel/paving trucks	3	250	6	500	40	240	20,000	7,273	5,455
Haul trucks (soil)	2	4,100	4	8,200	5	20	41,000	14,909	11,182
Total Truck Trips	18	6,405	36	12,810	165	1,300	225,400	81,963	61,473
Workers	30	15,000	60	30,000	40	2,400	1,200,000	436,364	327,273
Grand Total	**48**	**21,405**	**96**	**42,810**	**205**	**3,700**	**1,425,400**	**518,327**	**388,746**

Source: EngineeringDataNeeds_July30_2012.xlsx

Note:

Assume construction starts in 2018 (earliest possible date following publication of EIS/EIR and feasibility study).

Table A-128. Maximum Daily Mitigated Emissions

Truck Emission Factors (g/mi)		0.053	0.755	0.311	0.014	0.193	0.062
Worker Emission Factors (g/mi)		0.015	0.078	0.753	0.003	0.139	0.042
	Maximum Daily VMT	Peak Daily Emissions (lbs/day)					
Truck Type	(miles/day)	ROG	NOx	CO	SOx	PM10	PM2.5
Dump Truck	480	0.06	0.80	0.33	0.01	0.20	0.07
Concrete Trucks	160	0.02	0.27	0.11	0.00	0.07	0.02
Delivery Trucks (non-soil)	400	0.05	0.67	0.27	0.01	0.17	0.05
Gravel/paving trucks	240	0.03	0.40	0.16	0.01	0.10	0.03
Haul trucks (soil)	20	0.00	0.03	0.01	0.00	0.01	0.00
Truck Subtotal	1,300	0.15	2.16	0.89	0.04	0.55	0.18
Workers	2,400	0.08	0.41	3.99	0.02	0.73	0.22
Grand Total	**3,700**	**0.23**	**2.58**	**4.88**	**0.06**	**1.29**	**0.40**

Note:

PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface.

Lower San Felipe Intake Alternative - Pipeline Option
Haul Truck and Construction Worker Commuting Emissions

Table A-129. Annual Mitigated Emissions

Truck Emission Factors (g/mi)			0.053	0.755	0.311	0.014	0.190	0.061	0.053	0.774	0.315	0.014	0.190	0.061	0.054	0.797	0.321	0.014	0.190	0.061
Worker Emission Factors (g/mi)			0.015	0.078	0.753	0.003	0.136	0.042	0.014	0.069	0.692	0.003	0.136	0.042	0.012	0.062	0.640	0.003	0.136	0.042
	Annual VMT (miles/year)		**Annual Emissions - 2020 (tons/year)**						**Annual Emissions - 2021 (tons/year)**						**Annual Emissions - 2022 (tons/year)**					
Truck Type	**2020 - 2021**	**2022**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Dump Truck	2,909	2,182	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	0.00	0.00
Concrete Trucks	145	109	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	0.00	0.00
Delivery Trucks (non-soil)	56,727	42,545	0.00	0.05	0.02	0.00	0.01	0.00	0.00	0.05	0.02	0.00	0.01	0.00	0.00	0.04	0.02	0.00	0.01	0.00
Gravel/paving trucks	7,273	5,455	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haul trucks (soil)	14,909	11,182	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Truck Subtotal	81,963	61,473	0.00	0.07	0.03	0.00	0.02	0.01	0.00	0.07	0.03	0.00	0.02	0.01	0.00	0.05	0.02	0.00	0.01	0.00
Workers	436,364	327,273	0.01	0.04	0.36	0.00	0.07	0.02	0.01	0.03	0.33	0.00	0.07	0.02	0.00	0.02	0.23	0.00	0.05	0.02
Grand Total	**518,327**	**388,746**	**0.01**	**0.11**	**0.39**	**0.00**	**0.08**	**0.03**	**0.01**	**0.10**	**0.36**	**0.00**	**0.08**	**0.03**	**0.01**	**0.08**	**0.25**	**0.00**	**0.06**	**0.02**

Note:
PM_{10} and $PM_{2.5}$ emission factors include exhaust, tire wear, brake wear, and resuspension of loose material on the road surface (paved road dust). Annual emissions include natural control efficiency from precipitation.

Start Year: 2020
County: San Joaquin Valley

Conversions

1 pound = 453.6 grams
1 ton = 2000 pounds

Emission Factors - Weighted Average
Passenger Vehicles (Light duty automobiles and trucks)

Table A-130. Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.0153	0.0223	0.0776	0.7533	0.0031	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2021	0.0137	0.0199	0.0692	0.6917	0.0030	0.0018	0.0080	0.0368	0.0465	0.0017	0.0020	0.0158	0.0194
	2022	0.0123	0.0179	0.0621	0.6401	0.0029	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0111	0.0161	0.0560	0.5941	0.0028	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2024	0.0100	0.0146	0.0507	0.5567	0.0026	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
San Francisco Bay Area	2020	0.0139	0.0202	0.0711	0.6967	0.0030	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0195
	2021	0.0125	0.0182	0.0638	0.6437	0.0029	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2022	0.0113	0.0164	0.0576	0.5996	0.0028	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0102	0.0149	0.0522	0.5596	0.0027	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2024	0.0093	0.0135	0.0475	0.5237	0.0025	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Emission Factors - Weighted Average
Heavy-Duty Trucks (Diesel)

Table A-131. Mitigated Emission Factors for Haul and Delivery Trucks

		grams per mile												
County	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.053	0.060	0.755	0.311	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2021	0.053	0.061	0.774	0.315	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2022	0.054	0.062	0.797	0.321	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2023	0.056	0.064	0.840	0.332	0.014	0.004	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2024	0.057	0.065	0.855	0.336	0.014	0.004	0.036	0.062	0.101	0.004	0.009	0.026	0.039
San Francisco Bay Area	2020	0.054	0.062	0.782	0.322	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2021	0.055	0.063	0.802	0.327	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2022	0.056	0.064	0.826	0.333	0.014	0.003	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2023	0.058	0.066	0.871	0.344	0.014	0.004	0.036	0.062	0.101	0.003	0.009	0.026	0.039
	2024	0.059	0.067	0.886	0.348	0.014	0.004	0.036	0.062	0.101	0.004	0.009	0.026	0.039

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-132. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed October 18, 2018].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Default Assumptions

Number precipitation days >0.1 inches

San Joaquin Valley Air Basin	45
San Francisco Bay Area Air Basin	64

Road silt loading	0.03	g/m^2	(AP-42, ADT > 10,000, ubiquitous baseline)
Average vehicle weight	2.2	tons	

Source: CAPCOA. 2017. California Emissions Estimator Model User's Guide, Version 2016.3.2, Appendix D: Default Data Tables. Prepared by BREEZE Software, A Division of Trinity Consultants in collaboration with South Coast Air Quality Management District and the California Air Districts. November. Available online at: http://www.caleemod.com/ [Accessed on October 18, 2018].

Table A-133. Paved Road Dust Emission Factors

Air Basin	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
San Joaquin Valley	0.092	0.023	0.089	0.022
San Francisco Bay Area	0.092	0.023	0.088	0.022

Note:

Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Lower San Felipe Intake Alternative - Tunnel Option
Marine Emissions

Table A-134. Mitigated Propulsion Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	1,274	6	2015	21	0.50	0.948	0.852	0.720	0.21	0.67	0.44	0.25	4.09	0.08	0.68	3.73
Crew and Supply	439	6	2015	22	0.45	0.948	0.852	0.720	0.21	0.67	0.44	0.25	3.99	0.08	0.68	3.73

Note:
Barges and dredgers are not typically self-propelled and emissions from barge/dredger propulsion engines are not estimated.
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-135. Mitigated Propulsion Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	0.31	0.04	0.28	2.00	0.0055	0.31	0.04	0.28	2.02	0.0055	0.31	0.04	0.29	2.04	0.0055
Crew and Supply	0.27	0.04	0.25	1.79	0.0055	0.27	0.04	0.25	1.81	0.0055	0.27	0.04	0.26	1.83	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Table A-136. Mitigated Auxiliary Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	111	6	2015	23	0.31	0.948	0.852	0.720	0.14	0.44	0.28	0.16	5.32	0.22	0.99	3.73
Crew and Supply	79	6	2015	22	0.43	0.948	0.852	0.720	0.14	0.44	0.28	0.16	5.32	0.22	0.99	3.73

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-137. Mitigated Auxiliary Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	0.24	0.06	0.24	1.20	0.0055	0.24	0.07	0.24	1.21	0.0055	0.25	0.07	0.24	1.22	0.0055
Crew and Supply	0.34	0.09	0.33	1.67	0.0055	0.34	0.09	0.33	1.69	0.0055	0.34	0.09	0.34	1.70	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Tunneling and Spreading of Spoils)

Table A-138. Maximum Daily Mitigated Marine Vessel Emissions

Vessel Type	Quantity	Trips per Day	Hours per Trip	No. Propulsion Engines	No. Auxiliary Engines	Propulsion Engine Emissions (lbs/day)						Auxiliary Engine Emissions (lbs/day)						Total Engine Emissions (lbs/day)					
						ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5
Tug Boats	2	2	2	2	2	12.38	13.85	89.80	0.25	1.82	1.68	0.93	0.95	4.72	0.02	0.25	0.23	13.31	14.80	94.51	0.27	2.08	1.91
Crew and Supply	2	2	2	3	1	5.73	6.27	41.65	0.13	0.84	0.78	0.46	0.47	2.33	0.01	0.13	0.12	6.19	6.74	43.98	0.14	0.97	0.89
Total	**4**	**4**	**4**	**5**	**3**	**18.12**	**20.12**	**131.44**	**0.38**	**2.67**	**2.45**	**1.39**	**1.42**	**7.05**	**0.03**	**0.38**	**0.35**	**19.50**	**21.54**	**138.49**	**0.41**	**3.05**	**2.80**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

Table A-139. Annual Mitigated Marine Vessel Emissions by Year

	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)						Annual Emissions - 2023 (tons per year)					
Vessel Type	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Tug Boats																		
Propulsion Engines	0.29	0.33	2.11	0.01	0.04	0.04	0.50	0.56	3.64	0.01	0.07	0.07	0.04	0.05	0.31	0.00	0.01	0.01
Auxiliary Engines	0.02	0.02	0.11	0.00	0.01	0.01	0.04	0.04	0.19	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00	0.00
Tug Boats Subtotal	0.31	0.35	2.22	0.01	0.05	0.04	0.54	0.60	3.83	0.01	0.08	0.08	0.05	0.05	0.33	0.00	0.01	0.01
Crew and Supply																		
Propulsion Engines	0.13	0.15	0.98	0.00	0.02	0.02	0.23	0.25	1.69	0.01	0.03	0.03	0.02	0.02	0.15	0.00	0.00	0.00
Auxiliary Engines	0.01	0.01	0.05	0.00	0.00	0.00	0.02	0.02	0.09	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Crew and Supply Subtotal	0.15	0.16	1.03	0.00	0.02	0.02	0.25	0.27	1.78	0.01	0.04	0.04	0.02	0.02	0.15	0.00	0.00	0.00
Grand Total	**0.46**	**0.51**	**3.25**	**0.01**	**0.07**	**0.07**	**0.79**	**0.87**	**5.61**	**0.02**	**0.12**	**0.11**	**0.07**	**0.08**	**0.48**	**0.00**	**0.01**	**0.01**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

ROG, CO, NOx, or PM Emission Estimation Method

$$E = EF_0 \times F \times \left(1 + D \times \frac{A}{UL}\right) \times HP \times LF \times Hr$$

Where:
E = amount of emissions of a pollutant (PM and NOx) emitted during one period
EF_0 = the model year, horsepower, and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
F = fuel correction factor that accounts for emission reduction benefits from burning cleaner fuel
D = horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
A = age of the engine when the emissions are estimated
UL = 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

Source: California Air Resources Board. 2010. Staff Report: Initial Statement of Reasons for the Proposed Rulemaking. Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline.
http://www.arb.ca.gov/ports/marinevess/harborcraft/hcdocuments.htm

SOx Emission Estimation Method

$$F_c = HP \times LF \times Hr \times BSFC$$

Where:	Fc	=	fuel consumed per engine per year
	HP	=	rated horsepower of the engine
	Hr	=	number of annual operating hours of the engine
	LF	=	vessel type specific engine load factor
	BSFC	=	brake specific fuel consumption rate; 0.078 gal/kW-hr or 184 g/hp-hr

The sulfur content is assumed to be 15ppm per 13 CCR 2281(a).

Conversion Factors

453.6	grams per pound
2000	pounds per ton

PMSIZE Profile

0.92	PM2.5:PM10

Profile No. 425, Diesel Vehicle Exhaust

Trips per Project

2021	94
2022	162
2023	14
Total	270

Mitigation Measures

Ships, Propulsion Engines

-Selective Catalytic Reduction with low sulfur fuel	85%	NOx reduction

Ships, Auxiliary Engines

-Selective Catalytic Reduction with low sulfur fuel	85%	NOx reduction

Tug Boats	61%	VOC reduction
Crew and Supply	52%	VOC reduction

Lower San Felipe Intake Alternative - Pipeline Option
Marine Emissions

Table A-140. Mitigated Propulsion Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	1,274	6	2015	21	0.50	0.948	0.852	0.720	0.21	0.67	0.44	0.25	4.09	0.08	0.68	3.73
Crew and Supply	439	6	2015	22	0.45	0.948	0.852	0.720	0.21	0.67	0.44	0.25	3.99	0.08	0.68	3.73

Note:
Barges and dredgers are not typically self-propelled and emissions from barge/dredger propulsion engines are not estimated.
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-141. Mitigated Propulsion Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	0.31	0.04	0.28	2.00	0.0055	0.31	0.04	0.28	2.02	0.0055	0.31	0.04	0.29	2.04	0.0055
Crew and Supply	0.27	0.04	0.25	1.79	0.0055	0.27	0.04	0.25	1.81	0.0055	0.27	0.04	0.26	1.83	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Table A-142. Mitigated Auxiliary Engine Emission Factor Equation Variables

Vessel Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Tug Boats	111	6	2015	23	0.31	0.948	0.852	0.720	0.14	0.44	0.28	0.16	5.32	0.22	0.99	3.73
Crew and Supply	79	6	2015	22	0.43	0.948	0.852	0.720	0.14	0.44	0.28	0.16	5.32	0.22	0.99	3.73

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-143. Mitigated Auxiliary Engine Emission Factors

Vessel Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)					Aged Emission Factor - 2023 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Tug Boats	0.24	0.06	0.24	1.20	0.0055	0.24	0.07	0.24	1.21	0.0055	0.25	0.07	0.24	1.22	0.0055
Crew and Supply	0.34	0.09	0.33	1.67	0.0055	0.34	0.09	0.33	1.69	0.0055	0.34	0.09	0.34	1.70	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Lay Pipeline)

Table A-144. Maximum Daily Mitigated Marine Vessel Emissions

Vessel Type	Quantity	Trips per Day	Hours per Trip	No. Propulsion Engines	No. Auxiliary Engines	Propulsion Engine Emissions (lbs/day)						Auxiliary Engine Emissions (lbs/day)						Total Engine Emissions (lbs/day)					
						ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5	ROG	NOx	CO	SO2	PM10	PM2.5
Tug Boats	4	2	2	2	2	24.77	27.70	179.59	0.50	3.65	3.36	1.86	1.90	9.43	0.04	0.51	0.47	26.62	29.61	189.03	0.54	4.16	3.82
Crew and Supply	4	2	2	3	1	11.46	12.54	83.29	0.26	1.69	1.55	0.92	0.94	4.66	0.02	0.25	0.23	12.38	13.48	87.96	0.27	1.94	1.78
Total	**8**	**4**	**4**	**5**	**3**	**36.23**	**40.24**	**262.88**	**0.75**	**5.33**	**4.91**	**2.78**	**2.84**	**14.10**	**0.06**	**0.76**	**0.70**	**39.01**	**43.09**	**276.98**	**0.81**	**6.09**	**5.61**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

Table A-145. Annual Mitigated Marine Vessel Emissions by Year

	Annual Emissions - 2021 (tons per year)						Annual Emissions - 2022 (tons per year)					
Vessel Type	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**	**ROG**	**NOx**	**CO**	**SO2**	**PM10**	**PM2.5**
Tug Boats												
Propulsion Engines	3.00	3.36	21.78	0.06	0.44	0.41	1.57	1.76	11.40	0.03	0.23	0.21
Auxiliary Engines	0.23	0.23	1.14	0.01	0.06	0.06	0.12	0.12	0.60	0.00	0.03	0.03
Tug Boats Subtotal	3.23	3.59	22.92	0.07	0.50	0.46	1.69	1.88	12.00	0.03	0.26	0.24
Crew and Supply												
Propulsion Engines	1.39	1.52	10.10	0.03	0.20	0.19	0.73	0.80	5.29	0.02	0.11	0.10
Auxiliary Engines	0.11	0.11	0.57	0.00	0.03	0.03	0.06	0.06	0.30	0.00	0.02	0.01
Crew and Supply Subtotal	1.50	1.63	10.66	0.03	0.23	0.22	0.79	0.86	5.59	0.02	0.12	0.11
Grand Total	**4.73**	**5.22**	**33.58**	**0.10**	**0.74**	**0.68**	**2.48**	**2.74**	**17.59**	**0.05**	**0.39**	**0.36**

Note:
Hours per trip estimated to assume that marine vessels would be operating 8 hours per day.
PM2.5 emissions estimated using PM10 emissions and the California Emission Inventory and Reporting System (CEIDARS) particulate matter (PM) speciation profile no. 425 for diesel vehicle exhaust.
"Trips" represent one-day trips and are double the data provided by the engineers.

ROG, CO, NOx, or PM Emission Estimation Method

$$E = EF_0 \times F \times \left(1 + D \times \frac{A}{UL}\right) \times HP \times LF \times Hr$$

Where:
- E = amount of emissions of a pollutant (PM and NOx) emitted during one period
- EF_0 = the model year, horsepower, and engine use (propulsion or auxiliary) specific zero hour emission factor (when engine is new)
- F = fuel correction factor that accounts for emission reduction benefits from burning cleaner fuel
- D = horsepower and pollutant specific engine deterioration factor, which is the percentage increase of emission factors at the end of the useful life of the engine
- A = age of the engine when the emissions are estimated
- UL = 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

Source: California Air Resources Board. 2010. Staff Report: Initial Statement of Reasons for the Proposed Rulemaking. Amendments to the Regulations to Reduce Emissions from Diesel Engines on Commercial Harbor Craft Operated Within California Waters and 24 Nautical Miles of the California Baseline.
http://www.arb.ca.gov/ports/marinevess/harborcraft/hcdocuments.htm

SOx Emission Estimation Method

$$F_c = HP \times LF \times Hr \times BSFC$$

Where:	Fc	=	fuel consumed per engine per year
	HP	=	rated horsepower of the engine
	Hr	=	number of annual operating hours of the engine
	LF	=	vessel type specific engine load factor
	BSFC	=	brake specific fuel consumption rate; 0.078 gal/kW-hr or 184 g/hp-hr

The sulfur content is assumed to be 15ppm per 13 CCR 2281(a).

Conversion Factors

453.6	grams per pound
2000	pounds per ton

Trips per Project

2021	485
2022	254
Total	739

PMSIZE Profile

0.92 PM2.5:PM10
Profile No. 425, Diesel Vehicle Exhaust

Mitigation Measures

Ships, Propulsion Engines
-Selective Catalytic Reduction with low sulfur fuel 85% NOx reduction

Ships, Auxiliary Engines
-Selective Catalytic Reduction with low sulfur fuel 85% NOx reduction

Tug Boats 61% VOC reduction
Crew and Supply 52% VOC reduction

http://www.aqmd.gov/home/rules-compliance/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies/ocean-going-vessels

Lower San Felipe Intake Alternative - Pipeline Option
Dredge Emissions

Table A-146. Mitigated Emission Factor Equation Variables

Engine Type	Average HP	Average Age	Model Year	Useful Life	Load Factor	Fuel Correction Factor			Deterioration Factor				Zero-Hour Emission Factor (g/bhp-hr)			
						NOx	PM	ROG	NOx	PM	ROG	CO	NOx	PM	ROG	CO
Compressor	353	6	2015	19.5	0.5384	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92
Crane	377	6	2015	9	0.42016	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92
Deck door engine	86	6	2015	16	0.88989	0.948	0.852	0.72	0.14	0.44	0.28	0.16	2.53	0.01	0.1089	3.05
Generator	464	6	2015	22.5	0.74576	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92
Hoist swing winch	379	6	2015	27	0.31182	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92
Other	390	6	2015	16	0.80208	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92
Pump	518	6	2015	21	0.71213	0.948	0.852	0.72	0.21	0.67	0.44	0.25	1.36	0.01	0.0847	0.92

Note:
Model year equal to construction start date (year) minus average age of vessel.
A fuel correction factor of 0.72 for hydrocarbon emissions will be applied to all diesel-powered engines beginning with the 1994 calendar year.

Table A-147. Mitigated Dredging Auxiliary Engine Emission Factors

Engine Type	Aged Emission Factor - 2021 (g/bhp-hr)					Aged Emission Factor - 2022 (g/bhp-hr)				
	NOx	PM10	ROG	CO	SO2	NOx	PM10	ROG	CO	SO2
Compressor	0.74	0.01	0.04	0.53	0.0055	0.75	0.01	0.04	0.54	0.0055
Crane	0.62	0.01	0.03	0.45	0.0055	0.63	0.01	0.03	0.46	0.0055
Deck door engine	2.25	0.01	0.08	2.88	0.0055	2.27	0.01	0.08	2.90	0.0055
Generator	1.02	0.01	0.05	0.73	0.0055	1.02	0.01	0.05	0.74	0.0055
Hoist swing winch	0.42	0.00	0.02	0.30	0.0055	0.42	0.00	0.02	0.31	0.0055
Other	1.12	0.01	0.06	0.81	0.0055	1.13	0.01	0.06	0.82	0.0055
Pump	0.97	0.01	0.05	0.70	0.0055	0.98	0.01	0.05	0.71	0.0055

Note:
Starting in 2007, California required the use of ultra low sulfur diesel fuel (ULSD - 15 ppmw sulfur).
SO2 (g/hp-hr) = (S content in X/1,000,000) x (2 SO2/g S) x BSFC (184 g/hp-hr)

Construction Start Date 2021 (Lay Pipeline)

Table A-148. Mitigated Maximum Daily Emissions

Type	Quantity	Hours/ Day	Daily Emissions (lbs/day)					
			ROG	NOx	CO	SO2	PM10	PM2.5
Compressor	1	20	0.58	11.50	8.30	0.09	0.09	0.08
Crane	1	20	0.55	10.27	7.50	0.09	0.09	0.08
Deck door engine	1	20	0.29	8.52	10.91	0.02	0.03	0.03
Generator	1	20	1.04	20.77	14.97	0.11	0.15	0.14
Hoist swing winch	1	20	0.35	7.03	5.06	0.09	0.05	0.05
Other	1	20	0.98	19.18	13.88	0.09	0.15	0.14
Pump	1	20	1.12	22.23	16.03	0.13	0.17	0.15
		Total	**4.91**	**99.50**	**76.65**	**0.62**	**0.72**	**0.66**

Note: Emissions based on 2021 calendar year because this would represent the worst-case (highest) emissions scenario.

Table A-149. Mitigated Annual Emissions

Type	Trips/ Project	Trips per Year 2021	Trips per Year 2022	Hours/ Day	Annual Emissions - 2021 (tons/year) ROG	NOx	CO	SO2	PM10	PM2.5	Annual Emissions - 2022 (tons/year) ROG	NOx	CO	SO2	PM10	PM2.5
Compressor	12	11	1	20	0.00	0.06	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Crane	12	11	1	20	0.00	0.06	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Deck door engine	12	11	1	20	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Generator	12	11	1	20	0.01	0.11	0.08	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Hoist swing winch	12	11	1	20	0.00	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	12	11	1	20	0.01	0.11	0.08	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
Pump	12	11	1	20	0.01	0.12	0.09	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
			Total		**0.03**	**0.55**	**0.42**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.04**	**0.00**	**0.00**	**0.00**

Conversions
453.6 g/lb
2,000 lbs/ton

PMSIZE Ratio
0.92 PM2.5:PM10
Profile No. 425, Diesel Vehicle Exhaust

Dredge Trips
1 dredge (1 trip per day)
12 trips per project

CVP Enlarged Reservoir Expansion Alternative

Table A-150. Mitigated Onsite Construction Equipment Emissions

Equipment Type	Quantity	OFFROAD Description	HP	Hours per Day	Emission Factors (g/hp-hr or g/mi)						Daily Emissions (lb/day)						Annual Emissions (tons/year)					
					ROG	CO	NOX	SO2	PM10	PM2.5	ROG	CO	NOX	SO2	PM10	PM2.5	ROG	CO	NOX	SO2	PM10	PM2.5
Excavators	3	ConstMin - Excavators	158	20	0.027	1.102	0.020	0.002	0.004	0.003	0.55	23.02	0.42	0.04	0.08	0.07	0.10	4.20	0.08	0.01	0.01	0.01
Bulldozers	4	ConstMin - Rubber Tired Dozers	249	20	0.034	0.400	0.021	0.002	0.004	0.004	1.48	17.57	0.93	0.08	0.17	0.16	0.27	3.21	0.17	0.02	0.03	0.03
Cranes/Lifts	5	ConstMin - Cranes	231	20	0.018	0.278	0.015	0.001	0.003	0.002	0.91	14.14	0.77	0.07	0.13	0.12	0.17	2.58	0.14	0.01	0.02	0.02
Compactors	5	ConstMin - Rollers	80	20	0.030	1.185	0.101	0.002	0.004	0.003	0.53	20.89	1.79	0.03	0.06	0.06	0.10	3.81	0.33	0.01	0.01	0.01
Graders	2	ConstMin - Graders	188	20	0.029	0.400	0.022	0.002	0.004	0.004	0.47	6.63	0.36	0.03	0.06	0.06	0.09	1.21	0.07	0.01	0.01	0.01
Scrapers	2	ConstMin - Scrapers	367	20	0.032	0.465	0.026	0.002	0.004	0.004	1.04	15.04	0.83	0.08	0.14	0.13	0.19	2.75	0.15	0.01	0.03	0.02
Loaders (small)	2	ConstMin - Rubber Tired Loaders	188	20	0.029	0.363	0.019	0.002	0.003	0.003	0.48	6.02	0.32	0.03	0.06	0.05	0.09	1.10	0.06	0.01	0.01	0.01
Loaders (large)	3	ConstMin - Rubber Tired Loaders	541	20	0.034	0.366	0.020	0.002	0.004	0.003	2.40	26.18	1.42	0.13	0.26	0.24	0.44	4.78	0.26	0.02	0.05	0.04
Dump trucks	13	ConstMin - Off-Highway Trucks	403	20	0.040	0.394	0.021	0.002	0.004	0.004	9.20	90.90	4.90	0.43	0.92	0.85	1.68	16.59	0.89	0.08	0.17	0.15
Water Trucks	5		N/A	20	0.068	1.170	0.079	0.004	0.051	0.024	0.22	3.87	0.26	0.01	0.17	0.08	0.04	0.71	0.05	0.00	0.03	0.01
Offroad equipment have units of g/hp-hr; onroad equipment have units of g/mi.										**Total**	**17.29**	**224.28**	**12.00**	**0.94**	**2.06**	**1.82**	3.16	40.93	2.19	0.17	0.38	0.33

Note:
Offroad equipment emission factors from OFFROAD2017 model.
Onroad truck emission factors from EMFAC2014.

Sources:
OFFROAD2017: https://www.arb.ca.gov/orion/
EMFAC2014: http://www.arb.ca.gov/emfac/2014/

Operating Schedule

2 shifts per day
10 hours per shift
365 days per year

Construction Start: 2020

Speed Limit for Onroad Vehicles (Onsite)

15 miles per hour
(speed limit is 35 mph on site, but it is assumed that a water truck will be operating at a lower rate of speed)

Conversions

453.6 grams per pound
2,000 pounds per ton

Mitigation Measures

Diesel oxidation catalyst
80% NOx reduction

CVP Enlarged Reservoir Expansion Alternative
Offsite Construction Emissions

Table A-151. Mitigated Emission Factors (g/mi)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.015	0.753	0.078	0.003	0.002	0.008	0.037	0.100	0.147	0.002	0.002	0.016	0.025	0.045
Haul trucks	0.053	0.311	0.755	0.014	0.003	0.036	0.062	0.100	0.201	0.003	0.009	0.026	0.025	0.064

Table A-152. Mitigated Daily Emissions (pounds per day)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.59	28.83	2.97	0.12	0.07	0.31	1.41	3.84	5.63	0.06	0.08	0.60	0.96	1.71
Haul trucks	2.23	13.15	31.97	0.59	0.14	1.52	2.61	4.25	8.53	0.13	0.38	1.12	1.06	2.70
Total	**2.81**	**41.98**	**34.94**	**0.71**	**0.21**	**1.83**	**4.02**	**8.10**	**14.16**	**0.20**	**0.46**	**1.72**	**2.02**	**4.40**

Table A-153. Mitigated Annual Emissions (tons per year)

Source	ROG	CO	NOx	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Paved Road Dust	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Paved Road Dust	PM2.5 Total
Construction workers	0.11	5.26	0.54	0.02	0.01	0.06	0.26	0.70	1.03	0.01	0.01	0.11	0.18	0.31
Haul trucks	0.41	2.40	5.83	0.11	0.03	0.28	0.48	0.78	1.56	0.02	0.07	0.20	0.19	0.49
Total	**0.51**	**7.66**	**6.38**	**0.13**	**0.04**	**0.33**	**0.73**	**1.48**	**2.58**	**0.04**	**0.08**	**0.31**	**0.37**	**0.80**

One-way trip distance			Maximum Daily Workers and Trucks		
Workers	40	miles per trip	217	workers per day	(130 day time workers and 87 night time workers)
Trucks	40	miles per trip	240	trucks per day	

Conversions			Operating Schedule		Construction Start Year
453.6	grams per pound		365	days per year	2020
2,000	pounds per ton				

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Material Handling

Excavated Volume
11,200 cubic yards per shift
8,176,000 cubic yards per year

Equation (AP-42, Chapter 13.2.4):

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

where:
E = emission factor, pound per ton
k = particle size multiplier
U = mean wind speed, miles per hour
M = material moisture content, %

Average Wind Speed 9.64 mph
Source: MesoWest, Station CF031 (Rt. 152 San Luis), 2015 data. Accessed on: July 27, 2016. Available at: mesowest.utah.edu.

Material Moisture Content: 7.9 %
Source: EPA. 1998. AP-42, Chapter 11-9, Overburden moisture content, bulldozing.

Table A-154. Material Handling Emissions

		EF	Emissions	
Size	k	lb/ton	lbs/day	tpy
PM10	0.35	3.8E-04	8.4	1.5
PM2.5	0.053	5.8E-05	1.3	0.2

Operating Schedule
2 shift per day
7 days per week
365 days per year

Density
1.25 tons per cubic yard
Note: CalEEMod assumes haul trucks can handle 20 tons or 16 cy.

Number of Drops
2 drops per truck *(one drop at borrow site and one drop at dam site)*

Dust Control
61% reduction from watering at least 3 times per day
Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Grading

Operating Schedule

2	graders
7.1	miles per hour (AP-42, Table 11.9-3)
20	hours per day (total)
142	miles per day
51,830	miles per year *assumes 365 days per year*

Equations (AP-42, Chapter 11.9):

$TSP = 0.040(S)^{2.5}$ and $PM15 = 0.051(S)^{2.0}$

where:
S = mean vehicle speed, miles per hour

Scaling Factors

PM10	0.60	(multiply the 15-micron equation by this fraction to determine emissions)
PM2.5	0.031	(multiply the TSP equation by this fraction to determine emissions)

Table A-155. Grading Emissions

	EF	Emissions	
Size	lb/VMT	lbs/day	tpy
PM10	1.54	85.4	15.6
PM2.5	0.17	9.2	1.7

Dust Control

61% reduction from watering at least 3 times per day

Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Bulldozing

Operating Schedule

4	bulldozers	
20	hours per day (total)	
7,300	hours per year (total)	*assumes 365 days per year*

Equations (AP-42, Chapter 11.9):

$$TSP = \frac{5.7(s)^{1.2}}{M^{1.3}} \quad \text{and} \quad PM15 = \frac{1.0(s)^{1.5}}{M^{1.4}}$$

where:

s = silt content	6.9 %	(AP-42, Table 11.9-3, Overburden)
M = material moisture content	7.9 %	(AP-42, Table 11.9-3, Overburden)

Scaling Factors

PM10	0.75	(multiply the 15-micron equation by this fraction to determine emissions)
PM2.5	0.105	(multiply the TSP equation by this fraction to determine emissions)

Table A-156. Bulldozing Emissions

	EF	Emissions	
Size	lb/hr	lbs/day	tpy
PM10	0.75	5.9	1.1
PM2.5	0.41	3.2	0.6

Dust Control

61% reduction from watering at least 3 times per day

Source: CalEEMod

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Paved Road Dust (Haul Roads)

Number of Trucks	13		
Excavated quantity	11,200	cubic yards per shift	
Number of shifts	2	shift per day	
	1,723	cubic yards per truck per day	
	46.75	cubic yards per truck (body capacity)	
	74	trips per day per truck (loaded and unloaded trips)	
Haul Road Length	0.8	miles one-way (paved road; total route is 3.2 miles)	
	770	miles per day	
	280,904	miles per year	*assumes 365 days per year*

Table A-157. Paved Road Dust Emissions

	EF, g/VMT		Emissions	
Size	Uncontrolled	Controlled	lbs/day	tpy
PM10	22.2	21.5	7.5	1.3
PM2.5	5.6	5.4	1.9	0.3

Note: Uncontrolled EF used for daily emissions and controlled EF used for annual emissions.

Dust Control

80% assumes pipe-grid trackout-control device installed

Source: SCAQMD, Mitigation Measures, Fugitive Dust from Paved Roads
http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies/fugitive-dust

Conversions

453.6 grams per pound
2,000 pounds per ton

Percentage of haul route paved (estimated from Google Earth) 25%

CVP Enlarged Reservoir Expansion Alternative
Fugitive Dust Emissions - Unpaved Road Dust (Haul Roads)

Number of Trucks	13		
Excavated quantity	11,200	cubic yards per shift	
Number of shifts	2	shift per day	
	1,723	cubic yards per truck per day	
	46.75	cubic yards per truck (body capacity)	
	74	trips per day per truck (loaded and unloaded trips)	
Haul Road Length	2.4	miles one-way (unpaved road; total route is 3.2 miles)	
	2,309	miles per day	
	842,712	miles per year	*assumes 365 days per year*

Equations (AP-42, Chapter 13.2.2):

$$E = k(s/12)^a(W/3)^b$$

$$E_{ext} = E[(365 - P)/365]$$

where:
k, a, and b are empirical constants
E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
Eext = annual size-specific emission factor extrapolated for natural mitigation
P = number of days in a year with at least 0.254 mm (0.01 in) of precipitation

silt content (construction)	8.5	%	(AP-42, Table 13.2.2-1)
days of precipitation	49		(CalEEMod default)
Unloaded truck weight	50	tons	
Loaded truck weight	126	tons	
Average vehicle weight	88	tons	(estimated from eqiupment specifications)

Table A-158. Mitigated Unpaved Road Dust Emissions

Size	k	a	b	EF, lb/VMT		Emissions	
				Uncontrolled	Controlled	lbs/day	tpy
PM10	1.5	0.9	0.45	5.0	4.4	116.1	18.3
PM2.5	0.15	0.9	0.45	0.5	0.4	11.6	1.8

Source: AP-42, Table 13.2.2-2

Dust Control

61%	reduction from watering at least 3 times per day
99%	paving all unpaved roads (mitigation)

Source: CalEEMod

Percentage of haul route unpaved 75%
(estimated from Google Earth)

Conversions

2,000	pounds per ton

EMFAC2014 Emission Factors
On-Road Motor Vehicles

Table A-159. Mitigated Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.0153	0.0223	0.0776	0.7533	0.0031	0.0018	0.0080	0.0368	0.0466	0.0017	0.0020	0.0158	0.0194
	2021	0.0137	0.0199	0.0692	0.6917	0.0030	0.0018	0.0080	0.0368	0.0465	0.0017	0.0020	0.0158	0.0194
	2022	0.0123	0.0179	0.0621	0.6401	0.0029	0.0018	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0194
	2023	0.0111	0.0161	0.0560	0.5941	0.0028	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2024	0.0100	0.0146	0.0507	0.5567	0.0026	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Table A-160. Mitigated Emission Factors for Haul and Delivery Trucks

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Joaquin Valley	2020	0.0526	0.0599	0.7553	0.3107	0.0140	0.0033	0.0360	0.0617	0.1010	0.0031	0.0090	0.0265	0.0386
	2021	0.0534	0.0608	0.7745	0.3155	0.0140	0.0034	0.0360	0.0617	0.1011	0.0032	0.0090	0.0265	0.0387
	2022	0.0544	0.0619	0.7971	0.3211	0.0140	0.0034	0.0360	0.0617	0.1012	0.0033	0.0090	0.0265	0.0388
	2023	0.0562	0.0640	0.8405	0.3318	0.0141	0.0036	0.0360	0.0617	0.1014	0.0035	0.0090	0.0265	0.0389
	2024	0.0568	0.0647	0.8553	0.3355	0.0140	0.0037	0.0360	0.0617	0.1014	0.0035	0.0090	0.0265	0.0390

Table A-161. Mitigated Emission Factors for On-Site Water Trucks (San Joaquin Valley Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2020	5	0.185	0.211	0.141	3.206	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.025
2020	10	0.139	0.158	0.117	2.398	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.024
2020	15	0.068	0.077	0.079	1.170	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2020	20	0.026	0.030	0.052	0.455	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2020	25	0.016	0.018	0.039	0.273	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2020	30	0.012	0.014	0.033	0.206	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2020	35	0.009	0.011	0.028	0.164	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2020	40	0.008	0.009	0.025	0.135	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2020	45	0.007	0.008	0.023	0.115	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2020	50	0.006	0.007	0.021	0.099	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2020	55	0.005	0.006	0.019	0.087	0.004	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2020	60	0.005	0.005	0.019	0.082	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2020	65	0.005	0.005	0.019	0.082	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2021	5	0.170	0.194	0.125	3.145	0.004	0.007	0.008	0.037	0.052	0.007	0.002	0.016	0.024
2021	10	0.127	0.145	0.104	2.351	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2021	15	0.062	0.071	0.069	1.146	0.004	0.006	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2021	20	0.024	0.028	0.046	0.446	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2021	25	0.014	0.016	0.035	0.268	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2021	30	0.011	0.012	0.029	0.202	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2021	35	0.009	0.010	0.025	0.161	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2021	40	0.007	0.008	0.022	0.133	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2021	45	0.006	0.007	0.020	0.112	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020

Table A-161. Mitigated Emission Factors for On-Site Water Trucks (San Joaquin Valley Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2021	50	0.005	0.006	0.018	0.097	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2021	55	0.005	0.005	0.017	0.085	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2021	60	0.004	0.005	0.016	0.080	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2021	65	0.004	0.005	0.016	0.080	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2022	5	0.158	0.180	0.112	3.103	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.024
2022	10	0.118	0.135	0.093	2.319	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.023
2022	15	0.058	0.066	0.062	1.130	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2022	20	0.022	0.026	0.041	0.440	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2022	25	0.013	0.015	0.031	0.264	0.004	0.004	0.008	0.037	0.048	0.004	0.002	0.016	0.021
2022	30	0.010	0.012	0.026	0.199	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2022	35	0.008	0.009	0.022	0.159	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2022	40	0.007	0.008	0.020	0.131	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2022	45	0.006	0.006	0.018	0.111	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2022	50	0.005	0.006	0.016	0.096	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2022	55	0.004	0.005	0.015	0.084	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2022	60	0.004	0.005	0.015	0.079	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2022	65	0.004	0.005	0.015	0.079	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	5	0.150	0.170	0.103	3.085	0.004	0.006	0.008	0.037	0.051	0.006	0.002	0.016	0.023
2023	10	0.112	0.127	0.085	2.304	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2023	15	0.054	0.062	0.057	1.122	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2023	20	0.021	0.024	0.037	0.437	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2023	25	0.013	0.014	0.028	0.262	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2023	30	0.010	0.011	0.024	0.198	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2023	35	0.008	0.009	0.020	0.158	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2023	40	0.006	0.007	0.018	0.130	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	45	0.005	0.006	0.016	0.110	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	50	0.005	0.005	0.015	0.095	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	55	0.004	0.005	0.014	0.083	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	60	0.004	0.004	0.013	0.079	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2023	65	0.004	0.004	0.013	0.079	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	5	0.143	0.162	0.095	3.074	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	10	0.106	0.121	0.079	2.295	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	15	0.052	0.059	0.052	1.117	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2024	20	0.020	0.023	0.035	0.436	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2024	25	0.012	0.014	0.026	0.261	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	30	0.009	0.010	0.022	0.197	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	35	0.007	0.008	0.019	0.157	0.004	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2024	40	0.006	0.007	0.017	0.130	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	45	0.005	0.006	0.015	0.110	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	50	0.004	0.005	0.014	0.095	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	55	0.004	0.004	0.013	0.083	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	60	0.004	0.004	0.012	0.079	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	65	0.004	0.004	0.012	0.078	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-162. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed July 17, 2012].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Offsite Construction Vehicles

Number precipitation days >0.1 inches
Merced County 49

Road silt loading 0.03 g/m^2 (AP-42, Table 13.2.1-2, ADT > 10,000, ubiquitous baseline)
Average vehicle weight 2.4 tons

Source: CAPCOA. 2013. California Emissions Estimator Model User's Guide, Version 2013.2, Appendix D: Default Data Tables. Prepared by ENVIRON International Corporation and California Air Districts. July. Available online at: http://www.caleemod.com/ [Accessed on July 28, 2016].

Table A-163. Paved Road Dust Emission Factors - Offsite Construction Vehicles

	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
County	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	0.100	0.025	0.097	0.024

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Haul Road Vehicles

Number precipitation days >0.1 inches			
Merced County	49		
Road silt loading	0.2	g/m^2	(AP-42, Table 13.2.1-2, ADT 500-5,000, ubiquitous baseline)
Unloaded truck weight	50	tons	
	126	tons	
Average vehicle weight	88	tons	(estimated from eqiupment specifications)

Table A-164. Paved Road Dust Emission Factors - Onsite Haul Trucks

	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
County	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	22.2	5.6	21.5	5.4

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

Mitigated Emissions Summary

Table A-165. New Pacheco Alternative - Maximum Daily Mitigated Emissions

Source	Daily Emissions (pounds per day)					
	ROG	NOx	CO	SOx	PM10	PM2.5
			2024			
Off-Road Construction Equipment	2,063.41	2,191.15	2,695.93	2,025.58	2,031.25	2,029.88
On-Road Haul Trucks and Delivery Vehicles	1.27	19.14	7.51	0.30	4.36	1.39
Construction Worker Commuting	0.49	2.51	27.71	0.13	7.77	2.35
Total	**2065.17**	**2212.80**	**2731.14**	**2026.02**	**2043.38**	**2033.62**
			2025			
Off-Road Construction Equipment	2,065.12	2,191.78	2,698.55	2,026.58	2,032.23	2,030.87
On-Road Haul Trucks and Delivery Vehicles	2.25	34.15	13.31	0.53	7.66	2.43
Construction Worker Commuting	0.45	2.30	25.93	0.13	7.77	2.35
Total	**2067.82**	**2228.23**	**2737.79**	**2027.24**	**2047.66**	**2035.65**
			2026			
Off-Road Construction Equipment	2,067.13	2,193.54	2,702.03	2,027.58	2,033.26	2,031.90
On-Road Haul Trucks and Delivery Vehicles	2.28	34.66	13.44	0.53	7.66	2.44
Construction Worker Commuting	0.62	3.19	36.64	0.19	11.65	3.52
Total	**2070.03**	**2231.39**	**2752.12**	**2028.30**	**2052.58**	**2037.86**
			2027			
Off-Road Construction Equipment	2,069.01	2,194.51	2,705.13	2,028.58	2,034.27	2,032.91
On-Road Haul Trucks and Delivery Vehicles	2.30	35.15	13.56	0.53	7.66	2.44
Construction Worker Commuting	0.60	3.12	36.58	0.19	12.29	3.71
Total	**2071.91**	**2232.78**	**2755.28**	**2029.30**	**2054.23**	**2039.05**
			2028			
Off-Road Construction Equipment	2,070.81	2,195.76	2,708.26	2,029.57	2,035.28	2,033.92
On-Road Haul Trucks and Delivery Vehicles	0.16	2.49	0.95	0.04	0.53	0.17
Construction Worker Commuting	0.56	2.90	34.72	0.18	12.28	3.70
Total	**2071.53**	**2201.14**	**2743.93**	**2029.80**	**2048.10**	**2037.79**
			2029			
Off-Road Construction Equipment	2,072.29	2,197.21	2,710.87	2,030.57	2,036.30	2,034.93
On-Road Haul Trucks and Delivery Vehicles	0.16	2.52	0.96	0.04	0.53	0.17
Construction Worker Commuting	0.30	1.57	19.10	0.10	7.11	2.14
Total	**2072.76**	**2201.29**	**2730.94**	**2030.71**	**2043.94**	**2037.24**
Maximum Daily Emissions	**2072.76**	**2232.78**	**2755.28**	**2030.71**	**2054.23**	**2039.05**
BAAQMD Significance Threshold	54	54	n/a	n/a	82	54
Significant?	Yes	Yes	n/a	n/a	Yes	Yes

Source: BAAQMD 2017

Table A-166. New Pacheco Alternative - Annual Mitigated Emissions

Source	Annual Emissions (tons per year)					
	ROG	NOx	CO	SOx	PM10	PM2.5
			2024			
Off-Road Construction Equipment	2,031.19	2,054.50	2,146.63	2,024.29	2,025.32	2,025.07
On-Road Haul Trucks and Delivery Vehicles	0.13	1.88	0.74	0.03	0.43	0.14
Construction Worker Commuting	0.07	0.33	3.68	0.02	1.03	0.31
Total	**2031.38**	**2056.72**	**2151.04**	**2024.34**	**2026.78**	**2025.52**
			2025			
Off-Road Construction Equipment	2,032.32	2,055.44	2,147.92	2,025.29	2,026.32	2,026.07
On-Road Haul Trucks and Delivery Vehicles	0.35	5.25	2.05	0.08	1.18	0.37
Construction Worker Commuting	0.07	0.37	4.15	0.02	1.24	0.38
Total	**2032.74**	**2061.06**	**2154.12**	**2025.39**	**2028.74**	**2026.82**
			2026			
Off-Road Construction Equipment	2,033.51	2,056.58	2,149.38	2,026.29	2,027.33	2,027.08
On-Road Haul Trucks and Delivery Vehicles	0.41	6.31	2.45	0.10	1.39	0.44
Construction Worker Commuting	0.10	0.52	5.93	0.03	1.89	0.57
Total	**2034.02**	**2063.40**	**2157.75**	**2026.41**	**2030.61**	**2028.09**
			2027			
Off-Road Construction Equipment	2,034.67	2,057.57	2,150.76	2,027.29	2,028.33	2,028.08
On-Road Haul Trucks and Delivery Vehicles	0.39	5.90	2.28	0.09	1.29	0.41
Construction Worker Commuting	0.10	0.51	5.96	0.03	2.00	0.60
Total	**2035.15**	**2063.98**	**2158.99**	**2027.41**	**2031.62**	**2029.09**
			2028			
Off-Road Construction Equipment	2,035.81	2,058.62	2,152.15	2,028.29	2,029.33	2,029.08
On-Road Haul Trucks and Delivery Vehicles	0.03	0.45	0.17	0.01	0.10	0.03
Construction Worker Commuting	0.09	0.47	5.65	0.03	2.00	0.60
Total	**2035.93**	**2059.54**	**2157.97**	**2028.32**	**2031.43**	**2029.71**
			2029			
Off-Road Construction Equipment	2,036.90	2,059.70	2,153.44	2,029.29	2,030.33	2,030.08
On-Road Haul Trucks and Delivery Vehicles	0.01	0.19	0.07	0.00	0.04	0.01
Construction Worker Commuting	0.04	0.20	2.48	0.01	0.92	0.28
Total	**2036.95**	**2060.09**	**2155.99**	**2029.30**	**2031.29**	**2030.37**
Maximum Annual Emissions	**2036.95**	**2063.98**	**2158.99**	**2029.30**	**2031.62**	**2030.37**
De Minimis Threshold	100	100	100	100	n/a	100
Significant?	Yes	Yes	Yes	Yes	n/a	Yes

Source: 40 CFR 93.153

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Emission Factors - 2024 (g/hp-hr or g/hr)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	0.0473	1.2805	0.1321	0.0019	0.0046	0.0043
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	0.0473	1.2805	0.1321	0.0019	0.0046	0.0043
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	0.0450	0.4176	0.1121	0.0020	0.0043	0.0039
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.0351	0.3779	0.0989	0.0018	0.0037	0.0034
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	0.0394	0.3749	0.1007	0.0018	0.0038	0.0035
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	0.0445	0.3825	0.1021	0.0018	0.0040	0.0037
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	0.0315	0.4253	0.1143	0.0021	0.0041	0.0037
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.0564	1.1974	1.0558	0.0020	0.0039	0.0036
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	0.0337	0.4133	0.1103	0.0020	0.0040	0.0037
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.0780	1.3552	1.0746	0.0020	0.0045	0.0041
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.0294	0.3694	0.0986	0.0018	0.0035	0.0033
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.0319	0.3879	0.1031	0.0019	0.0037	0.0034
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.0294	0.3694	0.0986	0.0018	0.0035	0.0033
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.0294	0.3694	0.0986	0.0018	0.0035	0.0033
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.0428	1.2366	0.5148	0.0018	0.0043	0.0040
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	0.0467	0.4056	0.1084	0.0019	0.0042	0.0039
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	0.0514	0.4139	0.1100	0.0019	0.0043	0.0040
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	0.0350	0.4688	1.1181	0.0024	0.0094	0.0086
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.3113	1.6476	2.3691	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.0233	1.0605	0.0983	0.0018	0.0035	0.0032
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.0233	1.0605	0.0983	0.0018	0.0035	0.0032
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.0233	1.0605	0.0983	0.0018	0.0035	0.0032
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.0233	1.0605	0.0983	0.0018	0.0035	0.0032
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.0246	0.3654	0.0991	0.0018	0.0035	0.0032
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.0241	0.3608	0.0993	0.0018	0.0035	0.0032
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.1006	0.8142	0.2089	0.0047	0.0081	0.0074
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	0.1006	0.8142	0.2089	0.0047	0.0081	0.0074
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.1006	2.3894	0.2089	0.0047	0.0086	0.0079
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.3080	1.8498	2.3368	0.0048	0.0907	0.0834
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.0248	0.3087	0.0703	0.0015	0.0036	0.0033
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.0247	0.3015	0.0535	0.0015	0.0037	0.0034
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.4110	2.2002	3.1272	0.0060	0.1198	0.1102
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.0262	1.0346	0.3663	0.0015	0.0273	0.0251
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	2.8518	183.8896	2.2805	0.0080	0.1799	0.1359
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.0432	1.0349	0.1448	0.0015	0.0049	0.0045
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.0418	0.3492	0.0565	0.0015	0.0039	0.0036
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	0.0428	0.3339	0.0592	0.0015	0.0042	0.0039
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	4.4494	169.4553	3.3243	0.0090	1.8760	1.4174
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.1308	1.8824	1.4386	0.0035	0.0062	0.0057
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.0604	1.0581	0.7930	0.0015	0.0073	0.0067
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.0295	0.9386	0.1430	0.0015	0.0037	0.0034
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.0282	0.3167	0.0722	0.0015	0.0039	0.0036
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.2515	1.2485	1.9166	0.0035	0.0728	0.0670
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.2515	1.2485	1.9166	0.0035	0.0728	0.0670
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.2515	1.2485	1.9166	0.0035	0.0728	0.0670
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.1062	1.6505	1.3250	0.0033	0.0054	0.0050
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.1523	0.9557	1.2584	0.0025	0.0486	0.0447
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.1523	0.9557	1.2584	0.0025	0.0486	0.0447

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2025 (g/hp-hr or g/hr)						Emission Factors - 2026 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.0473	1.2793	0.1289	0.0019	0.0046	0.0043	0.0483	1.2891	0.1360	0.0019	0.0047	0.0043
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.0473	1.2793	0.1289	0.0019	0.0046	0.0043	0.0483	1.2891	0.1360	0.0019	0.0047	0.0043
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.0470	0.4208	0.1127	0.0020	0.0043	0.0040	0.0489	0.4245	0.1134	0.0020	0.0044	0.0040
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0371	0.3827	0.0996	0.0018	0.0037	0.0034	0.0396	0.3890	0.1004	0.0018	0.0038	0.0035
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0401	0.3767	0.1011	0.0018	0.0038	0.0035	0.0412	0.3785	0.1015	0.0018	0.0039	0.0036
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0482	0.3893	0.1035	0.0018	0.0041	0.0038	0.0502	0.3931	0.1043	0.0018	0.0042	0.0038
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.0319	0.4259	0.1144	0.0021	0.0041	0.0037	0.0333	0.4293	0.1148	0.0021	0.0041	0.0038
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.0572	1.2041	1.0577	0.0020	0.0039	0.0036	0.0563	1.1965	1.0554	0.0020	0.0039	0.0035
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0344	0.4147	0.1104	0.0020	0.0040	0.0037	0.0358	0.4180	0.1109	0.0020	0.0040	0.0037
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0819	1.3859	1.0808	0.0020	0.0046	0.0042	0.0856	1.4152	1.0863	0.0020	0.0047	0.0043
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0303	0.3722	0.0990	0.0018	0.0036	0.0033	0.0313	0.3749	0.0994	0.0018	0.0036	0.0033
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0322	0.3887	0.1032	0.0019	0.0037	0.0034	0.0327	0.3899	0.1034	0.0019	0.0038	0.0035
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0303	0.3722	0.0990	0.0018	0.0036	0.0033	0.0313	0.3749	0.0994	0.0018	0.0036	0.0033
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0303	0.3722	0.0990	0.0018	0.0036	0.0033	0.0313	0.3749	0.0994	0.0018	0.0036	0.0033
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0442	1.2435	0.5162	0.0018	0.0044	0.0041	0.0458	1.2521	0.5181	0.0018	0.0045	0.0042
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0489	0.4100	0.1093	0.0019	0.0043	0.0039	0.0505	0.4132	0.1100	0.0019	0.0043	0.0040
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0498	0.4114	0.1096	0.0019	0.0043	0.0040	0.0531	0.4173	0.1107	0.0019	0.0044	0.0041
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.0379	0.4738	1.1261	0.0024	0.0096	0.0089	0.0407	0.4787	1.1336	0.0024	0.0099	0.0091
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6467	2.3695	0.0045	0.0906	0.0834	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0238	1.0643	0.0985	0.0018	0.0035	0.0032	0.0244	1.0687	0.0988	0.0018	0.0035	0.0032
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0238	1.0643	0.0985	0.0018	0.0035	0.0032	0.0244	1.0687	0.0988	0.0018	0.0035	0.0032
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0238	1.0643	0.0985	0.0018	0.0035	0.0032	0.0244	1.0687	0.0988	0.0018	0.0035	0.0032
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0238	1.0643	0.0985	0.0018	0.0035	0.0032	0.0244	1.0687	0.0988	0.0018	0.0035	0.0032
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0251	0.3665	0.0992	0.0018	0.0035	0.0032	0.0256	0.3674	0.0994	0.0018	0.0035	0.0032
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0247	0.3615	0.0994	0.0018	0.0035	0.0032	0.0253	0.3616	0.0993	0.0018	0.0035	0.0032
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1019	0.8170	0.2093	0.0047	0.0081	0.0074	0.1024	0.8182	0.2096	0.0047	0.0081	0.0075
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1019	0.8170	0.2093	0.0047	0.0081	0.0074	0.1024	0.8182	0.2096	0.0047	0.0081	0.0075
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1019	2.3976	0.2093	0.0047	0.0087	0.0080	0.1023	2.4006	0.2095	0.0047	0.0087	0.0080
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3079	1.8435	2.3366	0.0048	0.0906	0.0834	0.3077	1.8366	2.3355	0.0048	0.0906	0.0833
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0250	0.3117	0.0474	0.0015	0.0030	0.0028	0.0252	0.3151	0.0473	0.0015	0.0030	0.0028
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0247	0.3043	0.0495	0.0015	0.0032	0.0029	0.0249	0.3077	0.0523	0.0015	0.0034	0.0031
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4110	2.2001	3.1270	0.0060	0.1198	0.1102	0.4110	2.2004	3.1274	0.0060	0.1198	0.1102
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0258	1.0405	0.3221	0.0015	0.0252	0.0231	0.0260	1.0514	0.3244	0.0015	0.0254	0.0233
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.8669	183.6809	2.2867	0.0080	0.1821	0.1376	2.8790	183.4791	2.2906	0.0080	0.1840	0.1390
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0442	1.0496	0.1296	0.0015	0.0045	0.0042	0.0446	1.0605	0.1274	0.0015	0.0045	0.0041
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0433	0.3554	0.0489	0.0015	0.0037	0.0034	0.0439	0.3597	0.0514	0.0015	0.0037	0.0034
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0443	0.3394	0.0573	0.0015	0.0039	0.0036	0.0449	0.3433	0.0555	0.0015	0.0041	0.0038
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.4603	169.0576	3.3256	0.0090	1.8686	1.4118	4.4705	168.6877	3.3263	0.0090	1.8613	1.4063
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.1379	1.9316	1.4487	0.0035	0.0064	0.0059	0.1445	1.9777	1.4581	0.0035	0.0066	0.0061
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0611	1.0696	0.8017	0.0015	0.0073	0.0068	0.0616	1.0807	0.8100	0.0015	0.0074	0.0068
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0294	0.9462	0.1322	0.0015	0.0037	0.0034	0.0297	0.9565	0.1273	0.0015	0.0036	0.0033
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0281	0.3191	0.0675	0.0015	0.0037	0.0034	0.0283	0.3224	0.0674	0.0015	0.0038	0.0035
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.1114	1.6869	1.3326	0.0033	0.0055	0.0051	0.1164	1.7212	1.3396	0.0033	0.0057	0.0052
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1524	0.9563	1.2592	0.0025	0.0486	0.0447	0.1521	0.9542	1.2564	0.0025	0.0485	0.0446
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1524	0.9563	1.2592	0.0025	0.0486	0.0447	0.1521	0.9542	1.2564	0.0025	0.0485	0.0446

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2027 (g/hp-hr or g/hr)						Emission Factors - 2028 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.0496	1.2969	0.1348	0.0019	0.0047	0.0043	0.0512	1.3078	0.1327	0.0019	0.0048	0.0044
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.0496	1.2969	0.1348	0.0019	0.0047	0.0043	0.0512	1.3078	0.1327	0.0019	0.0048	0.0044
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.0503	0.4270	0.1139	0.0020	0.0044	0.0041	0.0522	0.4303	0.1146	0.0020	0.0045	0.0041
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0397	0.3893	0.1006	0.0018	0.0038	0.0035	0.0416	0.3935	0.1012	0.0018	0.0039	0.0036
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0444	0.3843	0.1026	0.0018	0.0040	0.0037	0.0463	0.3873	0.1032	0.0018	0.0040	0.0037
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0498	0.3926	0.1042	0.0018	0.0041	0.0038	0.0534	0.3987	0.1053	0.0018	0.0043	0.0039
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.0350	0.4330	0.1153	0.0021	0.0042	0.0038	0.0360	0.4356	0.1157	0.0021	0.0042	0.0039
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.0563	1.1961	1.0552	0.0020	0.0039	0.0035	0.0570	1.2011	1.0561	0.0020	0.0039	0.0036
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0374	0.4221	0.1113	0.0020	0.0041	0.0038	0.0393	0.4264	0.1119	0.0020	0.0042	0.0038
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0888	1.4396	1.0902	0.0020	0.0048	0.0044	0.0926	1.4702	1.0975	0.0020	0.0049	0.0045
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0329	0.3786	0.1000	0.0018	0.0037	0.0034	0.0336	0.3800	0.1002	0.0018	0.0037	0.0034
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0334	0.3916	0.1037	0.0019	0.0038	0.0035	0.0342	0.3935	0.1039	0.0019	0.0038	0.0035
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0329	0.3786	0.1000	0.0018	0.0037	0.0034	0.0336	0.3800	0.1002	0.0018	0.0037	0.0034
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0329	0.3786	0.1000	0.0018	0.0037	0.0034	0.0336	0.3800	0.1002	0.0018	0.0037	0.0034
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0473	1.2597	0.5197	0.0018	0.0046	0.0042	0.0487	1.2669	0.5212	0.0018	0.0047	0.0043
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0521	0.4160	0.1105	0.0019	0.0044	0.0040	0.0532	0.4180	0.1109	0.0019	0.0044	0.0041
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0554	0.4218	0.1116	0.0019	0.0045	0.0041	0.0569	0.4243	0.1121	0.0019	0.0045	0.0042
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.0434	0.4837	1.1415	0.0024	0.0101	0.0093	0.0460	0.4882	1.1484	0.0024	0.0103	0.0095
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834	0.3114	1.6464	2.3696	0.0045	0.0906	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0252	1.0742	0.0990	0.0018	0.0036	0.0033	0.0259	1.0789	0.0993	0.0018	0.0036	0.0033
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0252	1.0742	0.0990	0.0018	0.0036	0.0033	0.0259	1.0789	0.0993	0.0018	0.0036	0.0033
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0252	1.0742	0.0990	0.0018	0.0036	0.0033	0.0259	1.0789	0.0993	0.0018	0.0036	0.0033
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0252	1.0742	0.0990	0.0018	0.0036	0.0033	0.0259	1.0789	0.0993	0.0018	0.0036	0.0033
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0257	0.3677	0.0994	0.0018	0.0035	0.0032	0.0260	0.3684	0.0995	0.0018	0.0035	0.0032
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0258	0.3622	0.0994	0.0018	0.0035	0.0032	0.0262	0.3647	0.1000	0.0018	0.0035	0.0032
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1025	0.8182	0.2095	0.0047	0.0081	0.0075	0.1025	0.8178	0.2094	0.0047	0.0081	0.0075
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1025	0.8182	0.2095	0.0047	0.0081	0.0075	0.1025	0.8178	0.2094	0.0047	0.0081	0.0075
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1025	2.4010	0.2095	0.0047	0.0087	0.0080	0.1025	2.4021	0.2096	0.0047	0.0087	0.0080
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3080	1.8327	2.3379	0.0048	0.0906	0.0834	0.3082	1.8284	2.3395	0.0048	0.0907	0.0834
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0252	0.3179	0.0426	0.0015	0.0029	0.0027	0.0255	0.3213	0.0410	0.0016	0.0029	0.0026
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0248	0.3102	0.0506	0.0015	0.0032	0.0030	0.0250	0.3135	0.0509	0.0016	0.0033	0.0030
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4110	2.2002	3.1272	0.0060	0.1198	0.1102	0.4110	2.2004	3.1274	0.0060	0.1198	0.1102
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0258	1.0591	0.2747	0.0015	0.0230	0.0211	0.0260	1.0700	0.2697	0.0016	0.0227	0.0209
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.8907	183.2967	2.2946	0.0080	0.1858	0.1404	2.9021	183.1243	2.2986	0.0080	0.1875	0.1417
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0451	1.0720	0.1103	0.0015	0.0044	0.0040	0.0456	1.0842	0.1042	0.0016	0.0038	0.0035
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0452	0.3655	0.0503	0.0015	0.0037	0.0034	0.0456	0.3693	0.0508	0.0016	0.0037	0.0034
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0456	0.3475	0.0540	0.0015	0.0039	0.0036	0.0462	0.3513	0.0499	0.0016	0.0038	0.0035
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8454	3.3971	0.0073	0.1327	0.1221	0.4483	2.8455	3.3972	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.4798	168.3729	3.3270	0.0090	1.8549	1.4015	4.4849	168.1890	3.3272	0.0090	1.8512	1.3987
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.1507	2.0202	1.4668	0.0035	0.0067	0.0062	0.1567	2.0624	1.4756	0.0035	0.0069	0.0063
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0621	1.0919	0.8185	0.0015	0.0074	0.0068	0.0622	1.1016	0.8207	0.0016	0.0063	0.0058
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0293	0.9618	0.1158	0.0015	0.0036	0.0033	0.0295	0.9715	0.1127	0.0016	0.0033	0.0030
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0283	0.3253	0.0661	0.0015	0.0037	0.0034	0.0284	0.3282	0.0661	0.0016	0.0037	0.0034
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2485	1.9167	0.0035	0.0728	0.0670	0.2515	1.2486	1.9169	0.0035	0.0729	0.0670
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2485	1.9167	0.0035	0.0728	0.0670	0.2515	1.2486	1.9169	0.0035	0.0729	0.0670
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2485	1.9167	0.0035	0.0728	0.0670	0.2515	1.2486	1.9169	0.0035	0.0729	0.0670
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.1209	1.7526	1.3461	0.0033	0.0058	0.0053	0.1254	1.7838	1.3525	0.0033	0.0059	0.0054
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1517	0.9521	1.2536	0.0025	0.0484	0.0445	0.1520	0.9537	1.2557	0.0025	0.0485	0.0446
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1517	0.9521	1.2536	0.0025	0.0484	0.0445	0.1520	0.9537	1.2557	0.0025	0.0485	0.0446

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2029 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.0528	1.3191	0.1408	0.0019	0.0049	0.0045
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.0528	1.3191	0.1408	0.0019	0.0049	0.0045
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.0535	0.4321	0.1149	0.0019	0.0045	0.0042
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.0435	0.3979	0.1018	0.0018	0.0039	0.0036
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.0477	0.3893	0.1035	0.0018	0.0041	0.0038
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.0555	0.4022	0.1060	0.0018	0.0043	0.0040
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.0374	0.4389	0.1162	0.0021	0.0042	0.0039
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.0563	1.1956	1.0547	0.0020	0.0039	0.0035
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.0410	0.4304	0.1125	0.0020	0.0042	0.0039
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0952	1.4912	1.1024	0.0020	0.0050	0.0046
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0354	0.3846	0.1009	0.0018	0.0037	0.0034
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.0350	0.3952	0.1042	0.0019	0.0038	0.0035
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0354	0.3846	0.1009	0.0018	0.0037	0.0034
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0354	0.3846	0.1009	0.0018	0.0037	0.0034
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0498	1.2720	0.5222	0.0018	0.0047	0.0044
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.0536	0.4187	0.1110	0.0019	0.0044	0.0041
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.0562	0.4227	0.1118	0.0019	0.0045	0.0041
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.0479	0.4918	1.1543	0.0024	0.0105	0.0096
22" Smooth Drum Manual (Bomag 55)	OFF - ConstMin - Rollers	Diesel	0.3114	1.6466	2.3698	0.0045	0.0907	0.0834
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.0263	1.0821	0.0994	0.0018	0.0036	0.0033
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.0263	1.0821	0.0994	0.0018	0.0036	0.0033
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.0263	1.0821	0.0994	0.0018	0.0036	0.0033
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.0263	1.0821	0.0994	0.0018	0.0036	0.0033
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.0262	0.3688	0.0996	0.0018	0.0035	0.0032
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.0265	0.3658	0.1003	0.0018	0.0035	0.0033
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.1028	0.8195	0.2098	0.0047	0.0081	0.0075
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.1028	0.8195	0.2098	0.0047	0.0081	0.0075
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.1027	2.4028	0.2096	0.0047	0.0087	0.0080
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.3080	1.8247	2.3382	0.0048	0.0906	0.0833
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0258	0.3250	0.0431	0.0016	0.0030	0.0027
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.0251	0.3167	0.0512	0.0016	0.0033	0.0031
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.4111	2.2004	3.1275	0.0060	0.1198	0.1102
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.0261	1.0803	0.2593	0.0016	0.0220	0.0202
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	2.9097	183.0458	2.3031	0.0080	0.1884	0.1423
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0459	1.0947	0.1021	0.0016	0.0038	0.0035
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0458	0.3727	0.0511	0.0016	0.0038	0.0035
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.0467	0.3552	0.0505	0.0016	0.0038	0.0035
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.4483	2.8455	3.3971	0.0073	0.1327	0.1221
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	4.4888	168.0628	3.3277	0.0090	1.8487	1.3968
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.1624	2.1017	1.4838	0.0035	0.0070	0.0065
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0621	1.1110	0.8289	0.0016	0.0064	0.0059
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0299	0.9825	0.1162	0.0016	0.0034	0.0031
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.0283	0.3309	0.0622	0.0016	0.0036	0.0033
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.2515	1.2486	1.9168	0.0035	0.0728	0.0670
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.1297	1.8139	1.3587	0.0033	0.0060	0.0055
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1524	0.9563	1.2591	0.0025	0.0486	0.0447
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.1524	0.9563	1.2591	0.0025	0.0486	0.0447

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Emission Factors - 2024 (g/hp-hr or g/hr)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.0214	0.8406	0.0769	0.0014	0.0028	0.0026
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.0214	0.8406	0.0769	0.0014	0.0028	0.0026
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.0213	0.2861	0.0768	0.0014	0.0027	0.0025
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.0202	0.2787	0.0764	0.0014	0.0027	0.0025
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.0214	0.8406	0.0769	0.0014	0.0028	0.0026
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.0214	0.8406	0.0769	0.0014	0.0028	0.0026
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.0202	0.2787	0.0764	0.0014	0.0027	0.0025
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.0229	0.9616	0.4137	0.0015	0.0029	0.0026
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	0.0340	0.4884	0.1320	0.0024	0.0046	0.0043
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.0340	0.4884	0.1320	0.0024	0.0046	0.0043
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.0913	1.7791	1.5051	0.0028	0.0058	0.0053
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.0229	0.9616	0.4137	0.0015	0.0029	0.0026
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.0428	1.2366	0.5148	0.0018	0.0043	0.0040
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	0.0359	0.4303	0.1172	0.0021	0.0042	0.0039
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	0.0359	0.4303	0.1172	0.0021	0.0042	0.0039
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.7511	16.3788	0.7562	0.0577	0.7353	0.3276

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from the San Joaquin Valley Air Basin was used to estimate emission factors for skidders.
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-road motor vehicles (e.g., flatbed trucks).

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2025 (g/hp-hr or g/hr)						Emission Factors - 2026 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.0218	0.8438	0.0771	0.0014	0.0028	0.0026	0.0224	0.8474	0.0773	0.0014	0.0029	0.0026
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.0218	0.8438	0.0771	0.0014	0.0028	0.0026	0.0224	0.8474	0.0773	0.0014	0.0029	0.0026
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0217	0.2869	0.0769	0.0014	0.0027	0.0025	0.0221	0.2876	0.0770	0.0014	0.0028	0.0025
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0207	0.2798	0.0766	0.0014	0.0027	0.0025	0.0216	0.2812	0.0769	0.0014	0.0027	0.0025
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.0218	0.8438	0.0771	0.0014	0.0028	0.0026	0.0224	0.8474	0.0773	0.0014	0.0029	0.0026
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.0218	0.8438	0.0771	0.0014	0.0028	0.0026	0.0224	0.8474	0.0773	0.0014	0.0029	0.0026
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0207	0.2798	0.0766	0.0014	0.0027	0.0025	0.0216	0.2812	0.0769	0.0014	0.0027	0.0025
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0225	0.9595	0.4133	0.0015	0.0028	0.0026	0.0233	0.9639	0.4143	0.0015	0.0029	0.0027
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0343	0.4897	0.1323	0.0024	0.0047	0.0043	0.0357	0.4928	0.1327	0.0024	0.0047	0.0043
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0343	0.4897	0.1323	0.0024	0.0047	0.0043	0.0357	0.4928	0.1327	0.0024	0.0047	0.0043
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.0901	1.7739	1.5083	0.0028	0.0058	0.0053	0.0956	1.8307	1.5346	0.0029	0.0060	0.0055
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0225	0.9595	0.4133	0.0015	0.0028	0.0026	0.0233	0.9639	0.4143	0.0015	0.0029	0.0027
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0442	1.2435	0.5162	0.0018	0.0044	0.0041	0.0458	1.2521	0.5181	0.0018	0.0045	0.0042
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
Lube Truck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
1000 Gallon Watertruck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
3000 Gallon Watertruck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
5000 Gallon Watertanker	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0371	0.4325	0.1176	0.0021	0.0043	0.0039	0.0389	0.4357	0.1183	0.0021	0.0043	0.0040
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0371	0.4325	0.1176	0.0021	0.0043	0.0039	0.0389	0.4357	0.1183	0.0021	0.0043	0.0040
5 Ton Boomtruck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
10 Ton Boomtruck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197
20 Ton Boomtruck	n/a - onroad	Diesel	0.7167	16.3075	0.7026	0.0558	0.7310	0.3235	0.6875	16.2591	0.6580	0.0542	0.7272	0.3197

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2027 (g/hp-hr or g/hr)						Emission Factors - 2028 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.0232	0.8535	0.0775	0.0014	0.0029	0.0027	0.0241	0.8592	0.0778	0.0014	0.0029	0.0027
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.0232	0.8535	0.0775	0.0014	0.0029	0.0027	0.0241	0.8592	0.0778	0.0014	0.0029	0.0027
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0227	0.2891	0.0772	0.0014	0.0028	0.0025	0.0235	0.2912	0.0776	0.0014	0.0028	0.0026
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0225	0.2827	0.0772	0.0014	0.0028	0.0025	0.0232	0.2841	0.0775	0.0014	0.0028	0.0026
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.0232	0.8535	0.0775	0.0014	0.0029	0.0027	0.0241	0.8592	0.0778	0.0014	0.0029	0.0027
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.0232	0.8535	0.0775	0.0014	0.0029	0.0027	0.0241	0.8592	0.0778	0.0014	0.0029	0.0027
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0225	0.2827	0.0772	0.0014	0.0028	0.0025	0.0232	0.2841	0.0775	0.0014	0.0028	0.0026
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0245	0.9705	0.4157	0.0015	0.0030	0.0027	0.0255	0.9758	0.4169	0.0015	0.0030	0.0028
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0358	0.4931	0.1328	0.0024	0.0047	0.0043	0.0354	0.4911	0.1324	0.0024	0.0047	0.0043
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0358	0.4931	0.1328	0.0024	0.0047	0.0043	0.0354	0.4911	0.1324	0.0024	0.0047	0.0043
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.0949	1.8104	1.5146	0.0028	0.0059	0.0054	0.0984	1.8252	1.5036	0.0028	0.0060	0.0055
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0245	0.9705	0.4157	0.0015	0.0030	0.0027	0.0255	0.9758	0.4169	0.0015	0.0030	0.0028
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0473	1.2597	0.5197	0.0018	0.0046	0.0042	0.0487	1.2669	0.5212	0.0018	0.0047	0.0043
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
Lube Truck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
1000 Gallon Watertruck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
3000 Gallon Watertruck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
5000 Gallon Watertanker	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0402	0.4383	0.1188	0.0021	0.0044	0.0040	0.0408	0.4397	0.1191	0.0021	0.0044	0.0040
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0402	0.4383	0.1188	0.0021	0.0044	0.0040	0.0408	0.4397	0.1191	0.0021	0.0044	0.0040
5 Ton Boomtruck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
10 Ton Boomtruck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133
20 Ton Boomtruck	n/a - onroad	Diesel	0.6624	16.2224	0.6206	0.0527	0.7237	0.3164	0.6399	16.1870	0.5879	0.0515	0.7204	0.3133

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-167. Emission Factor Summary by Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Emission Factors - 2029 (g/hp-hr or g/hr)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.0250	0.8653	0.0781	0.0014	0.0030	0.0027
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.0250	0.8653	0.0781	0.0014	0.0030	0.0027
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.0243	0.2931	0.0778	0.0014	0.0028	0.0026
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.0236	0.2847	0.0776	0.0014	0.0028	0.0026
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.0250	0.8653	0.0781	0.0014	0.0030	0.0027
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.0250	0.8653	0.0781	0.0014	0.0030	0.0027
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.0236	0.2847	0.0776	0.0014	0.0028	0.0026
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.0252	0.9740	0.4165	0.0015	0.0030	0.0028
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.0355	0.4922	0.1326	0.0024	0.0047	0.0043
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.0355	0.4922	0.1326	0.0024	0.0047	0.0043
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.0993	1.8320	1.5044	0.0028	0.0060	0.0055
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.0252	0.9740	0.4165	0.0015	0.0030	0.0028
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.0498	1.2720	0.5222	0.0018	0.0047	0.0044
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
Lube Truck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
1000 Gallon Watertruck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
3000 Gallon Watertruck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
5000 Gallon Watertanker	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.0409	0.4396	0.1191	0.0021	0.0044	0.0040
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.0409	0.4396	0.1191	0.0021	0.0044	0.0040
5 Ton Boomtruck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
10 Ton Boomtruck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104
20 Ton Boomtruck	n/a - onroad	Diesel	0.6200	16.1543	0.5597	0.0503	0.7174	0.3104

Notes:
No logging equipment is available in the OFFROAD2017 database for the San Francisco Bay Area Air Basin. Therefore, equipment from th
Emission factors are in units of grams per horsepower-hour (g/hp-hr) for offroad construction equipment and grams per hour (g/hr) for on-ro

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Maximum Daily Emissions - 2024 (pounds per day)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	0.23	6.21	0.64	0.01	0.02	0.02
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	0.71	19.20	1.98	0.03	0.07	0.06
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	1.82	16.85	4.52	0.08	0.17	0.16
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.31	3.37	0.88	0.02	0.03	0.03
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	1.30	12.33	3.31	0.06	0.13	0.12
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	1.37	11.79	3.15	0.05	0.12	0.11
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	0.27	3.62	0.97	0.02	0.03	0.03
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.09	1.90	1.68	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	0.59	7.29	1.95	0.04	0.07	0.06
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.09	1.61	1.28	0.00	0.01	0.00
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.30	3.83	1.02	0.02	0.04	0.03
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.33	4.02	1.07	0.02	0.04	0.04
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.37	4.66	1.24	0.02	0.04	0.04
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.38	4.72	1.26	0.02	0.05	0.04
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.15	4.36	1.82	0.01	0.02	0.01
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	4.20	36.49	9.75	0.17	0.38	0.35
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	3.08	24.82	6.60	0.11	0.26	0.24
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	1.21	16.18	38.60	0.08	0.32	0.30
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.12	5.61	0.52	0.01	0.02	0.02
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.15	6.78	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.15	6.78	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.17	7.72	0.72	0.01	0.03	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.21	3.06	0.83	0.02	0.03	0.03
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.33	5.01	1.38	0.03	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.80	6.46	1.66	0.04	0.06	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	0.93	7.54	1.93	0.04	0.07	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.67	15.80	1.38	0.03	0.06	0.05
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.14	0.82	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.24	2.99	0.68	0.01	0.04	0.03
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.36	4.39	0.78	0.02	0.05	0.05
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.33	1.75	2.48	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.12	4.56	1.61	0.01	0.12	0.11
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	1.63	105.40	1.31	0.00	0.10	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.26	6.11	0.86	0.01	0.03	0.03
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.49	4.13	0.67	0.02	0.05	0.04
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	0.81	6.32	1.12	0.03	0.08	0.07
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	3.53	134.49	2.64	0.01	1.49	1.12
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.20	2.90	2.22	0.01	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.16	2.85	2.13	0.00	0.02	0.02
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.17	5.38	0.82	0.01	0.02	0.02
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.33	3.71	0.85	0.02	0.05	0.04
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.21	1.05	1.61	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.24	1.21	1.86	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.27	1.32	2.03	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.15	2.40	1.93	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.14	0.88	1.17	0.00	0.05	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.14	0.88	1.17	0.00	0.05	0.04

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2025 (pounds per day)						Maximum Daily Emissions - 2026 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.23	6.20	0.63	0.01	0.02	0.02	0.23	6.25	0.66	0.01	0.02	0.02
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.71	19.18	1.93	0.03	0.07	0.06	0.72	19.33	2.04	0.03	0.07	0.06
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	1.90	16.98	4.55	0.08	0.17	0.16	1.97	17.12	4.58	0.08	0.18	0.16
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.33	3.41	0.89	0.02	0.03	0.03	0.35	3.46	0.89	0.02	0.03	0.03
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	1.32	12.39	3.33	0.06	0.13	0.12	1.36	12.45	3.34	0.06	0.13	0.12
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	1.49	12.00	3.19	0.05	0.13	0.12	1.55	12.12	3.21	0.05	0.13	0.12
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.27	3.62	0.97	0.02	0.03	0.03	0.28	3.65	0.98	0.02	0.03	0.03
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.09	1.91	1.68	0.00	0.01	0.01	0.09	1.90	1.68	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.61	7.31	1.95	0.04	0.07	0.07	0.63	7.37	1.96	0.04	0.07	0.07
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.10	1.65	1.29	0.00	0.01	0.01	0.10	1.68	1.29	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.31	3.86	1.03	0.02	0.04	0.03	0.32	3.88	1.03	0.02	0.04	0.03
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.33	4.03	1.07	0.02	0.04	0.04	0.34	4.04	1.07	0.02	0.04	0.04
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.38	4.69	1.25	0.02	0.05	0.04	0.39	4.73	1.25	0.02	0.05	0.04
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.39	4.76	1.27	0.02	0.05	0.04	0.40	4.79	1.27	0.02	0.05	0.04
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.16	4.39	1.82	0.01	0.02	0.01	0.16	4.42	1.83	0.01	0.02	0.01
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	4.39	36.88	9.83	0.17	0.38	0.35	4.54	37.17	9.89	0.17	0.39	0.36
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	2.99	24.67	6.57	0.11	0.26	0.24	3.18	25.02	6.64	0.11	0.26	0.24
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.31	16.36	38.88	0.08	0.33	0.31	1.40	16.53	39.14	0.08	0.34	0.31
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.13	5.63	0.52	0.01	0.02	0.02	0.13	5.65	0.52	0.01	0.02	0.02
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.15	6.80	0.63	0.01	0.02	0.02	0.16	6.83	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.15	6.80	0.63	0.01	0.02	0.02	0.16	6.83	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.17	7.74	0.72	0.01	0.03	0.02	0.18	7.77	0.72	0.01	0.03	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.21	3.07	0.83	0.02	0.03	0.03	0.21	3.08	0.83	0.02	0.03	0.03
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.34	5.02	1.38	0.03	0.05	0.04	0.35	5.02	1.38	0.03	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.81	6.48	1.66	0.04	0.06	0.06	0.81	6.49	1.66	0.04	0.06	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.94	7.56	1.94	0.04	0.07	0.07	0.95	7.58	1.94	0.04	0.08	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.67	15.86	1.38	0.03	0.06	0.05	0.68	15.88	1.39	0.03	0.06	0.05
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.81	1.03	0.00	0.04	0.04	0.14	0.81	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.24	3.02	0.46	0.01	0.03	0.03	0.24	3.06	0.46	0.01	0.03	0.03
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.36	4.43	0.72	0.02	0.05	0.04	0.36	4.48	0.76	0.02	0.05	0.04
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.33	1.75	2.48	0.00	0.10	0.09	0.33	1.75	2.48	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.11	4.59	1.42	0.01	0.11	0.10	0.11	4.64	1.43	0.01	0.11	0.10
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.64	105.28	1.31	0.00	0.10	0.08	1.65	105.17	1.31	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.26	6.20	0.77	0.01	0.03	0.02	0.26	6.27	0.75	0.01	0.03	0.02
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.51	4.20	0.58	0.02	0.04	0.04	0.52	4.25	0.61	0.02	0.04	0.04
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.84	6.42	1.08	0.03	0.07	0.07	0.85	6.49	1.05	0.03	0.08	0.07
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.54	134.17	2.64	0.01	1.48	1.12	3.55	133.88	2.64	0.01	1.48	1.12
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.21	2.98	2.24	0.01	0.01	0.01	0.22	3.05	2.25	0.01	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.16	2.88	2.16	0.00	0.02	0.02	0.17	2.91	2.18	0.00	0.02	0.02
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.17	5.42	0.76	0.01	0.02	0.02	0.17	5.48	0.73	0.01	0.02	0.02
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.33	3.74	0.79	0.02	0.04	0.04	0.33	3.78	0.79	0.02	0.04	0.04
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.21	1.05	1.61	0.00	0.06	0.06	0.21	1.05	1.61	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.24	1.21	1.86	0.00	0.07	0.07	0.24	1.21	1.86	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.32	2.03	0.00	0.08	0.07	0.27	1.32	2.03	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.16	2.45	1.94	0.00	0.01	0.01	0.17	2.50	1.95	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.17	0.00	0.05	0.04	0.14	0.88	1.16	0.00	0.04	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.17	0.00	0.05	0.04	0.14	0.88	1.16	0.00	0.04	0.04

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2027 (pounds per day)						Maximum Daily Emissions - 2028 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.24	6.29	0.65	0.01	0.02	0.02	0.25	6.34	0.64	0.01	0.02	0.02
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.74	19.44	2.02	0.03	0.07	0.07	0.77	19.61	1.99	0.03	0.07	0.07
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	2.03	17.23	4.60	0.08	0.18	0.16	2.11	17.36	4.62	0.08	0.18	0.17
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.35	3.47	0.90	0.02	0.03	0.03	0.37	3.50	0.90	0.02	0.03	0.03
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	1.46	12.64	3.38	0.06	0.13	0.12	1.52	12.74	3.39	0.06	0.13	0.12
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	1.53	12.10	3.21	0.05	0.13	0.12	1.65	12.29	3.25	0.05	0.13	0.12
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.30	3.68	0.98	0.02	0.04	0.03	0.31	3.71	0.98	0.02	0.04	0.03
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.09	1.90	1.67	0.00	0.01	0.01	0.09	1.91	1.68	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.66	7.44	1.96	0.04	0.07	0.07	0.69	7.52	1.97	0.04	0.07	0.07
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.11	1.71	1.30	0.00	0.01	0.01	0.11	1.75	1.31	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.34	3.92	1.04	0.02	0.04	0.03	0.35	3.94	1.04	0.02	0.04	0.04
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.35	4.06	1.07	0.02	0.04	0.04	0.35	4.08	1.08	0.02	0.04	0.04
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.41	4.77	1.26	0.02	0.05	0.04	0.42	4.79	1.26	0.02	0.05	0.04
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.42	4.84	1.28	0.02	0.05	0.04	0.43	4.86	1.28	0.02	0.05	0.04
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.17	4.44	1.83	0.01	0.02	0.01	0.17	4.47	1.84	0.01	0.02	0.02
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	4.69	37.41	9.94	0.17	0.39	0.36	4.79	37.60	9.97	0.17	0.40	0.37
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	3.32	25.29	6.69	0.11	0.27	0.25	3.41	25.44	6.72	0.11	0.27	0.25
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.50	16.70	39.41	0.08	0.35	0.32	1.59	16.85	39.65	0.08	0.36	0.33
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.13	5.68	0.52	0.01	0.02	0.02	0.14	5.71	0.53	0.01	0.02	0.02
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.16	6.87	0.63	0.01	0.02	0.02	0.17	6.90	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.16	6.87	0.63	0.01	0.02	0.02	0.17	6.90	0.63	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.18	7.82	0.72	0.01	0.03	0.02	0.19	7.85	0.72	0.01	0.03	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.22	3.08	0.83	0.02	0.03	0.03	0.22	3.09	0.83	0.02	0.03	0.03
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.36	5.03	1.38	0.03	0.05	0.04	0.36	5.06	1.39	0.03	0.05	0.04
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.81	6.49	1.66	0.04	0.06	0.06	0.81	6.49	1.66	0.04	0.06	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.95	7.58	1.94	0.04	0.08	0.07	0.95	7.57	1.94	0.04	0.08	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.68	15.88	1.39	0.03	0.06	0.05	0.68	15.89	1.39	0.03	0.06	0.05
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.81	1.03	0.00	0.04	0.04	0.14	0.81	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.24	3.08	0.41	0.01	0.03	0.03	0.25	3.12	0.40	0.02	0.03	0.03
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.36	4.51	0.74	0.02	0.05	0.04	0.36	4.56	0.74	0.02	0.05	0.04
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.33	1.75	2.48	0.00	0.10	0.09	0.33	1.75	2.48	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.11	4.67	1.21	0.01	0.10	0.09	0.11	4.72	1.19	0.01	0.10	0.09
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.66	105.06	1.32	0.00	0.11	0.08	1.66	104.97	1.32	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.27	6.33	0.65	0.01	0.03	0.02	0.27	6.41	0.62	0.01	0.02	0.02
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.53	4.32	0.59	0.02	0.04	0.04	0.54	4.36	0.60	0.02	0.04	0.04
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.86	6.57	1.02	0.03	0.07	0.07	0.87	6.65	0.94	0.03	0.07	0.07
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.56	133.63	2.64	0.01	1.47	1.11	3.56	133.48	2.64	0.01	1.47	1.11
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.23	3.12	2.26	0.01	0.01	0.01	0.24	3.18	2.28	0.01	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.17	2.94	2.20	0.00	0.02	0.02	0.17	2.96	2.21	0.00	0.02	0.02
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.17	5.51	0.66	0.01	0.02	0.02	0.17	5.57	0.65	0.01	0.02	0.02
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.33	3.82	0.78	0.02	0.04	0.04	0.33	3.85	0.78	0.02	0.04	0.04
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.21	1.05	1.61	0.00	0.06	0.06	0.21	1.05	1.61	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.24	1.21	1.86	0.00	0.07	0.07	0.24	1.21	1.86	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.32	2.03	0.00	0.08	0.07	0.27	1.32	2.03	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.18	2.55	1.96	0.00	0.01	0.01	0.18	2.60	1.97	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.88	1.16	0.00	0.04	0.04	0.14	0.88	1.16	0.00	0.04	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.88	1.16	0.00	0.04	0.04	0.14	0.88	1.16	0.00	0.04	0.04

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2029 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.26	6.40	0.68	0.01	0.02	0.02
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.79	19.77	2.11	0.03	0.07	0.07
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	2.16	17.43	4.63	0.08	0.18	0.17
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.39	3.54	0.91	0.02	0.04	0.03
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	1.57	12.80	3.40	0.06	0.13	0.12
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	1.71	12.40	3.27	0.05	0.13	0.12
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.32	3.73	0.99	0.02	0.04	0.03
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.09	1.90	1.67	0.00	0.01	0.01
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.72	7.59	1.98	0.04	0.07	0.07
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.11	1.78	1.31	0.00	0.01	0.01
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.37	3.98	1.05	0.02	0.04	0.04
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.36	4.09	1.08	0.02	0.04	0.04
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.45	4.85	1.27	0.02	0.05	0.04
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.45	4.92	1.29	0.02	0.05	0.04
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.18	4.49	1.84	0.01	0.02	0.02
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	4.82	37.66	9.99	0.17	0.40	0.37
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	3.37	25.35	6.70	0.11	0.27	0.25
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	1.65	16.98	39.85	0.08	0.36	0.33
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.05	0.25	0.37	0.00	0.01	0.01
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.14	5.73	0.53	0.01	0.02	0.02
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.17	6.92	0.64	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.17	6.92	0.64	0.01	0.02	0.02
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.19	7.87	0.72	0.01	0.03	0.02
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.22	3.09	0.83	0.02	0.03	0.03
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.37	5.08	1.39	0.03	0.05	0.05
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.82	6.50	1.67	0.04	0.06	0.06
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.95	7.59	1.94	0.04	0.08	0.07
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.68	15.89	1.39	0.03	0.06	0.05
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.14	0.80	1.03	0.00	0.04	0.04
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.25	3.15	0.42	0.02	0.03	0.03
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.37	4.61	0.74	0.02	0.05	0.04
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.33	1.75	2.48	0.00	0.10	0.09
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.12	4.76	1.14	0.01	0.10	0.09
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	1.67	104.92	1.32	0.00	0.11	0.08
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.27	6.47	0.60	0.01	0.02	0.02
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.54	4.40	0.60	0.02	0.04	0.04
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.88	6.72	0.96	0.03	0.07	0.07
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	2.85	18.07	21.57	0.05	0.84	0.78
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	3.56	133.38	2.64	0.01	1.47	1.11
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.25	3.24	2.29	0.01	0.01	0.01
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.17	2.99	2.23	0.00	0.02	0.02
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.17	5.63	0.67	0.01	0.02	0.02
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.33	3.88	0.73	0.02	0.04	0.04
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.21	1.05	1.61	0.00	0.06	0.06
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.24	1.21	1.86	0.00	0.07	0.07
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.27	1.32	2.03	0.00	0.08	0.07
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.19	2.64	1.98	0.00	0.01	0.01
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.17	0.00	0.05	0.04
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.14	0.89	1.17	0.00	0.05	0.04

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Maximum Daily Emissions - 2024 (pounds per day)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.12	4.56	0.42	0.01	0.02	0.01
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.16	6.30	0.58	0.01	0.02	0.02
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.17	2.25	0.60	0.01	0.02	0.02
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.27	3.79	1.04	0.02	0.04	0.03
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.12	4.56	0.42	0.01	0.02	0.01
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.12	4.82	0.44	0.01	0.02	0.01
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.32	4.36	1.20	0.02	0.04	0.04
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.06	2.67	1.15	0.00	0.01	0.01
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	0.66	9.52	2.57	0.05	0.09	0.08
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.33	4.76	1.29	0.02	0.05	0.04
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.18	3.45	2.92	0.01	0.01	0.01
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.06	2.67	1.15	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.19	5.34	2.22	0.01	0.02	0.02
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.33	7.22	0.33	0.03	0.32	0.14
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.10	2.17	0.10	0.01	0.10	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.10	2.17	0.10	0.01	0.10	0.04
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.07	1.44	0.07	0.01	0.06	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	1.58	18.97	5.17	0.09	0.19	0.17
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	0.79	9.49	2.58	0.05	0.09	0.09
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.03	0.72	0.03	0.00	0.03	0.01
		Total	**2,461,102**	**n/a**	**n/a**	**n/a**	**2,063.41**	**2,695.93**	**2,191.15**	**2,025.58**	**2,031.25**	**2,029.88**

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2025 (pounds per day)						Maximum Daily Emissions - 2026 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.12	4.58	0.42	0.01	0.02	0.01	0.12	4.60	0.42	0.01	0.02	0.01
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.16	6.32	0.58	0.01	0.02	0.02	0.17	6.35	0.58	0.01	0.02	0.02
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.17	2.25	0.60	0.01	0.02	0.02	0.17	2.26	0.60	0.01	0.02	0.02
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.28	3.80	1.04	0.02	0.04	0.03	0.29	3.82	1.04	0.02	0.04	0.03
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.12	4.58	0.42	0.01	0.02	0.01	0.12	4.60	0.42	0.01	0.02	0.01
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.13	4.84	0.44	0.01	0.02	0.02	0.13	4.86	0.44	0.01	0.02	0.02
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.32	4.38	1.20	0.02	0.04	0.04	0.34	4.40	1.20	0.02	0.04	0.04
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.06	2.67	1.15	0.00	0.01	0.01	0.06	2.68	1.15	0.00	0.01	0.01
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.67	9.54	2.58	0.05	0.09	0.08	0.70	9.60	2.59	0.05	0.09	0.08
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.33	4.77	1.29	0.02	0.05	0.04	0.35	4.80	1.29	0.02	0.05	0.04
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.17	3.44	2.93	0.01	0.01	0.01	0.19	3.55	2.98	0.01	0.01	0.01
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.06	2.67	1.15	0.00	0.01	0.01	0.06	2.68	1.15	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.19	5.37	2.23	0.01	0.02	0.02	0.20	5.41	2.24	0.01	0.02	0.02
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.32	7.19	0.31	0.02	0.32	0.14	0.30	7.17	0.29	0.02	0.32	0.14
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.09	2.16	0.09	0.01	0.10	0.04	0.09	2.15	0.09	0.01	0.10	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.09	2.16	0.09	0.01	0.10	0.04	0.09	2.15	0.09	0.01	0.10	0.04
Lube Truck	n/a - onroad	Diesel	0.06	1.44	0.06	0.00	0.06	0.03	0.06	1.43	0.06	0.00	0.06	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	1.64	19.07	5.19	0.09	0.19	0.17	1.71	19.21	5.22	0.09	0.19	0.18
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.82	9.54	2.59	0.05	0.09	0.09	0.86	9.61	2.61	0.05	0.10	0.09
5 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.72	0.03	0.00	0.03	0.01
		Total	**2,065.12**	**2,698.55**	**2,191.78**	**2,026.58**	**2,032.23**	**2,030.87**	**2,067.13**	**2,702.03**	**2,193.54**	**2,027.58**	**2,033.26**	**2,031.90**

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2027 (pounds per day)						Maximum Daily Emissions - 2028 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.13	4.63	0.42	0.01	0.02	0.01	0.13	4.66	0.42	0.01	0.02	0.01
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.17	6.40	0.58	0.01	0.02	0.02	0.18	6.44	0.58	0.01	0.02	0.02
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.18	2.27	0.61	0.01	0.02	0.02	0.18	2.29	0.61	0.01	0.02	0.02
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.30	3.84	1.05	0.02	0.04	0.03	0.31	3.86	1.05	0.02	0.04	0.03
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.13	4.63	0.42	0.01	0.02	0.01	0.13	4.66	0.42	0.01	0.02	0.01
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.13	4.89	0.44	0.01	0.02	0.02	0.14	4.92	0.45	0.01	0.02	0.02
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.35	4.43	1.21	0.02	0.04	0.04	0.36	4.45	1.21	0.02	0.04	0.04
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.07	2.70	1.15	0.00	0.01	0.01	0.07	2.71	1.16	0.00	0.01	0.01
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.70	9.61	2.59	0.05	0.09	0.08	0.69	9.57	2.58	0.05	0.09	0.08
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.35	4.80	1.29	0.02	0.05	0.04	0.34	4.79	1.29	0.02	0.05	0.04
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.18	3.51	2.94	0.01	0.01	0.01	0.19	3.54	2.92	0.01	0.01	0.01
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.07	2.70	1.15	0.00	0.01	0.01	0.07	2.71	1.16	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.20	5.44	2.25	0.01	0.02	0.02	0.21	5.47	2.25	0.01	0.02	0.02
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.29	7.15	0.27	0.02	0.32	0.14	0.28	7.14	0.26	0.02	0.32	0.14
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.09	2.15	0.08	0.01	0.10	0.04	0.08	2.14	0.08	0.01	0.10	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.09	2.15	0.08	0.01	0.10	0.04	0.08	2.14	0.08	0.01	0.10	0.04
Lube Truck	n/a - onroad	Diesel	0.06	1.43	0.05	0.00	0.06	0.03	0.06	1.43	0.05	0.00	0.06	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	1.77	19.33	5.24	0.09	0.19	0.18	1.80	19.39	5.25	0.09	0.19	0.18
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.89	9.66	2.62	0.05	0.10	0.09	0.90	9.69	2.63	0.05	0.10	0.09
5 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.72	0.03	0.00	0.03	0.01	0.03	0.71	0.03	0.00	0.03	0.01
		Total	**2,069.01**	**2,705.13**	**2,194.51**	**2,028.58**	**2,034.27**	**2,032.91**	**2,070.81**	**2,708.26**	**2,195.76**	**2,029.57**	**2,035.28**	**2,033.92**

Table A-168. Maximum Daily Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Maximum Daily Emissions - 2029 (pounds per day)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.14	4.69	0.42	0.01	0.02	0.01
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.19	6.49	0.59	0.01	0.02	0.02
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.19	2.30	0.61	0.01	0.02	0.02
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.32	3.87	1.05	0.02	0.04	0.03
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.14	4.69	0.42	0.01	0.02	0.01
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.14	4.96	0.45	0.01	0.02	0.02
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.37	4.46	1.21	0.02	0.04	0.04
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.07	2.71	1.16	0.00	0.01	0.01
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.69	9.59	2.58	0.05	0.09	0.08
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.35	4.80	1.29	0.02	0.05	0.04
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.19	3.55	2.92	0.01	0.01	0.01
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.07	2.71	1.16	0.00	0.01	0.01
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.22	5.50	2.26	0.01	0.02	0.02
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.27	7.12	0.25	0.02	0.32	0.14
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.08	2.14	0.07	0.01	0.09	0.04
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.08	2.14	0.07	0.01	0.09	0.04
Lube Truck	n/a - onroad	Diesel	0.05	1.42	0.05	0.00	0.06	0.03
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
1000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
3000 Gallon Watertruck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
5000 Gallon Watertanker	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	1.80	19.38	5.25	0.09	0.19	0.18
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.90	9.69	2.62	0.05	0.10	0.09
5 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
10 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
20 Ton Boomtruck	n/a - onroad	Diesel	0.03	0.71	0.02	0.00	0.03	0.01
		Total	**2,072.29**	**2,710.87**	**2,197.21**	**2,030.57**	**2,036.30**	**2,034.93**

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Annual Emissions - 2024 (tons per year)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment												
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	53	110	1	g/hp-hr	0.04	1.13	0.12	0.00	0.00	0.00
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	71,036	170	2	g/hp-hr	0.13	3.50	0.36	0.01	0.01	0.01
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	110,098	305	3	g/hp-hr	0.33	3.07	0.83	0.01	0.03	0.03
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	1,867	202	1	g/hp-hr	0.06	0.61	0.16	0.00	0.01	0.01
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	59,824	373	2	g/hp-hr	0.24	2.25	0.60	0.01	0.02	0.02
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	9,507	699	1	g/hp-hr	0.25	2.15	0.57	0.01	0.02	0.02
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	914	193	1	g/hp-hr	0.05	0.66	0.18	0.00	0.01	0.01
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	138	36	1	g/hp-hr	0.02	0.35	0.31	0.00	0.00	0.00
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	70,318	200	2	g/hp-hr	0.11	1.33	0.36	0.01	0.01	0.01
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	914	27	1	g/hp-hr	0.02	0.29	0.23	0.00	0.00	0.00
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	11,600	235	1	g/hp-hr	0.06	0.70	0.19	0.00	0.01	0.01
2.0 CY Excavator	ConstMin - Excavators	Diesel	75	235	1	g/hp-hr	0.06	0.73	0.20	0.00	0.01	0.01
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,063	286	1	g/hp-hr	0.07	0.85	0.23	0.00	0.01	0.01
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	5,755	290	1	g/hp-hr	0.07	0.86	0.23	0.00	0.01	0.01
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	24,968	80	1	g/hp-hr	0.03	0.80	0.33	0.00	0.00	0.00
5 Ton Flatbed Truck	n/a - onroad	Diesel	5,457	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	83	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	5,080	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	256,985	340	6	g/hp-hr	0.77	6.66	1.78	0.03	0.07	0.06
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	43,944	680	2	g/hp-hr	0.56	4.53	1.20	0.02	0.05	0.04
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	12,112	783	1	g/hp-hr	0.22	2.95	7.04	0.01	0.06	0.05
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	2,021	4	1	g/hp-hr	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	50	120	1	g/hp-hr	0.02	1.02	0.09	0.00	0.00	0.00
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	597	145	1	g/hp-hr	0.03	1.24	0.11	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	157	145	1	g/hp-hr	0.03	1.24	0.11	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	5,391	165	1	g/hp-hr	0.03	1.41	0.13	0.00	0.00	0.00
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	55	190	1	g/hp-hr	0.04	0.56	0.15	0.00	0.01	0.00
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	23,482	315	1	g/hp-hr	0.06	0.91	0.25	0.00	0.01	0.01
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	2,210	180	1	g/hp-hr	0.15	1.18	0.30	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	2,210	210	1	g/hp-hr	0.17	1.38	0.35	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	1,105	150	1	g/hp-hr	0.12	2.88	0.25	0.01	0.01	0.01
Concrete Equipment												
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	5,334	10	1	g/hp-hr	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	15,182	220	1	g/hp-hr	0.04	0.55	0.12	0.00	0.01	0.01
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	917	330	1	g/hp-hr	0.07	0.80	0.14	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	8,685	18	1	g/hp-hr	0.06	0.32	0.45	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	9,808	100	1	g/hp-hr	0.02	0.83	0.29	0.00	0.02	0.02
Utility Equipment												
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	34,088	13	1	g/hp-hr	0.30	19.24	0.24	0.00	0.02	0.01
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	200	134	1	g/hp-hr	0.05	1.12	0.16	0.00	0.01	0.00
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	20,262	268	1	g/hp-hr	0.09	0.75	0.12	0.00	0.01	0.01
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	2,843	429	1	g/hp-hr	0.15	1.15	0.20	0.01	0.01	0.01
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	483,274	12	12	g/hp-hr	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	200	18	1	g/hp-hr	0.64	24.54	0.48	0.00	0.27	0.21
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	1,060	35	1	g/hp-hr	0.04	0.53	0.41	0.00	0.00	0.00
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	19,943	61	1	g/hp-hr	0.03	0.52	0.39	0.00	0.00	0.00
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	7,171	130	1	g/hp-hr	0.03	0.98	0.15	0.00	0.00	0.00
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	30,483	266	1	g/hp-hr	0.06	0.68	0.15	0.00	0.01	0.01
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	19,230	19	1	g/hp-hr	0.04	0.19	0.29	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	38,711	22	1	g/hp-hr	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	237	24	1	g/hp-hr	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	111	33	1	g/hp-hr	0.03	0.44	0.35	0.00	0.00	0.00
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	19,299	21	1	g/hp-hr	0.03	0.16	0.21	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	12,675	21	1	g/hp-hr	0.03	0.16	0.21	0.00	0.01	0.01

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2025 (tons per year)						Annual Emissions - 2026 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.04	1.13	0.11	0.00	0.00	0.00	0.04	1.14	0.12	0.00	0.00	0.00
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.13	3.50	0.35	0.01	0.01	0.01	0.13	3.53	0.37	0.01	0.01	0.01
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.35	3.10	0.83	0.01	0.03	0.03	0.36	3.13	0.84	0.01	0.03	0.03
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.06	0.62	0.16	0.00	0.01	0.01	0.06	0.63	0.16	0.00	0.01	0.01
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.24	2.26	0.61	0.01	0.02	0.02	0.25	2.27	0.61	0.01	0.02	0.02
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.27	2.19	0.58	0.01	0.02	0.02	0.28	2.21	0.59	0.01	0.02	0.02
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.05	0.66	0.18	0.00	0.01	0.01	0.05	0.67	0.18	0.00	0.01	0.01
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.02	0.35	0.31	0.00	0.00	0.00	0.02	0.35	0.31	0.00	0.00	0.00
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.11	1.33	0.36	0.01	0.01	0.01	0.12	1.35	0.36	0.01	0.01	0.01
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.02	0.30	0.23	0.00	0.00	0.00	0.02	0.31	0.24	0.00	0.00	0.00
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.06	0.70	0.19	0.00	0.01	0.01	0.06	0.71	0.19	0.00	0.01	0.01
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.06	0.73	0.20	0.00	0.01	0.01	0.06	0.74	0.20	0.00	0.01	0.01
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.07	0.86	0.23	0.00	0.01	0.01	0.07	0.86	0.23	0.00	0.01	0.01
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.07	0.87	0.23	0.00	0.01	0.01	0.07	0.87	0.23	0.00	0.01	0.01
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.03	0.80	0.33	0.00	0.00	0.00	0.03	0.81	0.33	0.00	0.00	0.00
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.80	6.73	1.79	0.03	0.07	0.06	0.83	6.78	1.81	0.03	0.07	0.07
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.55	4.50	1.20	0.02	0.05	0.04	0.58	4.57	1.21	0.02	0.05	0.04
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.24	2.99	7.09	0.01	0.06	0.06	0.26	3.02	7.14	0.01	0.06	0.06
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.02	1.03	0.10	0.00	0.00	0.00	0.02	1.03	0.10	0.00	0.00	0.00
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.03	1.24	0.11	0.00	0.00	0.00	0.03	1.25	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.03	1.24	0.11	0.00	0.00	0.00	0.03	1.25	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.03	1.41	0.13	0.00	0.00	0.00	0.03	1.42	0.13	0.00	0.00	0.00
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.04	0.56	0.15	0.00	0.01	0.00	0.04	0.56	0.15	0.00	0.01	0.00
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.06	0.92	0.25	0.00	0.01	0.01	0.06	0.92	0.25	0.00	0.01	0.01
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.15	1.18	0.30	0.01	0.01	0.01	0.15	1.19	0.30	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.17	1.38	0.35	0.01	0.01	0.01	0.17	1.38	0.35	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.12	2.89	0.25	0.01	0.01	0.01	0.12	2.90	0.25	0.01	0.01	0.01
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.04	0.55	0.08	0.00	0.01	0.00	0.04	0.56	0.08	0.00	0.01	0.00
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.07	0.81	0.13	0.00	0.01	0.01	0.07	0.82	0.14	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.45	0.00	0.02	0.02	0.06	0.32	0.45	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.02	0.84	0.26	0.00	0.02	0.02	0.02	0.85	0.26	0.00	0.02	0.02
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.30	19.21	0.24	0.00	0.02	0.01	0.30	19.19	0.24	0.00	0.02	0.01
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.13	0.14	0.00	0.00	0.00	0.05	1.14	0.14	0.00	0.00	0.00
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.09	0.77	0.11	0.00	0.01	0.01	0.09	0.78	0.11	0.00	0.01	0.01
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.15	1.17	0.20	0.01	0.01	0.01	0.15	1.18	0.19	0.01	0.01	0.01
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.49	0.48	0.00	0.27	0.20	0.65	24.43	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.04	0.54	0.41	0.00	0.00	0.00	0.04	0.56	0.41	0.00	0.00	0.00
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.53	0.39	0.00	0.00	0.00	0.03	0.53	0.40	0.00	0.00	0.00
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.99	0.14	0.00	0.00	0.00	0.03	1.00	0.13	0.00	0.00	0.00
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.06	0.68	0.14	0.00	0.01	0.01	0.06	0.69	0.14	0.00	0.01	0.01
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.29	0.00	0.01	0.01	0.04	0.19	0.29	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.22	0.34	0.00	0.01	0.01	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.37	0.00	0.01	0.01	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.03	0.45	0.35	0.00	0.00	0.00	0.03	0.46	0.36	0.00	0.00	0.00
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01	0.03	0.16	0.21	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01	0.03	0.16	0.21	0.00	0.01	0.01

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2027 (tons per year)						Annual Emissions - 2028 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment														
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.04	1.15	0.12	0.00	0.00	0.00	0.05	1.16	0.12	0.00	0.00	0.00
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.14	3.55	0.37	0.01	0.01	0.01	0.14	3.58	0.36	0.01	0.01	0.01
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.37	3.14	0.84	0.01	0.03	0.03	0.38	3.17	0.84	0.01	0.03	0.03
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.06	0.63	0.16	0.00	0.01	0.01	0.07	0.64	0.16	0.00	0.01	0.01
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.27	2.31	0.62	0.01	0.02	0.02	0.28	2.32	0.62	0.01	0.02	0.02
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.28	2.21	0.59	0.01	0.02	0.02	0.30	2.24	0.59	0.01	0.02	0.02
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.05	0.67	0.18	0.00	0.01	0.01	0.06	0.68	0.18	0.00	0.01	0.01
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.02	0.35	0.31	0.00	0.00	0.00	0.02	0.35	0.31	0.00	0.00	0.00
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.12	1.36	0.36	0.01	0.01	0.01	0.13	1.37	0.36	0.01	0.01	0.01
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.02	0.31	0.24	0.00	0.00	0.00	0.02	0.32	0.24	0.00	0.00	0.00
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.06	0.72	0.19	0.00	0.01	0.01	0.06	0.72	0.19	0.00	0.01	0.01
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.06	0.74	0.20	0.00	0.01	0.01	0.06	0.74	0.20	0.00	0.01	0.01
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.08	0.87	0.23	0.00	0.01	0.01	0.08	0.87	0.23	0.00	0.01	0.01
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.08	0.88	0.23	0.00	0.01	0.01	0.08	0.89	0.23	0.00	0.01	0.01
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.03	0.81	0.33	0.00	0.00	0.00	0.03	0.82	0.34	0.00	0.00	0.00
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.86	6.83	1.81	0.03	0.07	0.07	0.87	6.86	1.82	0.03	0.07	0.07
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.61	4.62	1.22	0.02	0.05	0.05	0.62	4.64	1.23	0.02	0.05	0.05
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.27	3.05	7.19	0.01	0.06	0.06	0.29	3.08	7.24	0.01	0.06	0.06
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.02	1.04	0.10	0.00	0.00	0.00	0.03	1.04	0.10	0.00	0.00	0.00
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.03	1.25	0.12	0.00	0.00	0.00	0.03	1.26	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.03	1.25	0.12	0.00	0.00	0.00	0.03	1.26	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.03	1.43	0.13	0.00	0.00	0.00	0.03	1.43	0.13	0.00	0.00	0.00
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.04	0.56	0.15	0.00	0.01	0.00	0.04	0.56	0.15	0.00	0.01	0.00
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.07	0.92	0.25	0.00	0.01	0.01	0.07	0.92	0.25	0.00	0.01	0.01
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.15	1.19	0.30	0.01	0.01	0.01	0.15	1.18	0.30	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.17	1.38	0.35	0.01	0.01	0.01	0.17	1.38	0.35	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.12	2.90	0.25	0.01	0.01	0.01	0.12	2.90	0.25	0.01	0.01	0.01
Concrete Equipment														
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.04	0.56	0.08	0.00	0.01	0.00	0.05	0.57	0.07	0.00	0.01	0.00
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.07	0.82	0.13	0.00	0.01	0.01	0.07	0.83	0.14	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.45	0.00	0.02	0.02	0.06	0.32	0.45	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.02	0.85	0.22	0.00	0.02	0.02	0.02	0.86	0.22	0.00	0.02	0.02
Utility Equipment														
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.30	19.17	0.24	0.00	0.02	0.01	0.30	19.16	0.24	0.00	0.02	0.01
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.16	0.12	0.00	0.00	0.00	0.05	1.17	0.11	0.00	0.00	0.00
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.10	0.79	0.11	0.00	0.01	0.01	0.10	0.80	0.11	0.00	0.01	0.01
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.16	1.20	0.19	0.01	0.01	0.01	0.16	1.21	0.17	0.01	0.01	0.01
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.39	0.48	0.00	0.27	0.20	0.65	24.36	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.04	0.57	0.41	0.00	0.00	0.00	0.04	0.58	0.42	0.00	0.00	0.00
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.54	0.40	0.00	0.00	0.00	0.03	0.54	0.40	0.00	0.00	0.00
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	1.01	0.12	0.00	0.00	0.00	0.03	1.02	0.12	0.00	0.00	0.00
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.06	0.70	0.14	0.00	0.01	0.01	0.06	0.70	0.14	0.00	0.01	0.01
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.29	0.00	0.01	0.01	0.04	0.19	0.29	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.22	0.34	0.00	0.01	0.01	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.37	0.00	0.01	0.01	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.03	0.47	0.36	0.00	0.00	0.00	0.03	0.47	0.36	0.00	0.00	0.00
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01	0.03	0.16	0.21	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01	0.03	0.16	0.21	0.00	0.01	0.01

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2029 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Earthmoving Equipment								
110 Hsp Bulldozer (Cat D5)	ConstMin - Rubber Tired Dozers	Diesel	0.05	1.17	0.12	0.00	0.00	0.00
170 Hsp Bulldozer (Cat D6)	ConstMin - Rubber Tired Dozers	Diesel	0.14	3.61	0.39	0.01	0.01	0.01
305 Hsp Bulldozer (Cat D8)	ConstMin - Rubber Tired Dozers	Diesel	0.39	3.18	0.85	0.01	0.03	0.03
3.5 CY Loader (Cat 950)	ConstMin - Rubber Tired Loaders	Diesel	0.07	0.65	0.17	0.00	0.01	0.01
6.5 CY Loader (Cat 980)	ConstMin - Rubber Tired Loaders	Diesel	0.29	2.34	0.62	0.01	0.02	0.02
11.2 CY Loader (Cat 990)	ConstMin - Rubber Tired Loaders	Diesel	0.31	2.26	0.60	0.01	0.02	0.02
3.0 CY Track Loader (Cat 963)	ConstMin - Crawler Tractors	Diesel	0.06	0.68	0.18	0.00	0.01	0.01
1300LB Skid Steer Loader (Bobcat 743)	ConstMin - Skid Steer Loaders	Diesel	0.02	0.35	0.31	0.00	0.00	0.00
200 Hsp Grader (Cat 14G)	ConstMin - Graders	Diesel	0.13	1.39	0.36	0.01	0.01	0.01
1.7 CY Backhoe (JD 790)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.02	0.32	0.24	0.00	0.00	0.00
2.0 CY Backhoe (Cat 330)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.07	0.73	0.19	0.00	0.01	0.01
2.0 CY Excavator	ConstMin - Excavators	Diesel	0.07	0.75	0.20	0.00	0.01	0.01
2.6 CY Backhoe (Cat 350)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.08	0.89	0.23	0.00	0.01	0.01
2.7 CY Backhoe (Cat 345 BL)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.08	0.90	0.24	0.00	0.01	0.01
1.7 CY Backhoe Loader (Case680)	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.03	0.82	0.34	0.00	0.00	0.00
5 Ton Flatbed Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
20 Ton (10 CY) Tandem Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
24 Ton (12 CY) Tandem Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
35 Ton Articulated Truck (Cat D350)	ConstMin - Off-Highway Trucks	Diesel	0.88	6.87	1.82	0.03	0.07	0.07
50 Ton Off Hwy Truck 680 Hsp (Cat 773)	ConstMin - Off-Highway Trucks	Diesel	0.61	4.63	1.22	0.02	0.05	0.05
26 CY Tandem Scraper (Cat 637)	ConstMin - Scrapers	Diesel	0.30	3.10	7.27	0.01	0.07	0.06
22" Smooth Drum Manual (Bomag 55)	ConstMin - Rollers	Diesel	0.01	0.05	0.07	0.00	0.00	0.00
10 Ton Compactor 120 hsp (Dyn CA25)	ConstMin - Rollers	Diesel	0.03	1.04	0.10	0.00	0.00	0.00
13 Ton Compactor 72" (Cat 553)	ConstMin - Rollers	Diesel	0.03	1.26	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 563)	ConstMin - Rollers	Diesel	0.03	1.26	0.12	0.00	0.00	0.00
15 Ton Compactor 84" (Cat 663)	ConstMin - Rollers	Diesel	0.03	1.44	0.13	0.00	0.00	0.00
20 Ton Compactor 190 hsp (Bomag 217)	ConstMin - Rollers	Diesel	0.04	0.56	0.15	0.00	0.01	0.00
30 Ton Compactor 315 hsp (Cat 825)	ConstMin - Rollers	Diesel	0.07	0.93	0.25	0.00	0.01	0.01
180 Hsp Wheel Skidder (Cat 535)	OFF - Logging - Skidders	Diesel	0.15	1.19	0.30	0.01	0.01	0.01
210 Hsp Harvester (Cat 580)	OFF - Logging - Skidders	Diesel	0.17	1.38	0.35	0.01	0.01	0.01
150 Hsp Grapple (Cat 527)	OFF - Logging - Skidders	Diesel	0.12	2.90	0.25	0.01	0.01	0.01
Concrete Equipment								
Grout Mixer	OFF - ConstMin - Cement and Mortar Mixers	Diesel	0.02	0.15	0.19	0.00	0.01	0.01
90 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.05	0.58	0.08	0.00	0.01	0.00
124 YPH Trailer Mounted Concrete Pump	Portable Equipment - Non-Rental Pump	Diesel	0.07	0.84	0.14	0.00	0.01	0.01
Grout Pump	OFF - Light Commercial - Pumps	Diesel	0.06	0.32	0.45	0.00	0.02	0.02
8 YPH Wet Shotcrete Pump (Swing 750)	Portable Equipment - Non-Rental Pump	Diesel	0.02	0.87	0.21	0.00	0.02	0.02
Utility Equipment								
10 KW Generator Set (Gas)	OFF - Light Commercial - Generator Sets	Gasoline	0.30	19.15	0.24	0.00	0.02	0.01
100 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.05	1.18	0.11	0.00	0.00	0.00
200 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.10	0.80	0.11	0.00	0.01	0.01
320 KW Diesel Generator Set	Portable Equipment - Non-Rental Generator	Diesel	0.16	1.23	0.17	0.01	0.01	0.01
Tower 4-Lights 12 Hsp	OFF - ConstMin - Signal Boards	Diesel	0.52	3.30	3.94	0.01	0.15	0.14
3" Gas Water Pump 20,000 gph	OFF - Light Commercial - Pumps	Gasoline	0.65	24.34	0.48	0.00	0.27	0.20
150 CFM Diesel Compressor	OFF - Light Commercial - Air Compressors	Diesel	0.05	0.59	0.42	0.00	0.00	0.00
185 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	0.55	0.41	0.00	0.00	0.00
375 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.03	1.03	0.12	0.00	0.00	0.00
750 CFM Diesel Compressor	Portable Equipment - Non-Rental Compressor	Diesel	0.06	0.71	0.13	0.00	0.01	0.01
250 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.19	0.29	0.00	0.01	0.01
350 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.04	0.22	0.34	0.00	0.01	0.01
400 Amp Diesel Welder	OFF - Light Commercial - Welders	Diesel	0.05	0.24	0.37	0.00	0.01	0.01
Large Dia. Polyethylene Fusion Machine	OFF - Light Commercial - Welders	Diesel	0.03	0.48	0.36	0.00	0.00	0.00
2000 PSI Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01
10 GPM Pressure Washer	OFF - Light Commercial - Pressure Washers	Diesel	0.03	0.16	0.21	0.00	0.01	0.01

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Hours per Project	Size (hp)	Quantity	Unit	Annual Emissions - 2024 (tons per year)					
							ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment												
20 Ton Truck Crane	ConstMin - Cranes	Diesel	50	123	1	g/hp-hr	0.02	0.83	0.08	0.00	0.00	0.00
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	148	170	1	g/hp-hr	0.03	1.15	0.11	0.00	0.00	0.00
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	26,245	178	1	g/hp-hr	0.03	0.41	0.11	0.00	0.00	0.00
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	14,545	308	1	g/hp-hr	0.05	0.69	0.19	0.00	0.01	0.01
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	6,457	123	1	g/hp-hr	0.02	0.83	0.08	0.00	0.00	0.00
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	300	130	1	g/hp-hr	0.02	0.88	0.08	0.00	0.00	0.00
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	1,050	355	1	g/hp-hr	0.06	0.80	0.22	0.00	0.01	0.01
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	375	63	1	g/hp-hr	0.01	0.49	0.21	0.00	0.00	0.00
Drilling & Tunneling Equipment												
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	54,435	221	2	g/hp-hr	0.12	1.74	0.47	0.01	0.02	0.02
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	4,319	221	1	g/hp-hr	0.06	0.87	0.23	0.00	0.01	0.01
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	338	44	1	g/hp-hr	0.03	0.63	0.53	0.00	0.00	0.00
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	19	63	1	g/hp-hr	0.01	0.49	0.21	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	1,585	98	1	g/hp-hr	0.03	0.98	0.41	0.00	0.00	0.00
Service & Maintenance Equipment												
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	1,287	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	404,389	n/a	10	g/hr	0.06	1.32	0.06	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	117,268	n/a	3	g/hr	0.02	0.40	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	300	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	22,262	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	3,158	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	3,250	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	116,578	n/a	3	g/hr	0.02	0.40	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	76,667	n/a	2	g/hr	0.01	0.26	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	38,333	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	2,091	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	26,605	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	597	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	74,735	500	2	g/hp-hr	0.29	3.46	0.94	0.02	0.03	0.03
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	3,803	500	1	g/hp-hr	0.14	1.73	0.47	0.01	0.02	0.02
5 Ton Boomtruck	n/a - onroad	Diesel	212	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	249	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	375	n/a	1	g/hr	0.01	0.13	0.01	0.00	0.01	0.00
		Total	**2,461,102**	**n/a**	**n/a**	**n/a**	**2,031.19**	**2,146.63**	**2,054.50**	**2,024.29**	**2,025.32**	**2,025.07**

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2025 (tons per year)						Annual Emissions - 2026 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.02	0.84	0.08	0.00	0.00	0.00	0.02	0.84	0.08	0.00	0.00	0.00
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.03	1.15	0.11	0.00	0.00	0.00	0.03	1.16	0.11	0.00	0.00	0.00
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.03	0.41	0.11	0.00	0.00	0.00	0.03	0.41	0.11	0.00	0.00	0.00
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.05	0.69	0.19	0.00	0.01	0.01	0.05	0.70	0.19	0.00	0.01	0.01
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.02	0.84	0.08	0.00	0.00	0.00	0.02	0.84	0.08	0.00	0.00	0.00
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.02	0.88	0.08	0.00	0.00	0.00	0.02	0.89	0.08	0.00	0.00	0.00
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.06	0.80	0.22	0.00	0.01	0.01	0.06	0.80	0.22	0.00	0.01	0.01
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00	0.01	0.49	0.21	0.00	0.00	0.00
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.12	1.74	0.47	0.01	0.02	0.02	0.13	1.75	0.47	0.01	0.02	0.02
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.06	0.87	0.24	0.00	0.01	0.01	0.06	0.88	0.24	0.00	0.01	0.01
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.03	0.63	0.53	0.00	0.00	0.00	0.03	0.65	0.54	0.00	0.00	0.00
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00	0.01	0.49	0.21	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.03	0.98	0.41	0.00	0.00	0.00	0.04	0.99	0.41	0.00	0.00	0.00
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.06	1.31	0.06	0.00	0.06	0.03	0.06	1.31	0.05	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.02	0.39	0.02	0.00	0.02	0.01	0.02	0.39	0.02	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.02	0.39	0.02	0.00	0.02	0.01	0.02	0.39	0.02	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.26	0.01	0.00	0.01	0.01	0.01	0.26	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.30	3.48	0.95	0.02	0.03	0.03	0.31	3.51	0.95	0.02	0.03	0.03
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.15	1.74	0.47	0.01	0.02	0.02	0.16	1.75	0.48	0.01	0.02	0.02
5 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.01	0.00	0.01	0.00	0.01	0.13	0.01	0.00	0.01	0.00
		Total	**2,032.32**	**2,147.92**	**2,055.44**	**2,025.29**	**2,026.32**	**2,026.07**	**2,033.51**	**2,149.38**	**2,056.58**	**2,026.29**	**2,027.33**	**2,027.08**

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2027 (tons per year)						Annual Emissions - 2028 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5	ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment														
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.02	0.84	0.08	0.00	0.00	0.00	0.02	0.85	0.08	0.00	0.00	0.00
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.03	1.17	0.11	0.00	0.00	0.00	0.03	1.18	0.11	0.00	0.00	0.00
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.03	0.41	0.11	0.00	0.00	0.00	0.03	0.42	0.11	0.00	0.00	0.00
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.06	0.70	0.19	0.00	0.01	0.01	0.06	0.70	0.19	0.00	0.01	0.01
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.02	0.84	0.08	0.00	0.00	0.00	0.02	0.85	0.08	0.00	0.00	0.00
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.02	0.89	0.08	0.00	0.00	0.00	0.03	0.90	0.08	0.00	0.00	0.00
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.06	0.81	0.22	0.00	0.01	0.01	0.07	0.81	0.22	0.00	0.01	0.01
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00	0.01	0.49	0.21	0.00	0.00	0.00
Drilling & Tunneling Equipment														
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.13	1.75	0.47	0.01	0.02	0.02	0.13	1.75	0.47	0.01	0.02	0.02
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.06	0.88	0.24	0.00	0.01	0.01	0.06	0.87	0.24	0.00	0.01	0.01
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.03	0.64	0.54	0.00	0.00	0.00	0.03	0.65	0.53	0.00	0.00	0.00
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00	0.01	0.49	0.21	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	0.99	0.41	0.00	0.00	0.00	0.04	1.00	0.41	0.00	0.00	0.00
Service & Maintenance Equipment														
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.05	1.31	0.05	0.00	0.06	0.03	0.05	1.30	0.05	0.00	0.06	0.03
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.02	0.39	0.01	0.00	0.02	0.01	0.02	0.39	0.01	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.02	0.39	0.01	0.00	0.02	0.01	0.02	0.39	0.01	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.26	0.01	0.00	0.01	0.01	0.01	0.26	0.01	0.00	0.01	0.01
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.32	3.53	0.96	0.02	0.04	0.03	0.33	3.54	0.96	0.02	0.04	0.03
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.16	1.76	0.48	0.01	0.02	0.02	0.16	1.77	0.48	0.01	0.02	0.02
5 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.01	0.13	0.00	0.00	0.01	0.00	0.01	0.13	0.00	0.00	0.01	0.00
		Total	**2,034.67**	**2,150.76**	**2,057.57**	**2,027.29**	**2,028.33**	**2,028.08**	**2,035.81**	**2,152.15**	**2,058.62**	**2,028.29**	**2,029.33**	**2,029.08**

Table A-169. Annual Unmitgated Emissions - Onsite Construction Equipment

Equipment Description	OFFROAD2017 Equipment Category	Fuel	Annual Emissions - 2029 (tons per year)					
			ROG	CO	NOx	SOx	PM10	PM2.5
Hoisting Equipment								
20 Ton Truck Crane	ConstMin - Cranes	Diesel	0.02	0.86	0.08	0.00	0.00	0.00
50 Ton Truck Crane (Linkbelt 108)	ConstMin - Cranes	Diesel	0.03	1.18	0.11	0.00	0.00	0.00
60 Ton Crawler Crane (Linkbelt118)	ConstMin - Cranes	Diesel	0.03	0.42	0.11	0.00	0.00	0.00
150 Ton Crawler Crane (American 9260)	ConstMin - Cranes	Diesel	0.06	0.71	0.19	0.00	0.01	0.01
20 Ton Hydraulic Crane (Grove58)	ConstMin - Cranes	Diesel	0.02	0.86	0.08	0.00	0.00	0.00
30 Ton Hydraulic Crane (Grove500)	ConstMin - Cranes	Diesel	0.03	0.91	0.08	0.00	0.00	0.00
60 Ton Hydraulic Crane (Grove)	ConstMin - Cranes	Diesel	0.07	0.81	0.22	0.00	0.01	0.01
Motorized Manlift 66 Ft	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00
Drilling & Tunneling Equipment								
Hydraulic Drill 3" (AC1238/Tam400)	ConstMin - Bore/Drill Rigs	Diesel	0.13	1.75	0.47	0.01	0.02	0.02
2.5" Air Track Rockdrill (IR100)	ConstMin - Bore/Drill Rigs	Diesel	0.06	0.88	0.24	0.00	0.01	0.01
Core Drill Skid Mounted 44 Hsp	ConstMin - Bore/Drill Rigs	Diesel	0.04	0.65	0.53	0.00	0.00	0.00
Tunnel Scissor Truck	Industrial - Aerial Lifts	Diesel	0.01	0.49	0.21	0.00	0.00	0.00
1/4 CY Crawler Backhoe	ConstMin - Tractors/Loaders/Backhoes	Diesel	0.04	1.00	0.41	0.00	0.00	0.00
Service & Maintenance Equipment								
1/2 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
3/4 Ton Pickup Truck 2x2	n/a - onroad	Diesel	0.05	1.30	0.05	0.00	0.06	0.02
3/4 Ton Pickup Truck 4x4	n/a - onroad	Diesel	0.01	0.39	0.01	0.00	0.02	0.01
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
3/4 Ton Crew Cab Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
5 Ton Flat Bed Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
10 Ton Flat Bed Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
1- Ton Mechanic Truck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
2-Ton Mechanic Truck	n/a - onroad	Diesel	0.01	0.39	0.01	0.00	0.02	0.01
Lube Truck	n/a - onroad	Diesel	0.01	0.26	0.01	0.00	0.01	0.00
Fuel Truck (Tandem Axle 20000 litres)	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
1000 Gallon Watertruck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
3000 Gallon Watertruck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
5000 Gallon Watertanker	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
631 WaterWagon	ConstMin - Off-Highway Tractors	Diesel	0.33	3.54	0.96	0.02	0.04	0.03
631 Water Wagon	ConstMin - Off-Highway Tractors	Diesel	0.16	1.77	0.48	0.01	0.02	0.02
5 Ton Boomtruck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
10 Ton Boomtruck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
20 Ton Boomtruck	n/a - onroad	Diesel	0.00	0.13	0.00	0.00	0.01	0.00
		Total	**2,036.90**	**2,153.44**	**2,059.70**	**2,029.29**	**2,030.33**	**2,030.08**

Pacheco Reservoir Expansion Alternative
Offsite Construction Emissions

Table A-170. Construction Worker Commuting Emissions

Year	Maximum Daily Trips	Annual Trips	Emission Factors, grams per mile						Maximum Daily Emissions, pounds per day						Annual Emissions, tons per year					
			ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5
2024	600	159,250	0.0093	0.0475	0.5237	0.0025	0.1469	0.0444	0.49	2.51	27.71	0.13	7.77	2.35	0.07	0.33	3.68	0.02	1.03	0.31
2025	600	191,889	0.0085	0.0435	0.4900	0.0024	0.1469	0.0444	0.45	2.30	25.93	0.13	7.77	2.35	0.07	0.37	4.15	0.02	1.24	0.38
2026	900	291,261	0.0078	0.0402	0.4617	0.0023	0.1468	0.0444	0.62	3.19	36.64	0.19	11.65	3.52	0.10	0.52	5.93	0.03	1.89	0.57
2027	950	309,400	0.0072	0.0372	0.4367	0.0023	0.1468	0.0443	0.60	3.12	36.58	0.19	12.29	3.71	0.10	0.51	5.96	0.03	2.00	0.60
2028	950	309,400	0.0066	0.0346	0.4144	0.0022	0.1466	0.0442	0.56	2.90	34.72	0.18	12.28	3.70	0.09	0.47	5.65	0.03	2.00	0.60
2029	550	142,567	0.0062	0.0323	0.3939	0.0021	0.1465	0.0441	0.30	1.57	19.10	0.10	7.11	2.14	0.04	0.20	2.48	0.01	0.92	0.28
								Maximum	**0.62**	**3.19**	**36.64**	**0.19**	**12.29**	**3.71**	**0.10**	**0.52**	**5.96**	**0.03**	**2.00**	**0.60**

Note: Particulate matter (PM10 and PM2.5) emissions contain exhaust, tire wear, brake wear, and paved road dust.

Table A-171. Mitigated Haul Trucks Emissions

Year	Maximum Daily Trips	Annual Trips	Emission Factors, grams per mile						Maximum Daily Emissions, pounds per day						Annual Emissions, tons per year					
			ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5	ROG	NOx	CO	SOx	PM10	PM2.5
2024	245	48,230	0.0589	0.8860	0.3475	0.0141	0.2019	0.0641	1.27	19.14	7.51	0.30	4.36	1.39	0.13	1.88	0.74	0.03	0.43	0.14
2025	430	132,253	0.0595	0.9006	0.3511	0.0141	0.2020	0.0642	2.25	34.15	13.31	0.53	7.66	2.43	0.35	5.25	2.05	0.08	1.18	0.37
2026	430	156,520	0.0600	0.9141	0.3545	0.0141	0.2020	0.0642	2.28	34.66	13.44	0.53	7.66	2.44	0.41	6.31	2.45	0.10	1.39	0.44
2027	430	144,387	0.0606	0.9270	0.3577	0.0141	0.2021	0.0643	2.30	35.15	13.56	0.53	7.66	2.44	0.39	5.90	2.28	0.09	1.29	0.41
2028	30	10,920	0.0611	0.9397	0.3608	0.0141	0.2021	0.0643	0.16	2.49	0.95	0.04	0.53	0.17	0.03	0.45	0.17	0.01	0.10	0.03
2029	30	4,550	0.0616	0.9510	0.3636	0.0140	0.2022	0.0644	0.16	2.52	0.96	0.04	0.53	0.17	0.01	0.19	0.07	0.00	0.04	0.01
								Maximum	**2.30**	**35.15**	**13.56**	**0.53**	**7.66**	**2.44**	**0.41**	**6.31**	**2.45**	**0.10**	**1.39**	**0.44**

Note: Particulate matter (PM10 and PM2.5) emissions contain exhaust, tire wear, brake wear, and paved road dust.

One-way trip distance
Workers 40 miles
Trucks 40 miles

Conversions
453.6 grams per pound
2,000 pounds per ton

Emission Factors
Paved Road Dust Emissions

Equation 1:

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

where: E = particulate emission factor (having units matching the units of k),
k = particle size multiplier for particle size range and units of interest (see below),
sL = road surface silt loading (grams per square meter) (g/m2), and
W = average weight (tons) of the vehicles traveling the road.

Equation 2:

$$E_{ext} = [k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N)$$

where: k, sL, and W are as defined in Equation 1 and
E_{ext} = annual or other long-term average emission factor in the same units as k,
P = number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, and
N = number of days in the averaging period (e.g., 365 for annual, 91 for seasonal, 30 for monthly).

Table A-172. Particle Size Multipliers for Paved Road Equation

Size Range [a]	Ref.	Particle Size Multiplier, k [b]		
		g/VKT	g/VMT	lb/VMT
$PM_{2.5}$	[c]	0.15	0.25	0.00054
PM_{10}		0.62	1.00	0.0022
PM_{15}		0.77	1.23	0.0027
PM_{30}	[d]	3.23	5.24	0.011

Source: USEPA. 2011. Compilation of Air Pollutant Emission Factors (AP-42). Fifth Edition, Volume I. Chapter 13.2.1 Paved Roads. January. Available online at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf [Accessed July 17, 2012].

Notes:

[a] Refers to airborne particulate matter (PM-x) with an aerodynamic diameter equal to or less than x micrometers.

[b] Units shown are grams per vehicle kilometer traveled (g/VKT), grams per vehicle mile traveled (g/VMT), and pounds per vehicle mile traveled (lb/VMT). The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required in Equation 1.

[c] The k-factors for $PM_{2.5}$ were based on the average $PM_{2.5}$:PM_{10} ratio of test runs in Reference 30.

[d] PM-30 is sometimes termed "suspendable particulate" (SP) and is often used as a surrogate for TSP.

Offsite Construction Vehicles

Number precipitation days >0.1 inches
Santa Clara County 58

Road silt loading 0.03 g/m^2 (AP-42, Table 13.2.1-2, ADT > 10,000, ubiquitous baseline)
Average vehicle weight 2.4 tons

Source: CAPCOA. 2017. California Emissions Estimator Model User's Guide, Version 2016.3.2, Appendix D: Default Data Tables. Prepared by BREEZE Software, A Division of Trinity Consultants. October. Available online at: http://www.caleemod.com/ [Accessed on November 9, 2018].

Table A-173. Paved Road Dust Emission Factors - Offsite Construction Vehicles

County	Emission Factor (g/VMT)			
	Uncontrolled		Controlled	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Merced	0.100	0.025	0.096	0.024

Note:
Controlled emission factor only valid for long-term (annual) emissions; uncontrolled emission factor used for daily emissions.

EMFAC2014 Emission Factors
On-Road Motor Vehicles

Table A-174. Emission Factors for Construction Worker Commutes

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Francisco Bay Area	2024	0.0093	0.0135	0.0475	0.5237	0.0025	0.0017	0.0080	0.0368	0.0465	0.0016	0.0020	0.0158	0.0193
	2025	0.0085	0.0123	0.0435	0.4900	0.0024	0.0017	0.0080	0.0368	0.0464	0.0016	0.0020	0.0158	0.0193
	2026	0.0078	0.0113	0.0402	0.4617	0.0023	0.0016	0.0080	0.0368	0.0464	0.0015	0.0020	0.0158	0.0193
	2027	0.0072	0.0104	0.0372	0.4367	0.0023	0.0015	0.0080	0.0368	0.0463	0.0014	0.0020	0.0158	0.0192
	2028	0.0066	0.0097	0.0346	0.4144	0.0022	0.0014	0.0080	0.0368	0.0462	0.0013	0.0020	0.0158	0.0191
	2029	0.0062	0.0090	0.0323	0.3939	0.0021	0.0013	0.0080	0.0368	0.0461	0.0012	0.0020	0.0158	0.0190

Note:
Vehicle fleet mix includes gasoline, diesel, and electric automobiles (LDA) and light-duty trucks (LDT1 and LDT2).

Table A-175. Mitigated Emission Factors for Haul and Delivery Trucks

		grams per mile												
Air Basin	Year	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
San Francisco Bay Area	2024	0.059	0.067	0.886	0.348	0.014	0.004	0.036	0.062	0.101	0.004	0.009	0.026	0.039
	2025	0.059	0.068	0.901	0.351	0.014	0.004	0.036	0.062	0.102	0.004	0.009	0.026	0.039
	2026	0.060	0.068	0.914	0.354	0.014	0.004	0.036	0.062	0.102	0.004	0.009	0.026	0.039
	2027	0.061	0.069	0.927	0.358	0.014	0.004	0.036	0.062	0.102	0.004	0.009	0.026	0.039
	2028	0.061	0.070	0.940	0.361	0.014	0.004	0.036	0.062	0.102	0.004	0.009	0.026	0.039
	2029	0.062	0.070	0.951	0.364	0.014	0.004	0.036	0.062	0.102	0.004	0.009	0.026	0.039

Note: Mitigation requires model year 2015 or later engines.

Table A-176. Mitigated Emission Factors for On-Site Heavy-Duty Vehicles (San Francisco Bay Area Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2024	5	0.138	0.157	0.091	3.002	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.023
2024	10	0.103	0.117	0.075	2.238	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2024	15	0.050	0.057	0.050	1.092	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2024	20	0.019	0.022	0.033	0.425	0.004	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	25	0.012	0.013	0.025	0.255	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2024	30	0.009	0.010	0.021	0.193	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2024	35	0.007	0.008	0.018	0.153	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	40	0.006	0.007	0.016	0.126	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	45	0.005	0.006	0.015	0.107	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	50	0.004	0.005	0.013	0.092	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	55	0.004	0.004	0.012	0.081	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	60	0.004	0.004	0.012	0.077	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2024	65	0.003	0.004	0.012	0.076	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2025	5	0.132	0.150	0.085	2.990	0.004	0.005	0.008	0.037	0.050	0.005	0.002	0.016	0.022
2025	10	0.098	0.112	0.070	2.228	0.004	0.005	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2025	15	0.048	0.054	0.047	1.087	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2025	20	0.019	0.021	0.031	0.423	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	25	0.011	0.013	0.023	0.254	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2025	30	0.008	0.010	0.019	0.192	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2025	35	0.007	0.008	0.017	0.152	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2025	40	0.006	0.006	0.015	0.126	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2025	45	0.005	0.005	0.014	0.107	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020

Table A-176. Mitigated Emission Factors for On-Site Heavy-Duty Vehicles (San Francisco Bay Area Air Basin)

		grams per mile												
Year	Speed	ROG	TOG	NOx	CO	SOx	PM10 Exhaust	PM10 Tire Wear	PM10 Brake Wear	PM10 Total	PM2.5 Exhaust	PM2.5 Tire Wear	PM2.5 Brake Wear	PM2.5 Total
2025	50	0.004	0.005	0.012	0.092	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2025	55	0.004	0.004	0.012	0.081	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2025	60	0.003	0.004	0.011	0.076	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2025	65	0.003	0.004	0.011	0.076	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2026	5	0.126	0.144	0.079	2.982	0.004	0.005	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2026	10	0.094	0.107	0.066	2.222	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2026	15	0.046	0.052	0.044	1.084	0.004	0.004	0.008	0.037	0.048	0.004	0.002	0.016	0.021
2026	20	0.018	0.020	0.029	0.422	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2026	25	0.011	0.012	0.022	0.253	0.004	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2026	30	0.008	0.009	0.018	0.192	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2026	35	0.006	0.007	0.016	0.152	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2026	40	0.005	0.006	0.014	0.125	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2026	45	0.005	0.005	0.013	0.107	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2026	50	0.004	0.004	0.012	0.092	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2026	55	0.003	0.004	0.011	0.081	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2026	60	0.003	0.004	0.010	0.076	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2026	65	0.003	0.004	0.010	0.076	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2027	5	0.122	0.139	0.075	2.977	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2027	10	0.091	0.103	0.062	2.217	0.004	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2027	15	0.044	0.050	0.041	1.081	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2027	20	0.017	0.020	0.027	0.421	0.004	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2027	25	0.010	0.012	0.021	0.253	0.004	0.003	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	30	0.008	0.009	0.017	0.191	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	35	0.006	0.007	0.015	0.152	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	40	0.005	0.006	0.013	0.125	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2027	45	0.004	0.005	0.012	0.107	0.004	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2027	50	0.004	0.004	0.011	0.092	0.004	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2027	55	0.003	0.004	0.010	0.081	0.004	0.002	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2027	60	0.003	0.004	0.010	0.076	0.004	0.002	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2027	65	0.003	0.004	0.010	0.075	0.004	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2028	5	0.118	0.134	0.071	2.971	0.003	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.022
2028	10	0.087	0.100	0.059	2.212	0.003	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2028	15	0.043	0.049	0.039	1.079	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2028	20	0.017	0.019	0.026	0.420	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.020
2028	25	0.010	0.011	0.020	0.252	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	30	0.008	0.009	0.016	0.191	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	35	0.006	0.007	0.014	0.151	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2028	40	0.005	0.006	0.012	0.125	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2028	45	0.004	0.005	0.011	0.106	0.003	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2028	50	0.004	0.004	0.010	0.091	0.003	0.002	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2028	55	0.003	0.004	0.010	0.080	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2028	60	0.003	0.003	0.009	0.076	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2028	65	0.003	0.003	0.009	0.075	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2029	5	0.114	0.130	0.068	2.966	0.003	0.004	0.008	0.037	0.049	0.004	0.002	0.016	0.021
2029	10	0.085	0.097	0.056	2.208	0.003	0.004	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2029	15	0.041	0.047	0.037	1.077	0.003	0.003	0.008	0.037	0.048	0.003	0.002	0.016	0.021
2029	20	0.016	0.018	0.025	0.419	0.003	0.003	0.008	0.037	0.047	0.003	0.002	0.016	0.020
2029	25	0.010	0.011	0.019	0.252	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	30	0.007	0.008	0.016	0.190	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.020
2029	35	0.006	0.007	0.013	0.151	0.003	0.002	0.008	0.037	0.047	0.002	0.002	0.016	0.019
2029	40	0.005	0.005	0.012	0.125	0.003	0.002	0.008	0.037	0.046	0.002	0.002	0.016	0.019
2029	45	0.004	0.005	0.011	0.106	0.003	0.002	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2029	50	0.004	0.004	0.010	0.091	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2029	55	0.003	0.004	0.009	0.080	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2029	60	0.003	0.003	0.009	0.076	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019
2029	65	0.003	0.003	0.009	0.075	0.003	0.001	0.008	0.037	0.046	0.001	0.002	0.016	0.019

Note: Mitigation requires model year 2015 or later engines.

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