

DOCKETED

Docket Number:	16-AFC-01
Project Title:	Stanton Energy Reliability Center
TN #:	214207-16
Document Title:	Appendix 5.1E - Estimated Construction Period Emissions and Impacts
Description:	Application for Certification Vol. 2
Filer:	Sabrina Savala
Organization:	Stanton Energy Reliability Center, LLC
Submitter Role:	Applicant
Submission Date:	10/27/2016 10:23:29 AM
Docketed Date:	10/26/2016

Appendix 5.1E
Estimated Construction Period
Emissions and Impacts

Construction Emissions and Impact Analysis

Construction Phases

Construction of SERC is expected to last approximately 12 months. Actual construction activities will occur during months 1 through 12, while commissioning, testing, and startup will occur in months 11 and 12. Construction will occur 5 days per week, between the hours of 8 a.m. and 5 p.m. The peak construction workforce is expected to be on site during months 7 and 8. Offsite linears are assumed to be constructed during months 4 through 6.

The construction will occur in the following four main phases:

- Mobilization and site preparation
- Foundation work
- Construction/installation of major structures and equipment
- Commissioning, testing, and startup

The main site consists of two parcels (east parcel at 1.764 acres, and the west parcel at 2.214 acres) for a total of approximately 3.978 acres (only 3.173 acres will be disturbed during construction). The site is essentially flat. A laydown yard will be located on the main site. The proposed facility power block and support systems will be constructed on the east parcel. The proposed battery system will be constructed on the west parcel, and will consist of battery storage buildings, inverters, and transformers. The site is currently vacant. The site is currently level, and as such, the site will require only minimum grading and leveling prior to construction of the power block and support systems. Site preparation includes finish grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence. The proposed offsite linears (gas line, underground transmission line, water line, and sewer line) are anticipated to create a disturbance area equal to 4.59 acres.

Fugitive dust emissions from the construction of SERC will result from the following:

- Dust entrained during site preparation and finish grading/excavation at the construction site
- Dust entrained during onsite travel on paved and unpaved surfaces
- Dust entrained during aggregate and soil loading and unloading operations
- Wind erosion of areas disturbed during construction activities

Combustion emissions during construction will result from the following:

- Exhaust from diesel-powered construction equipment used for site preparation, grading, excavation, and construction of onsite structures
- Exhaust from water trucks used to control construction dust emissions
- Exhaust from diesel-powered welding machines, electric generators, air compressors, and water pumps
- Exhaust from pickup trucks and diesel-powered trucks used to transport workers and materials around the construction site

- Exhaust from diesel-powered trucks used to deliver concrete, fuel, and construction supplies to the construction site
- Exhaust from automobiles used by workers to commute to the construction site

To determine the potential daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Daily fugitive dust emissions are expected to be most prominent during months 1 through 5 of construction when site preparation occurs (i.e., grading, cut and fill operations, and foundation excavations). Exhaust emissions are expected to be most prominent in months 6 through 11 during the installation of the major mechanical equipment. Annual emissions are based on the total equipment mix during the 12-month construction period.

Available Mitigation Measures

The following mitigation measures are proposed to control fugitive dust and exhaust emissions from the diesel heavy equipment used during construction of SERC:

- The applicant will have an on-site construction mitigation manager who will be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the proposed construction mitigations will be provided on a periodic basis.
- All unpaved roads and disturbed areas in the project and laydown construction sites will be watered as frequently as necessary to control fugitive dust. The frequency of watering will be on a minimum schedule of three times during the daily construction activity period. Watering may be reduced or eliminated during periods of precipitation.
- Onsite vehicle speeds will be limited to 5 miles per hour on unpaved areas within the project construction site.
- The construction site entrance(s) will be posted with visible speed limit signs.
- All construction equipment vehicle tires will be inspected and cleaned as necessary to be free of dirt prior to leaving the construction site via paved roadways.
- Gravel ramps will be provided at the tire cleaning area.
- All unpaved exits from the construction site will be graveled or treated to reduce track-out to public roadways.
- All construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been provided.
- Construction areas adjacent to any paved roadway will be provided with sandbags or other similar measures as specified in the construction Storm Water Pollution Prevention Plan (SWPPP) to prevent runoff to roadways.
- All paved roads within the construction site will be cleaned on a periodic basis (or less during periods of precipitation), to prevent the accumulation of dirt and debris.
- The first 500 feet of any public roadway exiting the construction site will be cleaned on a periodic basis (or less during periods of precipitation), using wet sweepers or air filtered dry vacuum sweepers, when construction activity occurs or on any day when dirt or runoff from the construction site is visible on the public roadways.
- Any soil storage piles and/or disturbed areas that remain inactive for longer than 10 days will be covered, or shall be treated with appropriate dust suppressant compounds.

- All vehicles that are used to transport solid bulk material on public roadways and that have the potential to cause visible emissions will be covered, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to minimize fugitive dust emissions. A minimum freeboard height of 2 feet will be required on all bulk materials transport.
- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition will remain in place until the soil is stabilized or permanently covered with vegetation.
- Disturbed areas will be re-vegetated as soon as practical.

To mitigate exhaust emissions from construction equipment, the applicant is proposing the following:

- The applicant will work with the construction contractor to utilize to the extent feasible, EPA-ARB Tier 2/Tier 3 engine compliant equipment for equipment over 100 horsepower.
- Insure periodic maintenance and inspections per the manufacturers specifications.
- Reduce idling time through equipment and construction scheduling.
- Use California low sulfur diesel fuels (≤ 15 ppmw S).

Estimation of Emissions with Mitigation Measures

Tables 5.1E-1 and 5.1E-2 show the estimated mitigated period, monthly, and daily heavy equipment exhaust and fugitive dust emissions for the onsite and offsite construction periods. Detailed emission calculations and support data are included in Tables 5.1E-4 through 5.1E-7, including estimates of CO₂e.

Table 5.1E-1. On-Site Construction Emissions Summary

Activity Category	Tons/Period					
	VOC	CO	NO _x	SO _x	PM10	PM2.5
Equipment Exhaust	0.65	3.61	4.684	0.008	0.297	0.294
Fugitive Dust	0	0	0	0	0.264	0.056
Unpaved Road Dust	0	0	0	0	0.428	0.043
Paved Road Dust	0	0	0	0	0.004	0.001
Wind Blown Dust	0	0	0	0	0.0002	0.0001
On-Site Emissions Tabulations						
Total Tons/Period	0.650	3.610	4.684	0.008	0.994	0.394
Total Tons/Year	0.650	3.610	4.684	0.008	0.994	0.394
Pounds/Month	108.3	601.7	780.6	1.41	165.66	65.65
Pounds/Day	4.92	27.35	35.48	0.06	7.53	2.98

Table 5.1E-2. Off-Site Construction Emissions Summary

Activity Category	Tons/Period					
	VOC	CO	NO _x	SO _x	PM10	PM2.5
Equipment Exhaust	0.163	0.915	1.175	0.002	0.079	0.078
Fugitive Dust	0	0	0	0	0.013	0.003
Delivery/Hauling Exhaust	0.389	1.788	4.513	0.012	0.227	0.184
Site Support Vehicle Exhaust	0.054	0.478	0.045	0.001	0.009	0.006
Worker Commute Exhaust	0.217	1.912	0.180	0.004	0.036	0.024
Unpaved Road Dust	0	0	0	0	0	0
Paved Road Dust	0	0	0	0	2.157	0.530
Track Out Dust	0	0	0	0	0.001	0.0002
Off-Site Emissions Tabulations						
Total Tons/Period	0.824	5.093	5.914	0.019	2.523	0.825
Total Tons/Year	0.824	5.093	5.914	0.019	2.523	0.825
Pounds /Month	137.4	848.8	985.6	3.11	420.6	137.5
Pounds /Day	6.24	38.58	44.80	0.14	19.12	6.25

Total CO₂e emissions are as follows:

- On-site construction CO₂e = 764 tons/year (construction period)
- Off-site construction CO₂e = 1,941 tons/year (construction period)

Analysis of Ambient Impacts from Facility Construction

Ambient air quality impacts from emissions during the construction of SERC were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 5.1), monitoring stations delineated in Section 5.1 were used to establish the ambient background levels for the construction impact modeling analysis. Appendix 5.1B, Table 5.1B-4 shows the maximum concentrations of NO_x, SO₂, CO, PM2.5, and PM10 recorded for 2013 through 2015 at those monitoring stations, as well as the modeled impact concentrations for the construction emissions.

Dispersion Model

As in the analysis of project operating impacts, the USEPA-approved model AERMOD (version15181) was used to estimate ambient impacts from onsite construction activities. A detailed discussion of the AERMOD dispersion model and the associated processing programs AERSURFACE, AERMET, and AERMAP is included in Section 5.1. As with the operational impact analysis, the Anaheim and Costa Mesa air quality monitoring site meteorology was processed in accordance with USEPA guidance.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. Combustion equipment exhaust emissions were modeled as eighteen (18) 3.048-meter-high point sources (exhaust parameters of 750 Kelvin, 64.681 m/s exit velocity, and 0.1524-meter stack diameter) placed at regular 150-foot intervals around the construction area. Construction fugitive dust emissions were modeled as an area source covering the construction area with an effective plume height of 0.5 meters. Combustion and fugitive emissions were assumed to occur for 8 hours/day (8 a.m. to 5 p.m., accounting for labor force downtime for meals and mandatory break periods) consistent with the expected period of onsite construction activities generating both exhaust emissions and fugitive dust. The construction impacts modeling analysis generally used the same receptor locations and meteorological data as used for the project operating impact analysis. Exceptions were that only the 10-meter fence line and 20-meter downwash receptor grids were modeled since maximum impacts will occur in the immediate project vicinity and the FASTALL option was utilized to minimize runtimes for the area source and the larger number of point sources modeled. A detailed discussion of the receptor locations and meteorological data is included in Section 5.1. To determine the construction impacts on short-term ambient standards (24 hours and less), the daily onsite construction emission levels shown in Table 5.1E-1 were used. For pollutants with annual average ambient standards, the annual emission levels as shown in Table 5.1E-1 were used.

Modeling Results

Based on the emission rates of NO_x , SO_2 , CO, $\text{PM}_{2.5}$, and PM_{10} , the modeling options, receptor grids, and meteorological data, AERMOD calculates short-term and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour, 8-hour, and 24-hour ambient impacts are based on the daily emission rates of NO_x , SO_2 , CO, $\text{PM}_{2.5}$, and PM_{10} spread over the estimated daily hours of operation. The annual impacts are based on the annual emission rates of these pollutants.

The annual average concentrations of NO_2 were computed following the revised USEPA guidance for computing these concentrations (August 9, 1995 Federal Register, 60 FR 40465). The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NO_x ratio. The 1-hour NO_2 impacts were modeled using the ozone limiting method (OLM) as described in the Section 5.1.6 for the commissioning impacts.

The modeling analysis results are summarized in Table 5.1E-3. In general, the impacts are shown as the maximum impact for the 5-year period for the Federal as well as the state standards. This is conservative in that the short-term Federal standards are usually based on a lesser modeled value, like the highest value of the second-highest for each year (e.g., 1-hour and 8-hour CO and 3-hour and 24-hour SO_2) or the 5-year average of the annual 98th percentile daily maximum values (e.g., 1-hour NO_2 and 24-hour $\text{PM}_{2.5}$). Also included in the table are the maximum background levels that have occurred in the last 3 years and the resulting total ambient impacts (modeled construction impacts plus background concentrations). Like the modeled impacts, these background concentrations are generally the maximum measured concentration over the 3-year period, which are conservative with respect to the Federal standards as discussed above. The two exceptions shown in the table below are for the Federal standards for 1-hour NO_2 background (average of the 98th percentile daily 1-hour maxima from each of the 3 years) and 24-hour $\text{PM}_{2.5}$ background (average of the 98th percentile from each of the 3 years). As shown in Table 5.1E-3, modeled construction impacts due to facility emissions alone for all pollutants are below the most stringent state and Federal standards.

Table 5.1E-3. Modeled Maximum Construction Impacts

Pollutant	Averaging Time	Maximum Construction Impacts ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	Total Impact ($\mu\text{g}/\text{m}^3$)	State Standards ($\mu\text{g}/\text{m}^3$)	Federal Standards ($\mu\text{g}/\text{m}^3$)
NO ₂ ^a	1-hour	29.4	152.6/116.6	182.0/146.0	339	188
	Annual	1.01	50.9	51.9	57	100
SO ₂	1-hour	0.07	23.1	23.2	655	196
	3-hour	0.03	23.1	23.1	-	1,300
	24-hour	0.01	3.7	3.7	105	-
	Annual	0.002	0.8	0.8	0	80
CO	1-hour	28.43	3,910	3,938	23,000	40,000
	8-hour	13.7	2,889	2,903	10,000	10,000
PM10	24-hour	27.4	84	111	50	150
	Annual ^b	7.6	26.7	34.3	20	-
PM2.5	24-hour	3.9	27.7	31.6	-	35
	Annual	1.15	10.5	11.7	12	12.0

^a ARM applied for annual average, using national default 0.75 ratio, and OLM for 1-hour averages.

^b Annual Arithmetic Mean.

Maximum modeled construction impacts, when added to background concentrations only exceed the state PM10 standards, and only because the background concentrations already exceed the state standards. All of the other maximum modeled construction impacts, when added to representative worst-case background concentrations, are less than the applicable state or Federal standards. Modeled SERC construction particulate impacts shown are not unusual in comparison to the modeling results for most construction projects; actual impacts for construction sites that use good dust suppression techniques and low-emitting vehicles typically would not be expected to cause exceedances of air quality particulate standards. The input and output modeling files are being provided electronically to the appropriate agencies.

Table 5.1E-4 Construction Schedule

Activity	Month 1 Nov-18	Month 2 Dec-18	Month 3 Jan-19	Month 4 Feb-19	Month 5 Mar-19	Month 6 Apr-19	Month 7 May-19	Month 8 Jun-19	Month 9 Jul-19	Month 10 Aug-19	Month 11 Sep-19	Month 12 Oct-19
Mobilization	X											
Delineate and mark the boundaries of the construction zone	X											
Install Perimeter Fencing/Gates	X											
Stabilize construction entrance/exit and roadway; install tire wash	X											
Establish parking and staging areas	X											
Establish laydown area for materials storage/staging	X											
Establish concrete washout area	X											
Install BMPs	X											
Clear and grub; strip topsoil	X											
Grading	X	X										
Piles, piers, bridges		X	X									
Underground utilities - Wet			X									
Underground utilities - Mechanical			X	X								
Underground utilities - Electrical			X	X								
Construct reinforced concrete foundations				X	X							
Construct equipment buildings					X	X						
Install Mechanical Equipment					X	X						
Install Electrical Equipment					X	X						
Construct and Install Auxiliary Equipment/Tanks/Structures						X	X	X				
Construct Warehouse, Sound Enclosure							X	X				
Install above ground piping and conduit						X	X	X				
Pull and terminate electrical conductors							X	X				
Insulation, Painting								X	X			
Install BOP Instrumentation and CEMS								X	X			
Finish Parking Area/Roadways/Landscaping									X			
Final Completion									X	X	X	
Equipment Firing/Testing & Initial Commissioning										X	X	X

Table 5.1E-5 Stanton Construction Manpower Loading

Version: 08292016

Role	MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Surveyor	2	2	2					2				
Operator						2	2	2	4	4	4	4
Laborer	5	6	6	8	8	12	12	16	16	12	8	8
Truck Driver	1	3	3	2	2	2	3	3	2	2	1	1
Carpenter	2	8	4	4	8	8	12	8	8	6	4	2
Paving Crew		2	2	2							2	2
Pipe Fitter			2	2	3	3	3	6	4	3	2	2
Electrician			2	2	2	2	4	6	4	4	2	2
Cement Finisher		2	2	2	2	2	2	2	2	2	2	0
Ironworker			2	2	4	4	4	2	2	2	0	0
Tradesman	2	4	4	4	6	6	6	8	8	6	4	2
Project Manager	1	1	1	1	1	1	1	1	1	1	1	1
Construction Manager	1	1	1	1	1	1	1	1	1	1	1	1
PM Assistant	1	1	1	1	1	1	1	1	1	1	1	1
Engineer	2	2	2	2	2	2	2	2	2	2	2	2
Gen tie crew				6	6	6	6	6				
Gas interconnect crew			6	8	12	12	12	12	6	4		
Total	17	32	40	47	58	64	71	78	61	50	34	28

Avg monthly manpower: 48

Peak monthly manpower: 78

Table 5.1E-6 Construction Equipment Listing by Month and Type (Main Site)

Equipment Category**	Avg HP	Month 1		Month 2		Month 3		Month 4		Month 5		Month 6		Month 7		Month 8		Month 9		Month 10		Month 11		Month 12			
		# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*	# used	hrs/day*		
Bore/Drill Rigs/Pile Drivers	209			1	8																						
Cement Mixers	25																										
Industrial/Concrete Saws	56	1	4	1	4			1	4	1	4	1	4	1	4	1	4	1	4	1	4						
Cranes	194					1	6	1	6	1	6	1	6	1	6	1	6	1	6								
Crawler Tractors/Dozers	120	2	4																								
Crushing/Processing Eq.	127																										
Dump and Tender Trucks	25	2	4	1	4	2	4	2	4	2	4	2	4	1	4	1	4	1	4	1	4	1	4				
Excavators	152					1	8	2	8	1	8																
Forklifts/Aerial Lifts/Booms	120									1	6	2	8	2	8	2	8	1	8								
Generators/Compressors	50	2	8	2	8	2	8	2	8	2	8	2	8	2	8	2	8	1	8	1	8						
Graders	157	2	8	2	8													1	8								
Off Highway Tractors	120																										
Off Highway Trucks	250																										
Pavers	99																										
Paving Eq./Surfacing Eq.	91																										
Plate Compactors	15					1	4	1	4	1	4	1	4	1	4	1	4	2	8								
Rollers/Compactors	99	2	8	1	8	1	4	1	4	1	4	2	4					2	8								
Rough Terrain Forklifts	120	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4	1	4	1	4
Rubber Tired Dozers	356																										
Rubber Tired Loaders	175	2	4																								
Scrapers	267	1	8	1	4																						
Signal Boards/Light Sets	15																										
Skid Steer Loaders	50			2	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4				
Tractors/Loaders/Backhoes	120			1	4	2	6	3	6	1	1	1	6	1	4	1	4	2	4	1	4						
Trenchers	120					2	4	2	4									2	4								
Welders	50					1	4	2	4	2	6	2	6	2	6	2	4	1	4	1	4	1	4	1	4		
Gasoline Pickups (F150 type)	175	See Site Support Emissions Calcs																									
Diesel Pickups	175	See Site Support Emissions Calcs																									
Light Lift Helicopter	420																										
Heavy Lift Helicopter	8760																										
Water Truck	240	2	8	2	8	1	8	1	8	2	8	2	8	2	8	1	8	1	8	1	8	1	8				

*hrs/day = the number of hours of expected use on the average work day

#/used = average number of this equip type used on the average work day

Table 5.1E-6 Cont'd

Linear Construction Equipment List

Equipment Category**	Avg HP	Month 5		Month 6		Month 7	
		# used	hrs/day*	# used	hrs/day*	# used	hrs/day*
Bore/Drill Rigs/Pile Drivers	209						
Cement Mixers	25						
Industrial/Concrete Saws	56	2	4	2	4	2	4
Cranes	194	1	6	1	6	1	6
Crawler Tractors/Dozers	120						
Crushing/Processing Eq.	127						
Dump and Tender Trucks	25	2	4	2	4	4	4
Excavators	152						
Forklifts/Aerial Lifts/Booms	120	1	6	1	8	2	6
Generators/Compressors	50	2	8	2	8	4	8
Graders	157						
Off Highway Tractors	120						
Off Highway Trucks	250						
Pavers	99					1	8
Paving Eq./Surfacing Eq.	91					1	8
Plate Compactors	15			1	4	1	4
Rollers/Compactors	99	2	4	2	4	3	4
Rough Terrain Forklifts	120						
Rubber Tired Dozers	356						
Rubber Tired Loaders	175						
Scrapers	267						
Signal Boards/Light Sets	15	2	8	2	8	3	8
Skid Steer Loaders	50						
Tractors/Loaders/Backhoes	120	2	6	2	6	3	6
Trenchers	120						
Welders	50	2	6	2	6	2	6
Gasoline Pickups (F150 type)	175	See Site Support Emissions Calcs					
Diesel Pickups	175	See Site Support Emissions Calcs					
Light Lift Helicopter	420						
Heavy Lift Helicopter	8760						
Water Truck	240	2	8	2	8	2	8

***hrs/day = the number of hours of expected use on the average work day**
#/used = average number of this equip type used on the average work day

Table 5.1E-7 Part 1

Assumptions for Exhaust Emissions and Fugitive Dust Emissions Estimates and Other Offsite Emissions Estimates

Onsite Fugitive Dust from Construction Activities

- (1) MRI Report, South Coast AQMD Project No. 95040, March 1996, Level 2 Analysis Procedure.
MRI Report uncontrolled factor of 0.11 tons/acre/month is based on 168 hours per month of const activity.
For an activity rate of ~176 hrs/month, the adjusted EF would be ~0.12 tons/acre/month (uncontrolled).
- (2) Soil Handling (Cut and Fill), EPA, AP-42, Section 13.2.4., 11/06. For SERC, cut and fill, and trenching, is balanced on site.
- (3) URBEMIS, Version 9.2.4, User's Manual Appendix A, page A-6.
- (4) CARB Area Source Methodology, Section 7.7, 9/02.
- (5) WRAP Fugitive Dust Handbook, 9/06.
- (6) USEPA, AP-42, Section 13.2.3, 2/10.
- (7) Estimating PM Emissions from Construction Operations, USEPA, MRI, 9/99.
- (8) Wind speed data for Anaheim met station. Annual avg wind speed = 4.2 mph, % time wind speeds > 12 mph = 2%
- (9) Soil Moisture; 10.7% per the Applicant
- (10) typical value is 10% of total acreage, for SERC the daily disturbance values are conservatively high based on the applicant supplied data
- (11) SCAQMD CEQA Handbook 1993.
- (12) SCAQMD, Sample Construction Scenarios for Projects Less than Five Acres, Fugitive Dust Mitigations, February 2005.

Delivery-Site Support-Worker Commute Emissions

Emissions Factors: SCAQMD 2018 EFs: <http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook>
EFs for 2018 used for entirety of construction period into 2019, conservative assumption.
CARB-CEIDARS, Updated Fractions for PM Profiles: PM2.5 = 0.991 of PM10 for Diesel Exhaust, and 0.998 for Gasoline Vehicles.
All hauling and delivery is assumed to be done by HDDTs (worst case assumption due to some hauling expected by MDGTs)
All site support vehicles are assumed to be LDTs-gasoline engines (light duty trucks).
All worker commute vehicles are assumed to the LDAs/LDTs-gasoline engines.
Worker vehicles will be parked offsite on a paved or gravelled area.

Trackout Emissions

PM2.5 fraction of PM10 assumed to be 0.169 (CARB CEIDARS updated fraction values) for paved roads.
Trackout on paved roads from site is usually evaluated for the first 0.1 miles.
of controlled ingress/egress points planned for site construction = 2
EPA, AP-42, Section 13.2.1, January 2011.
Site soil silt content = 15.5% per the Applicant geotech report

Wind Blown Dust from Soil Storage Piles

MDAQMD, Emissions Inventory Guidance, Mineral Handling and Processing Industries, April 2000.
USEPA, AP-42, Section 13.2.2, Unpaved Roads, Figure 13.2.2-1, Thornethwaite Precipitation Data,
or Precipitation day data from CalEEMod technical appendix.
Soil storage areas only, open cut and fill areas are not soil storage areas.
*Best estimate from site prep contractor and/or grading plan engineer

Unpaved Road Fugitive Emissions

Ref: USEPA, AP-42, Section 13.2.2, Nov 2006
See AP-42 Section 13.2.2 for all equations, data ranges, data explanations, etc.
Assumed road type: Industrial Unpaved Surfaces
Roads will be paved by the end of month 9.

Paved Road Fugitive Emissions

Ref: USEPA, AP-42, Section 13.2.1, Jan 2011.
See AP-42 Section 13.2.1 for all equations, data ranges, data explanations, etc.
Roads will be paved starting in month 10.

Construction Equipment Exhaust Emissions

1. Fuel Consumption Rates

Rice Solar AFC, Construction Appendix, October 2009.
Tables 5.1A-28, 29, 39, 72.
Avg diesel BSFC value is 0.032 gal/Hp-Hr. Factor increased by 20% to account for variability: Use 0.039 gal/Hp-Hr.
For gasoline const equipment: SCAQMD PR-XXI, March 1995, Staff Report, Att B: 0.11 gal/Hp-Hr

2. Construction equipment exhaust emissions will be calculated on an annual basis using the site specific equipment list, HP ratings, hours of use, days of use, etc. Annual emissions will be apportioned to monthly and daily values based on the estimated construction schedule.

3. The equipment list derived from the South Coast AQMD Offroad database will be used to establish the various equipment categories. Composite avg HP values were derived from CalEEMod Technical Appendices. Emissions Factors are the composite factors per the SCAQMD Offroad database for the construction start year. Emissions factors for the start year will be used for all subsequent years if the project is less than 5 years in length. CalEEMod uses the statewide construction equipment mix and emissions factors. There is no data that indicates that the use of the SCAQMD composite factors will introduce a significant error as compared to the CalEEMod equipment list or emissions factors. CalEEMod (App D) EFs will be used for years after 2025.

4. CARB-CEIDARS, Updated Size Fractions for PM Profiles: PM_{2.5} = 0.991 of PM₁₀ : Diesel Vehicle Exhaust

5. Trench construction times per: Southern Regional Water Pipeline Alliance, 3/08.
Optimum trench construction progress rate is 80m (260ft) per day.
Non-optimum trench construction progress rate is 30m (100 ft) per day.
An average progress of 180 ft/day is used where applicable, or the applicant supplied timeframe.

6. Paving speeds can range from 3 to 15 m/min depending on asphalt delivery rates and required compaction thickness. A minimum paving speed of 3 m/min (10 ft/min or 600 ft/hr) was used where applicable. The minimum speed is based upon a 3" compacted layer, 12 ft lane width, with an asphalt delivery rate of ~ 140 tons/hr. Ref: Asphalt Paving Speed, Pavement Worktip No. 31, AAPA, 11/2001.

7. GWP values: CH₄=25, N₂O=298, ref: 40 CFR 98 Subpart A, Table A-1.
40 CFR 98 Subpart A, Table A-1
40 CFR 98 Subpart C, Tables C-1 and C-2
CARB, Mandatory GHG Reporting Program, Table 4, Appendix A, 2007

8. Gasoline EFs: EPA OMS-AMD Report NR-009A, 2-13-98, and SCAQMD EMFAC 2007 CEQA Tables, 2016.

9. Fugitive Dust Mitigation Values were derived from the SCAQMD Mitigation Measures and Control Efficiency tables, Rev 4/2007. Calculation methodology for combining two or more control techniques derived from SCAQMD CEQA Handbook, 1993, Section A-9, Examples 1 and 2. Control techniques are cumulative in the multiplicative sense.

10. Other site specific data: linear data

- a. Gas pipeline, 2.75 miles long, 10ft wide ROW, 2.5 X 6 ft trench: 3.33 acres, 8067 yd³
- b. 66 Kv underground trans line, 0.25 mile long, 40 ft wide ROW, 8ft X 12 ft trench: 1.21 acres, 4693 yd³
- c. water lines (2), 130 ft long total, 10 ft wide ROW, 2 ft X 5ft trench: 0.03 acres, 48 yd³
- d. sewer line, 70 ft long, 10 ft wide ROW, 2 ft X 7 ft trench: 0.02 acres, 36 yd³

Table 5.1E-7 Part 2 On and Off-Site Construction Emissions Calculation

Part 2 of Table 5.1E-7 contains the emissions calculations for SERC construction.

There are a total of 22 pages in Part 2.

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: SERC Phase ID: Main Site Construction

Assumptions:

Composite fuel consumption rates for const equipment: diesel 0.039 gal/hp-hr
gasoline 0.11 gal/hp-hr

Construction Schedule: 12 months Construction Totals: 1.00 period, yrs.
22 days/month 264 work days
8.00 hours/day 2112 work hours

Anticipated Construction Start Year: 2018

Equipment types and use rates supplied by the Applicant.

Diesel Equipment Category	Weighted Average HP	# of Units Used for Project	Avg Use Rate Hrs/day	# of Days On Site (each)	Total Hrs/Day	Total Hrs per Const Period	Total HP-Hrs Period
Aerial Lifts	63	1	8	22	8	176	11088
Air Compressors	78	0	0	0	0	0	0
Bore-Drill Rigs	206	0	0	0	0	0	0
Cement Mixers	9	0	0	0	0	0	0
Concrete/Industrial Saws	81	9	4	22	36	792	64152
Cranes	226	7	6	22	42	924	208824
Crawler Tractors/Dozers	208	2	4	22	8	176	36608
Crushing/Processing Eq.	85	0	0	0	0	0	0
Dumpers/Tenders/Water Trucks	16	16	4	22	64	1408	22528
Excavators	163	4	8	22	32	704	114752
Forklifts	89	8	7.6	22	60.8	1337.6	119046.4
Generator Sets	84	18	8	22	144	3168	266112
Graders	175	5	8	22	40	880	154000
Off-Highway Tractors	123	0	0	0	0	0	0
Off-Highway Trucks	400	0	0	0	0	0	0
Other Diesel Construction Eq. (H2O Trk)	172	15	8	22	120	2640	454080
Other General Industrial Eq.	88	0	0	0	0	0	0
Other Material Handling Eq.	167	0	0	0	0	0	0
Pavers	126	1	8	22	8	176	22176
Paving Eq. Other	131	1	8	22	8	176	23056
Plate Compactors	8	8	4.6	22	36.8	809.6	6476.8
Pressure Washers	13	0	0	0	0	0	0
Pumps	84	0	0	0	0	0	0
Roller Compactors	81	10	5.7	22	57	1254	101574
Rough Terrain Forklifts	100	22	4	22	88	1936	193600
Rubber Tired Dozers	255	0	0	0	0	0	0
Rubber Tires Loaders	200	2	4	22	8	176	35200
Scrapers	362	2	6	22	12	264	95568
Signal Boards	6	0	0	0	0	0	0
Skid Steer Loaders	65	10	4	22	40	880	57200
Surfacing Eq.	254	0	0	0	0	0	0
Sweepers/Scrubbers	64	0	0	0	0	0	0
Tractors	98	5	4.3	22	21.5	473	46354
Front End Loaders	98	4	4.3	22	17.2	378.4	37083.2
Backhoes	98	4	4.3	22	17.2	378.4	37083.2
Trenchers	81	6	4	22	24	528	42768
Welders	46	14	4.7	22	65.8	1447.6	66589.6
Gasoline Const Equipment	175	12	4	22	48	1056	184800

CO2e Multipliers:

Diesel Fuel: 1.003471
 Gasoline: 1.003583

Const Period Diesel Hp-Hrs = 2215919
 Const Period Gasoline Hp-Hrs = 184800
 Const Period Diesel Fuel Use = 86421 gals
 Const Period Gasoline Fuel Use = 20328 gals

Diesel Equipment Category	Emissions Factors					
	lbs/hr VOC (ROG)	lbs/hr CO	lbs/hr NOx	lbs/hr SOx	lbs/hr PM10	lbs/hr CO2
Aerial Lifts	0.0322	0.1740	0.2152	0.0004	0.0119	34.7
Air Compressors	0.0582	0.3130	0.3935	0.0007	0.0246	63.6
Bore-Drill Rigs	0.0539	0.5011	0.4175	0.0017	0.0099	164.9
Cement Mixers	0.0087	0.0416	0.0538	0.0001	0.0022	7.2
Concrete/Industrial Saws	0.0605	0.3850	0.3959	0.0007	0.0261	58.5
Cranes	0.1012	0.4060	0.7908	0.0014	0.0318	128.6
Crawler Tractors/Dozers	0.1185	0.5387	0.7960	0.0013	0.0457	114.0
Crushing/Processing Eq.	0.1109	0.6328	0.7330	0.0015	0.0412	132.3
Dumpers/Tenders	0.0092	0.0314	0.0584	0.0001	0.0023	7.6
Excavators	0.0848	0.5160	0.5181	0.0013	0.0249	119.6
Forklifts	0.0372	0.2173	0.2186	0.0006	0.0101	54.4
Generator Sets	0.0477	0.2786	0.3759	0.0007	0.0192	61.0
Graders	0.1049	0.5812	0.7217	0.0015	0.0355	132.7
Off-Highway Tractors	0.1631	0.6762	1.2293	0.0017	0.0579	151.4
Off-Highway Trucks	0.1613	0.5634	1.0525	0.0027	0.0360	260.1
Other Diesel Construction Eq.	0.0633	0.3542	0.4478	0.0013	0.0181	122.5
Other General Industrial Eq.	0.1113	0.4591	0.8242	0.0016	0.0336	152.2
Other Material Handling Eq.	0.1050	0.4495	0.8053	0.0015	0.0324	141.2
Pavers	0.1121	0.5017	0.6241	0.0009	0.0419	77.9
Paving Eq. Other	0.0857	0.4136	0.5558	0.0008	0.0374	68.9
Plate Compactors	0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Pressure Washers	0.0101	0.0562	0.0703	0.0001	0.0036	9.4
Pumps	0.0458	0.2722	0.3306	0.0006	0.0189	49.6
Roller Compactors	0.0683	0.3885	0.4485	0.0008	0.0291	67.0
Rough Terrain Forklifts	0.0638	0.4499	0.4219	0.0008	0.0277	70.3
Rubber Tired Dozers	0.2343	0.8819	1.8194	0.0025	0.0737	239.1
Rubber Tires Loaders	0.0861	0.4470	0.5831	0.0012	0.0300	108.6
Scrapers	0.2135	0.8418	1.6042	0.0027	0.0653	262.5
Signal Boards	0.0143	0.0916	0.1029	0.0002	0.0050	16.7
Skid Steer Loaders	0.0253	0.2146	0.1799	0.0004	0.0074	30.3
Surfacing Eq.	0.0923	0.4187	0.8043	0.0017	0.0291	166.0
Sweepers/Scrubbers	0.0681	0.4946	0.4308	0.0009	0.0251	78.5
Tractors	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Front End Loaders	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Backhoes	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Trenchers	0.1061	0.4368	0.5117	0.0007	0.0393	58.7
Welders	0.0388	0.1876	0.1941	0.0003	0.0133	25.6
Gasoline Const Equipment	0.0771	0.3855	1.08	0.00014	0.1542	14.2

Construction Period Emissions, lbs

Diesel Equipment Category

	VOC	CO	NOx	SOx	PM10	CO2
Aerial Lifts	6	31	38	0	2	6111
Air Compressors	0	0	0	0	0	0
Bore-Drill Rigs	0	0	0	0	0	0
Cement Mixers	0	0	0	0	0	0
Concrete/Industrial Saws	48	305	314	1	21	46303
Cranes	94	375	731	1	29	118852
Crawler Tractors/Dozers	21	95	140	0	8	20067
Crushing/Processing Eq.	0	0	0	0	0	0
Dumpers/Tenders	13	44	82	0	3	10735
Excavators	60	363	365	1	18	84184
Forklifts	50	291	292	1	14	72760
Generator Sets	151	883	1191	2	61	193225
Graders	92	511	635	1	31	116814
Off-Highway Tractors	0	0	0	0	0	0
Off-Highway Trucks	0	0	0	0	0	0
Other Diesel Construction Eq.	167	935	1182	3	48	323454
Other General Industrial Eq.	0	0	0	0	0	0
Other Material Handling Eq.	0	0	0	0	0	0
Pavers	20	88	110	0	7	13716
Paving Eq. Other	15	73	98	0	7	12133
Plate Compactors	4	21	25	0	1	3492
Pressure Washers	0	0	0	0	0	0
Pumps	0	0	0	0	0	0
Roller Compactors	86	487	562	1	36	84073
Rough Terrain Forklifts	123	871	817	2	54	136064
Rubber Tired Dozers	0	0	0	0	0	0
Rubber Tires Loaders	15	79	103	0	5	19116
Scrapers	56	222	424	1	17	69297
Signal Boards	0	0	0	0	0	0
Skid Steer Loaders	22	189	158	0	6	26644
Surfacing Eq.	0	0	0	0	0	0
Sweepers/Scrubbers	0	0	0	0	0	0
Tractors	24	172	158	0	9	31595
Front End Loaders	19	138	126	0	7	25276
Backhoes	19	138	126	0	7	25276
Trenchers	56	231	270	0	21	31001
Welders	56	272	281	0	19	37062
Gasoline Const Equipment	81	407	1140	0	163	14949

Construction Equipment Exhaust Emissions Estimates

Totals	VOC	CO	NOx	SOx	PM10	PM2.5	CO2
Lbs per const. period	1299	7221	9367	17	594	588.98	1522201
Tons per const. period	0.65	3.61	4.68	0.008	0.30	0.29	761.1
Monthly, Lbs	108.3	601.7	780.6	1.411	49.53	49.08	126850.1
Daily, Lbs	4.9	27.4	35.5	0.064	2.25	2.23	5765.9
CO2 from Diesel Fuel Use:	753.6	tons/period			Total CO2e:	763.7	tons/period
CO2 from Gasoline Use:	7.5	tons/period					

CONSTRUCTION EQUIPMENT EXHAUST EMISSIONS

Project: SERC Phase ID: OffSite Linears Construction

Assumptions:

Composite fuel consumption rates for const equipment: diesel 0.039 gal/hp-hr
gasoline 0.11 gal/hp-hr

Construction Schedule: 3 months Construction Totals: 0.25 period, yrs.
22 days/month 66 work days
8.00 hours/day 528 work hours

Anticipated Construction Start Year: 2018

Equipment types and use rates supplied by the Applicant.

Diesel Equipment Category	Weighted Average HP	# of Units Used for Project	Avg Use Rate Hrs/day	# of Days On Site (each)	Total Hrs/Day	Total Hrs per Const Period	Total HP-Hrs Period
Aerial Lifts	63	0	0	0	0	0	0
Air Compressors	78	0	0	0	0	0	0
Bore-Drill Rigs	206	0	0	0	0	0	0
Cement Mixers	9	0	0	0	0	0	0
Concrete/Industrial Saws	81	6	4	22	24	528	42768
Cranes	226	2	6	22	12	264	59664
Crawler Tractors/Dozers	208	0	0	0	0	0	0
Crushing/Processing Eq.	85	0	0	0	0	0	0
Dumpers/Tenders/Water Trucks	16	8	4	22	32	704	11264
Excavators	163	0	0	0	0	0	0
Forklifts	89	0	0	0	0	0	0
Generator Sets	84	8	8	22	64	1408	118272
Graders	175	0	0	0	0	0	0
Off-Highway Tractors	123	0	0	0	0	0	0
Off-Highway Trucks	400	0	0	0	0	0	0
Other Diesel Construction Eq.	172	0	0	0	0	0	0
Other General Industrial Eq.	88	0	0	0	0	0	0
Other Material Handling Eq.	167	0	0	0	0	0	0
Pavers	126	1	8	22	8	176	22176
Paving Eq. Other	131	1	8	22	8	176	23056
Plate Compactors	8	2	4	22	8	176	1408
Pressure Washers	13	0	0	0	0	0	0
Pumps	84	0	0	0	0	0	0
Roller Compactors	81	7	4	22	28	616	49896
Rough Terrain Forklifts	100	0	0	0	0	0	0
Rubber Tired Dozers	255	0	0	0	0	0	0
Rubber Tires Loaders	200	0	0	0	0	0	0
Scrapers	362	0	0	0	0	0	0
Signal Boards	6	7	8	22	56	1232	7392
Skid Steer Loaders	65	0	0	0	0	0	0
Surfacing Eq.	254	0	0	0	0	0	0
Sweepers/Scrubbers	64	0	0	0	0	0	0
Tractors	98	3	6	22	18	396	38808
Front End Loaders	98	2	6	22	12	264	25872
Backhoes	98	2	6	22	12	264	25872
Trenchers	81	0	0	0	0	0	0
Welders	46	6	6	22	36	792	36432
Gasoline Const Equipment	175	3	4	22	12	264	46200

CO2e Multipliers:

Diesel Fuel: 1.003471
 Gasoline: 1.003583

Const Period Diesel Hp-Hrs = 462880
 Const Period Gasoline Hp-Hrs = 46200
 Const Period Diesel Fuel Use = 18052 gals
 Const Period Gasoline Fuel Use = 5082 gals

Diesel Equipment Category	Emissions Factors					
	lbs/hr VOC (ROG)	lbs/hr CO	lbs/hr NOx	lbs/hr SOx	lbs/hr PM10	lbs/hr CO2
Aerial Lifts	0.0322	0.1740	0.2152	0.0004	0.0119	34.7
Air Compressors	0.0582	0.3130	0.3935	0.0007	0.0246	63.6
Bore-Drill Rigs	0.0539	0.5011	0.4175	0.0017	0.0099	164.9
Cement Mixers	0.0087	0.0416	0.0538	0.0001	0.0022	7.2
Concrete/Industrial Saws	0.0605	0.3850	0.3959	0.0007	0.0261	58.5
Cranes	0.1012	0.4060	0.7908	0.0014	0.0318	128.6
Crawler Tractors/Dozers	0.1185	0.5387	0.7960	0.0013	0.0457	114.0
Crushing/Processing Eq.	0.1109	0.6328	0.7330	0.0015	0.0412	132.3
Dumpers/Tenders	0.0092	0.0314	0.0584	0.0001	0.0023	7.6
Excavators	0.0848	0.5160	0.5181	0.0013	0.0249	119.6
Forklifts	0.0372	0.2173	0.2186	0.0006	0.0101	54.4
Generator Sets	0.0477	0.2786	0.3759	0.0007	0.0192	61.0
Graders	0.1049	0.5812	0.7217	0.0015	0.0355	132.7
Off-Highway Tractors	0.1631	0.6762	1.2293	0.0017	0.0579	151.4
Off-Highway Trucks	0.1613	0.5634	1.0525	0.0027	0.0360	260.1
Other Diesel Construction Eq.	0.0633	0.3542	0.4478	0.0013	0.0181	122.5
Other General Industrial Eq.	0.1113	0.4591	0.8242	0.0016	0.0336	152.2
Other Material Handling Eq.	0.1050	0.4495	0.8053	0.0015	0.0324	141.2
Pavers	0.1121	0.5017	0.6241	0.0009	0.0419	77.9
Paving Eq. Other	0.0857	0.4136	0.5558	0.0008	0.0374	68.9
Plate Compactors	0.0050	0.0263	0.0314	0.0001	0.0012	4.3
Pressure Washers	0.0101	0.0562	0.0703	0.0001	0.0036	9.4
Pumps	0.0458	0.2722	0.3306	0.0006	0.0189	49.6
Roller Compactors	0.0683	0.3885	0.4485	0.0008	0.0291	67.0
Rough Terrain Forklifts	0.0638	0.4499	0.4219	0.0008	0.0277	70.3
Rubber Tired Dozers	0.2343	0.8819	1.8194	0.0025	0.0737	239.1
Rubber Tires Loaders	0.0861	0.4470	0.5831	0.0012	0.0300	108.6
Scrapers	0.2135	0.8418	1.6042	0.0027	0.0653	262.5
Signal Boards	0.0143	0.0916	0.1029	0.0002	0.0050	16.7
Skid Steer Loaders	0.0253	0.2146	0.1799	0.0004	0.0074	30.3
Surfacing Eq.	0.0923	0.4187	0.8043	0.0017	0.0291	166.0
Sweepers/Scrubbers	0.0681	0.4946	0.4308	0.0009	0.0251	78.5
Tractors	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Front End Loaders	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Backhoes	0.0513	0.3647	0.3331	0.0008	0.0189	66.8
Trenchers	0.1061	0.4368	0.5117	0.0007	0.0393	58.7
Welders	0.0388	0.1876	0.1941	0.0003	0.0133	25.6
Gasoline Const Equipment	0.0771	0.3855	1.08	0.00014	0.1542	14.2

Construction Period Emissions, lbs

Diesel Equipment Category

	VOC	CO	NOx	SOx	PM10	CO2
Aerial Lifts	0	0	0	0	0	0
Air Compressors	0	0	0	0	0	0
Bore-Drill Rigs	0	0	0	0	0	0
Cement Mixers	0	0	0	0	0	0
Concrete/Industrial Saws	32	203	209	0	14	30869
Cranes	27	107	209	0	8	33958
Crawler Tractors/Dozers	0	0	0	0	0	0
Crushing/Processing Eq.	0	0	0	0	0	0
Dumpers/Tenders	6	22	41	0	2	5368
Excavators	0	0	0	0	0	0
Forklifts	0	0	0	0	0	0
Generator Sets	67	392	529	1	27	85878
Graders	0	0	0	0	0	0
Off-Highway Tractors	0	0	0	0	0	0
Off-Highway Trucks	0	0	0	0	0	0
Other Diesel Construction Eq.	0	0	0	0	0	0
Other General Industrial Eq.	0	0	0	0	0	0
Other Material Handling Eq.	0	0	0	0	0	0
Pavers	20	88	110	0	7	13716
Paving Eq. Other	15	73	98	0	7	12133
Plate Compactors	1	5	6	0	0	759
Pressure Washers	0	0	0	0	0	0
Pumps	0	0	0	0	0	0
Roller Compactors	42	239	276	0	18	41299
Rough Terrain Forklifts	0	0	0	0	0	0
Rubber Tired Dozers	0	0	0	0	0	0
Rubber Tires Loaders	0	0	0	0	0	0
Scrapers	0	0	0	0	0	0
Signal Boards	18	113	127	0	6	20572
Skid Steer Loaders	0	0	0	0	0	0
Surfacing Eq.	0	0	0	0	0	0
Sweepers/Scrubbers	0	0	0	0	0	0
Tractors	20	144	132	0	7	26452
Front End Loaders	14	96	88	0	5	17634
Backhoes	14	96	88	0	5	17634
Trenchers	0	0	0	0	0	0
Welders	31	149	154	0	11	20277
Gasoline Const Equipment	20	102	285	0	41	3737

Construction Equipment Exhaust Emissions Estimates

Totals	VOC	CO	NOx	SOx	PM10	PM2.5	CO2
Lbs per const. period	326	1830	2351	4	158	156.30	330287
Tons per const. period	0.16	0.91	1.18	0.002	0.08	0.08	165.1
Monthly, Lbs	108.7	610.0	783.7	1.278	52.57	52.10	110095.8
Daily, Lbs	4.9	27.7	35.6	0.058	2.39	2.37	5004.4
CO2 from Diesel Fuel Use:	163.3	tons/period			Total CO2e:	165.7	tons/period
CO2 from Gasoline Use:	1.9	tons/period					

CONSTRUCTION ACTIVITIES FUGITIVE DUST ESTIMATES

MRI Level 2 Analysis (Notes 1, 3-7)

Main Site Area

Acres Subject to Construction Disturbance Activites:		3.173	
Max Acres Subject to Construction Disturbance Activites on any day of this phase:		1.000	note (10)
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.12	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	8	
	Days/Wk:	5	
	Days/Month:	22	Applicant Data
	Phase Const Period, Months:	12	1.00 yrs
	Phase Const Period, Days:	264	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)		
	Mean # days/year with rain >= 0.01 inch:	30	
	Mean # months/yr with rain >= 0.01 inch:	1.00	
	Adjusted Const Period, Months:	11.00	
	Adjusted Const Period, Days:	234	

Controls for Fugitive Dust: Proposed watering cycle 3 times per day

3 watering cycles/8-10 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
 Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

Calculated % control based on mitigations proposed:	84	% control
Conservative control % used for emissions estimates:	80	% control
	0.2	release fraction

Emissions:	PM10	PM2.5
tons/month	0.02	0.01
tons/period	0.26	0.06
avg lbs/day	2.18	0.46

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:	11100	Mean annual wind speed, mph: (8)	4.2
Total tons of soil handled:	57409.2	Avg. Soil moisture, %: (9)	10.7
Total days soil handled:	22	Avg. Soil density, tons/cu.yd:	1.3
Tons soil/day:	2610	k factor for PM10:	0.35
Control Eff, watering/speed control, %	80	Number of Drops per ton:	4
Release Fraction:	0.2	Calc 1 wind	0.797
		Calc 2 moisture	10.464
		Calc 3 int	0.076
Emissions:	PM10	PM2.5	
tons/period	0.000	0.000	Calc 4 PM10 lb/ton 0.0001
tons/month	0.000	0.000	PM2.5 fraction of PM10: 0.210
avg lbs/day	0.004	0.001	

Controlled Emissions Totals:	PM10	PM2.5
tons/period	0.264	0.056
tons/month	0.024	0.005
avg lbs/day	2.186	0.459

CONSTRUCTION ACTIVITIES FUGITIVE DUST ESTIMATES

MRI Level 2 Analysis (Notes 1, 3-7)

Offsite Linears

Acres Subject to Construction Disturbance Activities:		4.59	
Max Acres Subject to Construction Disturbance Activities on any day of this phase:		0.200	note (10)
Emissions Factor for PM10 Uncontrolled, tons/acre/month:		0.12	
PM2.5 fraction of PM10 (per CARB CEIDARS Profiles):		0.21	
Activity Levels:	Hrs/Day:	8	
	Days/Wk:	5	
	Days/Month:	22	Applicant Data
	Phase Const Period, Months:	3	0.25 yrs
	Phase Const Period, Days:	66	
Wet Season Adjustment:	(Per AP-42, Section 13.2.2, Figure 13.2.2-1, 12/03 or CalEEMod, Appendix D, Table 1.1.)		
	Mean # days/year with rain >= 0.01 inch:	30	
	Mean # months/yr with rain >= 0.01 inch:	1.00	
	Adjusted Const Period, Months:	2.75	
	Adjusted Const Period, Days:	59	

Controls for Fugitive Dust: Proposed watering cycle: 3 times per day

3 watering cycles/8-10 hour construction shift yields a 68% reduction, use 68% for non-desert sites. (11)(12)
 Speed control of onsite const traffic to <15 mph yields a 40-70% reduction (use 50% control as conservative for site). (11)(12)

Calculated % control based on mitigations proposed:	84	% control
Conservative control % used for emissions estimates:	80	% control
	0.2	release fraction

Emissions:		PM10	PM2.5
tons/month		0.00	0.00
tons/period		0.01	0.00
avg lbs/day		0.44	0.09

Soil Handling Emissions (Cut and Fill): (2)

Total cu.yds of soil handled:	12844	Mean annual wind speed, mph: (8)	4.2
Total tons of soil handled:	33214.6	Avg. Soil moisture, %: (9)	10.7
Total days soil handled:	59	Avg. Soil density, tons/cu.yd:	1.3
Tons soil/day:	563	k factor for PM10:	0.35
Control Eff, watering/speed control, %	80	Number of Drops per ton:	2
Release Fraction:	0.2	Calc 1 wind	0.797
		Calc 2 moisture	10.464
		Calc 3 int	0.076
		Calc 4 PM10 lb/ton	0.0001
		PM2.5 fraction of PM10:	0.210

Emissions:	PM10	PM2.5
tons/period	0.000	0.000
tons/month	0.000	0.000
avg lbs/day	0.009	0.002

Controlled Emissions Totals:	PM10	PM2.5
tons/period	0.013	0.003
tons/month	0.005	0.001
avg lbs/day	0.446	0.094

CONSTRUCTION PHASE - Truck Hauling/Delivery, Site Support, and Worker Commute Vehicle Emissions

Delivery and Hauling (assumed 100% HDDTs)

Phase ID:	Construction		Emissions Factors, Lbs/VMT (SCAQMD 2018-for Construction Start Year)							
Phase Length, months:	12	Applicant data	NOx	CO	VOC	SOx	PM10	PM2.5	CO2	
Avg Days/Month:	22	Applicant data	HDDTs	0.01526414	0.00604721	0.00131697	0.00003934	0.00076808	0.00062383	4.207568
Avg Deliveries per Day:	32	Applicant data	LDTs	0.000473	0.00502881	0.00057178	0.00001071	0.00009494	0.00006234	1.1056264
Avg Delivery RT distance, mi:	70	Estimate	LDAs	0.000473	0.00502881	0.00057178	0.00001071	0.00009494	0.00006234	1.1056264
VMT/day	2240									
VMT/month	49280									
VMT/period	591360									
			HDDT Delivery and Hauling Emissions Estimates							
			lbs/day	34.192	13.546	2.950	0.088	1.720	1.397	9425
			lbs/month	752.217	298.007	64.900	1.939	37.851	30.742	207349
			tons/period	4.513	1.788	0.389	0.012	0.227	0.184	1244

Site Support Staff Vehicles (assumed 100% LDTs)

Estimated # of vehicles:	6	Site Support Vehicle Emissions Estimates								
Avg VMT/day:	120	Estimate*	lbs/day	0.341	3.621	0.412	0.008	0.068	0.045	796
VMT/day	720		lbs/month	7.492	79.656	9.057	0.170	1.504	0.987	17513
VMT/month	15840		tons/period	0.045	0.478	0.054	0.001	0.009	0.006	105.079
VMT/period	190080									

Worker Commute Vehicles (assumed 50% LDA, 50% LDT)

Avg # of Workers/day:	48	Worker Commute Vehicle Emissions								
# Workers per vehicle:	1		lbs/day	1.362	14.483	1.647	0.031	0.273	0.180	3184.20
Vehicles per day:	48		lbs/month	29.969	318.625	36.228	0.679	6.015	3.950	70052.49
Avg commute RT distance, mi.	60	Estimate	tons/period	0.180	1.912	0.217	0.004	0.036	0.024	420.31
VMT/day	2880									
VMT/month	63360									
VMT/period	760320									

RT=round trip

worst case worker assumption is NO carpooling.

* 4 trips at 5 miles/day each per vehicle

Fugitive Dust Emissions From Unpaved Roads

	Onsite	Offsite	
Unpaved Road Technical Data			
Mean vehicle weight, Tons:	14.7	0	See Veh Weight tab
Surface material silt content, %	15.5	0	Best estimate
PM10 "k" value, lb/VMT	1.5	1.5	
PM2.5 "k" value, lb/VMT	0.15	0.15	
PM10 "a" exponent value:	0.9	0.9	
PM2.5 "a" exponent value:	0.9	0.9	
PM10 "b" exponent value:	0.45	0.45	
PM2.5 "b" exponent value:	0.45	0.45	
PM10 Intermediate Calculation 1	1.259	0.000	
PM10 Intermediate Calculation 2	2.045	0.000	
PM10 Emissions Factor, lb/VMT	3.861	0.000	
PM2.5 Intermediate Calculation 1	1.259	0.000	
PM2.5 Intermediate Calculation 2	2.045	0.000	
PM2.5 Emissions Factor, lb/VMT	0.386	0.000	
Unpaved Road Travel Data			
Average Trip Length, miles	0.1	0	Estimate based on site size
Total Trips per day	56	0	Applicant data
Total VMT/day	5.6	0	
Avg Days/month	22	0	Applicant data
Monthly VMT	123.2	0	
Construction Period, months	9	0	Adj Months, see Const Dust tab
Period VMT	1108.8	0	
Describe dust control methods below:			
(watering twice daily and speed control to 5 mph)			
Expected Dust Control Efficiency, %	80	80	SCAQMD Mitigation Tables
Release Fraction:	0.2	0.2	
Controlled Emissions PM10			
lbs/day	4.32	0.00	
lbs/month	95.14	0.00	
lbs/period	856.25	0.00	
tons/period	0.43	0.00	
Controlled Emissions PM2.5			
lbs/day	0.43	0.00	
lbs/month	9.51	0.00	
lbs/period	85.62	0.00	
tons/period	0.04	0.00	
Notes:			

1. onsite roads are paved by the end of month 9

Fugitive Dust Emissions from Paved Roads

Paved Road Technical Data		Onsite	Offsite	
Mean Vehicle Weight, tons:		14.7	14.7	See Veh Weight tab
Road Surface Silt Loading, gms/sq.m		0.6	0.06	Table 13.2.1-3, AP-42, Ubiquitous Baseline
PM10 "k" factor		0.0022	0.0022	Values based on ADT data (2011)
PM2.5 "k" factor		0.00054	0.00054	
	PM10 Intermediate Calculation 1	0.628	0.077	
	PM10 Intermediate Calculation 2	15.512	15.512	
PM10 Emissions Factor, lb/VMT		0.021	0.003	
	PM2.5 Intermediate Calculation 1	0.628	0.077	
	PM2.5 Intermediate Calculation 2	15.512	15.512	
PM2.5 Emissions Factor, lb/VMT		0.0053	0.0006	
Paved Road Travel Data				
Average RT Length, miles		0.1	65	Applicant data (weighted RT distance)
Total RT per day		56	104	Applicant data
Total VMT/day		5.6	6760	
Avg Days/month		22	22	Applicant data
Monthly VMT		123.2	148720	
Construction Period, months		3	11	Adj Months, see Const Dust tab
Period VMT		369.6	1635920	
Controlled Emissions PM10				
	lbs/day	0.12	17.83	
	lbs/month	2.64	392.26	
	lbs/period	7.92	4314.85	
	tons/period	0.00	2.16	
Controlled Emissions PM2.5				
	lbs/day	0.03	4.38	
	lbs/month	0.65	96.28	
	lbs/period	1.94	1059.10	
	tons/period	0.00	0.53	

CONSTRUCTION PHASE - Trackout Emissions

Paved Road Length (miles):	0.2	0.1 mile each access point		
Daily # of Vehicles:	86	Controlled Emissions Estimates		
Avg Vehicle Weight (tons):	14.7	PM10	PM2.5	
Total Unadjusted VMT/day	17.2	0.077		
Particle Size Multipliers	PM10	15.512		
lb/VMT	0.0022	0.003	0.0004	lb/VMT
		0.012	0.0021	lbs/day
Road Sfc Silt Loading (g/m ²):	0.06	0.0001	0.0000	tons/month
# of Active Trackout Points:	2	0.001	0.0003	tons/period
Added Trackout Miles for PM10 Calc		<i>Default Silt Load Values for Paved Road Types</i>		
Added Trackout VMT/day:	12	ADT	sL Value	
Final Adjusted VMT/day	29	<500	0.6	gm/m ²
Final Adjusted VMT/month	642	500-5000	0.2	gm/m ²
Final Adjusted VMT/period	7066	5000-10000	0.06	gm/m ²
Construction days/month:	22	>10000	0.03	gm/m ²
Adj. Construction months/period:	11.00	>10000	0.015	gm/m ² limited access freeway
Control Applied to Trackout:	Gravel entrance, metal cleaning grates, water washing, sweeping			
Control Efficiency, %	84	0.84	Release Factor =	0.16

vehicles = 82 (worker 48, delivery 32, site support 6)

Fugitive Dust from Wind Erosion of Soil Storage Piles

Site Preparation and Grading Phases

Avg acres of soil storage piles exposed per day:	0.1	Applicant estimate *
Soil silt content, %:	33.9	0.339
Number of days/year with precipitation >0.01 inches:	30	
Annual % of time wind speed greater than 12 mph:	2	0.02 from met data set
Watering control efficiency, %:	80	0.8
PM10 aerodynamic factor:	0.5	
PM2.5 aerodynamic factor:	0.2	
Avg Const Days/month:	22	
Total construction period exposure time, months:	11	Adj Months, see Const Dust tab

Controlled Emissions Estimates

	lb/acre-day	lbs/day	lbs/month	lbs/period	tons/period
PM10	0.019	0.0019	0.041	0.45	0.0002
PM2.5	0.007	0.0007	0.016	0.18	0.0001

* estimate from grading contractor or derived from grading plan.

Average Vehicle Weight Estimate for Construction Period

Vehicle Type	Avg Weight tons	Avg # Vehicles per day	Frac. of total vehicles	
Passenger LDP/LDT	1.5	50	0.439	Worker and support travel vehicles
HDD Loaded	35	32	0.281	
HDD Unloaded	15	32	0.281	Materials delivery trucks, service trucks, fuel trucks, concrete trucks, etc.
MDGT Loaded	15	0	0.000	
MDGT Unloaded	5	0	0.000	
		114	1.000	
Vehicle Total		82		

Weighted Avg Vehicle Weight, tons : 14.7

HDDT/MDGT Delivery Vehicle Weight Data

Passenger LDP/LDT	2.5	0	0.000	
HDD Loaded	35	32	0.500	
HDD Unloaded	15	32	0.500	Materials delivery trucks, service trucks, fuel trucks, concrete trucks, etc.
MDGT Loaded	15	0	0.000	
MDGT Unloaded	5	0	0.000	
		64	1.000	
Vehicle Total		32		

Weighted Avg Vehicle Weight, tons : 25.0

Ref: Mission Rock Energy Center, AFC-Air Quality Analysis, Appendix 5.1E, 10/2015.

Diesel Fuel Consumption Rate Conversions

Source: Rice Solar Project AFC, 10/2009, Construction Appendix
Tables 5.1A-28, 40, 72

Equipment Type	HP	BSFC gal/hr	BSFC gal/hp-hr
Air Compressor	23.5	0.66	0.028
Paver	174	5.86	0.034
Scraper	450	14.62	0.032
Dozer	410	12.1	0.030
Grader	210	6.57	0.031
Water Truck	450	11.51	0.026
Backhoe	97	2.37	0.024
Excavator	325	10.59	0.033
Compactor	410	11.51	0.028
Crane 150 ton	347	8.18	0.024
Crane 20 ton	130	3.67	0.028
Crane 225 ton	340	8.18	0.024
Crane 225 ton	173	3.67	0.021
Loader	216	7.78	0.036
Concrete Truck	350	11.51	0.033
Rock Plant-Screen	191	6.75	0.035
Generator	173	7.3	0.042
Generator	98	4.3	0.044
Generator	173	7.3	0.042
Generator	98	4.3	0.044
Generator	173	7.3	0.042
Generator	25	0.81	0.032
Generator	26	0.81	0.031
Welder	19.5	0.52	0.027
Welder (gasoline)	19.5	0.89	0.046
		avg diesel	0.032
variability factor 20%			0.039

SCAQMD On-Road Emissions Factors for 2018

Scenario Year: 2018

All model years in the range 1974 to 2018

Passenger Vehicles (pounds/mile)	
CO	0.00502881
NOx	0.00047300
ROG	0.00057178
SOx	0.00001071
PM10	0.00009494
PM2.5	0.00006234
CO2	1.10562643
CH4	0.00005003

Delivery Trucks (pounds/mile)	
CO	0.00923234
NOx	0.00979416
ROG	0.00139856
SOx	0.00002749
PM10	0.00040110
PM2.5	0.00031792
CO2	2.84646835
CH4	0.00006203

Scenario Year: 2018

All model years in the range 1974 to 2018

HHDT-DSL (pounds/mile)	
CO	0.00604721
NOx	0.01526414
ROG	0.00131697
SOx	0.00003934
PM10	0.00076808
PM2.5	0.00062383
CO2	4.20756838
CH4	0.00006182

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00062758
PM2.5	0.00057700

EMFAC 2007, Ver 2.3

<http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook>

Conversion of Tons/Period to Normalized Tons/Year and Summation of Emissions

Enter the length (months) of this phase or period. If the value is less than 12 months, then enter 12 months: 12 1 Eq Years
 Avg Construction Work Days per Month: 22

On Site Emissions	Tons/Period							
	VOC	CO	NOx	SOx	PM10	PM2.5	CO2	CO2e
Construction Equipment Exhaust	0.650	3.610	4.684	0.008	0.297	0.294	761.1	763.7
Construction Site Fugitive Dust	0.000	0.000	0.000	0.000	0.264	0.056	0.0	0.0
Unpaved Roads Fugitive Dust	0.000	0.000	0.000	0.000	0.428	0.043	0.0	0.0
Paved Roads Fugitive Dust	0.000	0.000	0.000	0.000	0.004	0.001	0.0	0.0
Storage Pile Wind Blown Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0

Cumulative On Site Emissions Summary

Total Tons/Period	0.650	3.610	4.684	0.008	0.994	0.394	761.1	763.7
Normalized Tons/Year	0.650	3.610	4.684	0.008	0.994	0.394	761.1	763.7
Avg Lbs/Month	108.27	601.74	780.62	1.41	165.66	65.65		
Avg Lbs/Day	4.92	27.35	35.48	0.06	7.53	2.98		

Off Site Emissions	Tons/Period							
	VOC	CO	NOx	SOx	PM10	PM2.5	CO2	CO2e
Construction Equipment Exhaust	0.163	0.915	1.175	0.002	0.079	0.078	165.144	165.717
Construction Site Fugitive Dust	0.000	0.000	0.000	0.000	0.013	0.003	0.000	0.000
Delivery/Hauling Exhaust	0.389	1.788	4.513	0.012	0.227	0.184	1244.1	1248.4
Site Support Vehicle Exhaust	0.054	0.478	0.045	0.001	0.009	0.006	105.1	105.5
Worker Commute Exhaust	0.217	1.912	0.180	0.004	0.036	0.024	420.3	421.8
Unpaved Roads Fugitive Dust	0.000	0.000	0.000	0.000	0.000	0.000	0.0	0.0
Paved Roads Fugitive Dust	0.000	0.000	0.000	0.000	2.157	0.530	0.0	0.0
Track Out Fugitive Dust	0.000	0.000	0.000	0.000	0.001	0.000	0.0	0.0

Cumulative Off Site Emissions Summary

Total Tons/Period	0.824	5.093	5.914	0.019	2.523	0.825	1934.631	1941.405
Normalized Tons/Year	0.824	5.093	5.914	0.019	2.523	0.825	1934.6	1941.4
Avg Lbs/Month	137.36	848.79	985.59	3.11	420.58	137.48		
Avg Lbs/Day	6.24	38.58	44.80	0.14	19.12	6.25		

Total CO2e, tons/yr: **2705.1**

SCAB Fleet Average Emission Factors (Diesel)

2018

Air Basin	SC
-----------	----

Equipment	MaxHP	ROG (lb/hr)	CO (lb/hr)	NOX (lb/hr)	SOX (lb/hr)	PM (lb/hr)	CO2 (lb/hr)	CH4 (lb/hr)
Aerial Lifts	15	0.0101	0.0528	0.0631	0.0001	0.0025	8.7	0.0009
	25	0.0143	0.0468	0.0865	0.0001	0.0039	11.0	0.0013
	50	0.0336	0.1506	0.1525	0.0003	0.0093	19.6	0.0030
	120	0.0327	0.2319	0.2565	0.0004	0.0170	38.1	0.0029
	500	0.0840	0.3899	0.8852	0.0021	0.0270	213	0.0076
	750	0.1545	0.7049	1.6423	0.0039	0.0494	385	0.0139
Aerial Lifts Composite		0.0322	0.1740	0.2152	0.0004	0.0119	34.7	0.0029
Air Compressors	15	0.0098	0.0456	0.0608	0.0001	0.0033	7.2	0.0009
	25	0.0207	0.0645	0.1187	0.0002	0.0060	14.4	0.0019
	50	0.0518	0.2142	0.1848	0.0003	0.0131	22.3	0.0047
	120	0.0504	0.3097	0.3370	0.0006	0.0255	47.0	0.0045
	175	0.0685	0.4994	0.5069	0.0010	0.0268	88.5	0.0062
	250	0.0747	0.2653	0.6529	0.0015	0.0206	131	0.0067
	500	0.1262	0.4504	1.0161	0.0023	0.0345	232	0.0114
	750	0.1960	0.6961	1.6134	0.0036	0.0540	358	0.0177
1000	0.2958	1.0416	3.7257	0.0049	0.0965	486	0.0267	
Air Compressors Composite		0.0582	0.3130	0.3935	0.0007	0.0246	63.6	0.0052
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0029	10.3	0.0011
	25	0.0193	0.0658	0.1219	0.0002	0.0046	16.0	0.0017
	50	0.0204	0.2211	0.1897	0.0004	0.0034	31.0	0.0018
	120	0.0308	0.4665	0.2710	0.0009	0.0072	77.1	0.0028
	175	0.0475	0.7542	0.2910	0.0016	0.0092	141	0.0043
	250	0.0538	0.3426	0.2499	0.0021	0.0068	188	0.0049
	500	0.0887	0.5512	0.4035	0.0031	0.0112	311	0.0080
	750	0.1755	1.0891	0.8022	0.0062	0.0222	615	0.0158
1000	0.2789	1.6441	4.2095	0.0093	0.0723	928	0.0252	
Bore/Drill Rigs Composite		0.0539	0.5011	0.4175	0.0017	0.0099	165	0.0049
Cement and Mortar Mixers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3	0.0007
	25	0.0232	0.0754	0.1391	0.0002	0.0064	17.6	0.0021
Cement and Mortar Mixers Composite		0.0087	0.0416	0.0538	0.0001	0.0022	7.2	0.0008
Concrete/Industrial Saws Composite	25	0.0199	0.0678	0.1256	0.0002	0.0047	16.5	0.0018
	50	0.0549	0.2534	0.2388	0.0004	0.0148	30.2	0.0050
	120	0.0650	0.4661	0.4898	0.0009	0.0335	74.1	0.0059
	175	0.1012	0.8661	0.8304	0.0018	0.0410	160	0.0091
Concrete/Industrial Saws Composite		0.0605	0.3850	0.3959	0.0007	0.0261	58.5	0.0055
Cranes	50	0.0646	0.2527	0.2019	0.0003	0.0151	23.2	0.0058
	120	0.0639	0.3486	0.3857	0.0006	0.0306	50.1	0.0058
	175	0.0752	0.4766	0.5029	0.0009	0.0283	80.3	0.0068
	250	0.0787	0.2521	0.6168	0.0013	0.0212	112	0.0071
	500	0.1202	0.4085	0.8748	0.0018	0.0317	180	0.0108
	750	0.2034	0.6869	1.5239	0.0030	0.0544	303	0.0184
9999	0.7422	2.3933	7.8338	0.0098	0.2146	971	0.0670	
Cranes Composite		0.1012	0.4060	0.7908	0.0014	0.0318	129	0.0091
Crawler Tractors	50	0.0813	0.2884	0.2240	0.0003	0.0181	24.9	0.0073
	120	0.0945	0.4679	0.5589	0.0008	0.0448	65.8	0.0085
	175	0.1270	0.7327	0.8534	0.0014	0.0479	121	0.0115
	250	0.1333	0.4179	1.0430	0.0019	0.0385	166	0.0120
	500	0.1959	0.7202	1.4625	0.0025	0.0554	259	0.0177
	750	0.3529	1.2889	2.6916	0.0047	0.1006	465	0.0318
1000	0.5380	2.0171	5.7362	0.0066	0.1663	658	0.0485	
Crawler Tractors Composite		0.1185	0.5387	0.7960	0.0013	0.0457	114	0.0107

Crushing/Proc. Equip	50	0.0949	0.4230	0.3607	0.0006	0.0241	44.0	0.0086
	120	0.0849	0.5506	0.5679	0.0010	0.0416	83.1	0.0077
	175	0.1258	0.9520	0.8975	0.0019	0.0475	167	0.0113
	250	0.1386	0.4932	1.1284	0.0028	0.0359	245	0.0125
	500	0.2037	0.7231	1.5205	0.0037	0.0524	374	0.0184
	750	0.3193	1.1368	2.4441	0.0059	0.0824	589	0.0288
	9999	0.8312	2.7569	9.5902	0.0131	0.2467	1,308	0.0750
Crushing/Proc. Equipment Co		0.1109	0.6328	0.7330	0.0015	0.0412	132	0.0100
Dumpers/Tender	25	0.0092	0.0314	0.0584	0.0001	0.0023	7.6	0.0008
Dumpers/Tenders Composite		0.0092	0.0314	0.0584	0.0001	0.0023	7.6	0.0008
Excavators	25	0.0198	0.0677	0.1253	0.0002	0.0047	16.4	0.0018
	50	0.0468	0.2521	0.2002	0.0003	0.0111	25.0	0.0042
	120	0.0693	0.5017	0.4425	0.0009	0.0289	73.6	0.0063
	175	0.0824	0.6641	0.5069	0.0013	0.0264	112	0.0074
	250	0.0933	0.3323	0.5984	0.0018	0.0202	159	0.0084
	500	0.1339	0.4689	0.7881	0.0023	0.0284	234	0.0121
	750	0.2224	0.7769	1.3381	0.0039	0.0476	387	0.0201
Excavators Composite		0.0848	0.5160	0.5181	0.0013	0.0249	120	0.0077
Forklifts	50	0.0229	0.1440	0.1180	0.0002	0.0058	14.7	0.0021
	120	0.0265	0.2118	0.1745	0.0004	0.0108	31.2	0.0024
	175	0.0394	0.3322	0.2328	0.0006	0.0125	56.1	0.0036
	250	0.0440	0.1559	0.2594	0.0009	0.0089	77.1	0.0040
	500	0.0623	0.2131	0.3432	0.0011	0.0125	111	0.0056
Forklifts Composite		0.0372	0.2173	0.2186	0.0006	0.0101	54.4	0.0034
Generator Sets	15	0.0123	0.0644	0.0852	0.0002	0.0043	10.2	0.0011
	25	0.0231	0.0788	0.1449	0.0002	0.0070	17.6	0.0021
	50	0.0491	0.2265	0.2357	0.0004	0.0138	30.6	0.0044
	120	0.0642	0.4694	0.5181	0.0009	0.0333	77.9	0.0058
	175	0.0808	0.7324	0.7528	0.0016	0.0337	142	0.0073
	250	0.0857	0.3931	0.9756	0.0024	0.0274	213	0.0077
	500	0.1264	0.6113	1.3836	0.0033	0.0415	337	0.0114
	750	0.2080	0.9868	2.2918	0.0055	0.0679	544	0.0188
	9999	0.5230	2.0948	7.5356	0.0105	0.1778	1,049	0.0472
Generator Sets Composite		0.0477	0.2786	0.3759	0.0007	0.0192	61.0	0.0043
Graders	50	0.0676	0.2868	0.2305	0.0004	0.0157	27.5	0.0061
	120	0.0860	0.5138	0.5323	0.0009	0.0398	75.0	0.0078
	175	0.1059	0.7294	0.7002	0.0014	0.0385	124	0.0096
	250	0.1115	0.3778	0.8409	0.0019	0.0287	172	0.0101
	500	0.1420	0.5194	0.9989	0.0023	0.0359	229	0.0128
	750	0.3024	1.0988	2.1820	0.0049	0.0774	486	0.0273
Graders Composite		0.1049	0.5812	0.7217	0.0015	0.0355	133	0.0095
Off-Highway Trac	120	0.1622	0.6879	0.9427	0.0011	0.0779	93.7	0.0146
	175	0.1614	0.8085	1.1191	0.0015	0.0632	130	0.0146
	250	0.1275	0.3861	1.0244	0.0015	0.0411	130	0.0115
	750	0.5173	2.0914	4.1264	0.0057	0.1633	568	0.0467
	1000	0.7842	3.2770	8.0820	0.0082	0.2526	814	0.0708
Off-Highway Tractors Compos		0.1631	0.6762	1.2293	0.0017	0.0579	151	0.0147
Off-Highway Trud	175	0.0983	0.7542	0.5947	0.0014	0.0314	125	0.0089
	250	0.1042	0.3572	0.6660	0.0019	0.0225	167	0.0094
	500	0.1656	0.5578	0.9706	0.0027	0.0351	272	0.0149
	750	0.2693	0.9044	1.6152	0.0044	0.0577	442	0.0243
	1000	0.4058	1.3339	4.3394	0.0063	0.1110	625	0.0366
Off-Highway Trucks Composit		0.1613	0.5634	1.0525	0.0027	0.0360	260	0.0146
Other Constructio	15	0.0118	0.0617	0.0737	0.0002	0.0029	10.1	0.0011
	25	0.0159	0.0544	0.1008	0.0002	0.0038	13.2	0.0014
	50	0.0412	0.2342	0.2102	0.0004	0.0108	28.0	0.0037
	120	0.0604	0.5116	0.4573	0.0009	0.0279	80.9	0.0054
	175	0.0608	0.5859	0.4478	0.0012	0.0218	107	0.0055
	500	0.1122	0.4743	0.8004	0.0025	0.0275	254	0.0101
Other Construction Equipment		0.0633	0.3542	0.4478	0.0013	0.0181	123	0.0057

Other General Industrial Equip	15	0.0066	0.0391	0.0466	0.0001	0.0018	6.4	0.0006
	25	0.0185	0.0632	0.1170	0.0002	0.0044	15.3	0.0017
	50	0.0548	0.2314	0.1869	0.0003	0.0134	21.7	0.0049
	120	0.0732	0.4277	0.4544	0.0007	0.0350	62.0	0.0066
	175	0.0835	0.5664	0.5608	0.0011	0.0307	95.9	0.0075
	250	0.0884	0.2862	0.6866	0.0015	0.0221	136	0.0080
	500	0.1664	0.5336	1.1846	0.0026	0.0412	265	0.0150
	750	0.2755	0.8795	2.0057	0.0044	0.0689	437	0.0249
	1000	0.3866	1.2370	4.3716	0.0056	0.1169	560	0.0349
Other General Industrial Equip		0.1113	0.4591	0.8242	0.0016	0.0336	152	0.0100
Other Material Handling Equip	50	0.0758	0.3192	0.2598	0.0004	0.0186	30.3	0.0068
	120	0.0709	0.4162	0.4437	0.0007	0.0341	60.7	0.0064
	175	0.1050	0.7171	0.7125	0.0014	0.0389	122	0.0095
	250	0.0934	0.3046	0.7336	0.0016	0.0237	145	0.0084
	500	0.1186	0.3838	0.8543	0.0019	0.0297	192	0.0107
	9999	0.5386	1.6331	5.7822	0.0073	0.1543	741	0.0486
Other Material Handling Equip		0.1050	0.4495	0.8053	0.0015	0.0324	141	0.0095
Pavers	25	0.0226	0.0769	0.1434	0.0002	0.0057	18.7	0.0020
	50	0.0968	0.3188	0.2539	0.0004	0.0217	28.0	0.0087
	120	0.1030	0.4862	0.6205	0.0008	0.0506	69.2	0.0093
	175	0.1365	0.7632	0.9644	0.0014	0.0539	128	0.0123
	250	0.1574	0.5000	1.3162	0.0022	0.0490	194	0.0142
	500	0.1765	0.6885	1.4189	0.0023	0.0539	233	0.0159
Pavers Composite		0.1121	0.5017	0.6241	0.0009	0.0419	77.9	0.0101
Paving Equipment	25	0.0152	0.0520	0.0963	0.0002	0.0036	12.6	0.0014
	50	0.0821	0.2696	0.2165	0.0003	0.0185	23.9	0.0074
	120	0.0805	0.3809	0.4869	0.0006	0.0400	54.5	0.0073
	175	0.1062	0.5971	0.7567	0.0011	0.0424	101	0.0096
	250	0.0962	0.3068	0.8236	0.0014	0.0300	122	0.0087
Paving Equipment Composite		0.0857	0.4136	0.5558	0.0008	0.0374	68.9	0.0077
Plate Compactor	15	0.0050	0.0263	0.0314	0.0001	0.0012	4.3	0.0005
Plate Compactors Composite		0.0050	0.0263	0.0314	0.0001	0.0012	4.3	0.0005
Pressure Washer	15	0.0059	0.0308	0.0408	0.0001	0.0021	4.9	0.0005
	25	0.0094	0.0319	0.0587	0.0001	0.0028	7.1	0.0008
	50	0.0170	0.0895	0.1059	0.0002	0.0054	14.3	0.0015
	120	0.0167	0.1383	0.1528	0.0003	0.0087	24.1	0.0015
Pressure Washers Composite		0.0101	0.0562	0.0703	0.0001	0.0036	9.4	0.0009
Pumps	15	0.0101	0.0468	0.0625	0.0001	0.0034	7.4	0.0009
	25	0.0279	0.0871	0.1601	0.0002	0.0080	19.5	0.0025
	50	0.0599	0.2670	0.2677	0.0004	0.0164	34.3	0.0054
	120	0.0676	0.4767	0.5260	0.0009	0.0350	77.9	0.0061
	175	0.0845	0.7338	0.7548	0.0016	0.0350	140	0.0076
	250	0.0866	0.3786	0.9399	0.0023	0.0271	201	0.0078
	500	0.1387	0.6343	1.4367	0.0034	0.0442	345	0.0125
	750	0.2330	1.0487	2.4376	0.0057	0.0741	571	0.0210
	9999	0.7050	2.7434	9.8509	0.0136	0.2358	1,355	0.0636
Pumps Composite		0.0458	0.2722	0.3306	0.0006	0.0189	49.6	0.0041
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0018	6.3	0.0007
	25	0.0161	0.0549	0.1017	0.0002	0.0038	13.3	0.0015
	50	0.0662	0.2547	0.2171	0.0003	0.0158	26.0	0.0060
	120	0.0680	0.3919	0.4411	0.0007	0.0341	59.0	0.0061
	175	0.0897	0.6130	0.6569	0.0012	0.0356	108	0.0081
	250	0.0934	0.3306	0.8164	0.0017	0.0274	153	0.0084
	500	0.1262	0.4902	1.0345	0.0022	0.0365	219	0.0114
Rollers Composite		0.0683	0.3885	0.4485	0.0008	0.0291	67.0	0.0062
Rough Terrain Forklifts	50	0.0655	0.3294	0.2744	0.0004	0.0166	33.9	0.0059
	120	0.0596	0.4179	0.3967	0.0007	0.0273	62.4	0.0054
	175	0.0911	0.7231	0.6072	0.0014	0.0322	125	0.0082
	250	0.0988	0.3504	0.7075	0.0019	0.0237	171	0.0089
	500	0.1441	0.5029	0.9468	0.0025	0.0341	257	0.0130
Rough Terrain Forklifts Composite		0.0638	0.4499	0.4219	0.0008	0.0277	70.3	0.0058

Rubber Tired Doz	175	0.1676	0.8191	1.1443	0.0015	0.0646	129	0.0151
	250	0.1890	0.5640	1.4879	0.0021	0.0605	183	0.0171
	500	0.2531	1.0338	1.9476	0.0026	0.0787	265	0.0228
	750	0.3821	1.5520	2.9917	0.0040	0.1195	399	0.0345
	1000	0.5986	2.5082	6.0072	0.0060	0.1906	592	0.0540
Rubber Tired Dozers Compos		0.2343	0.8819	1.8194	0.0025	0.0737	239	0.0211
Rubber Tired Loaders	25	0.0204	0.0697	0.1291	0.0002	0.0048	16.9	0.0018
	50	0.0742	0.3198	0.2591	0.0004	0.0174	31.1	0.0067
	120	0.0660	0.4016	0.4121	0.0007	0.0307	58.9	0.0060
	175	0.0888	0.6227	0.5902	0.0012	0.0323	106	0.0080
	250	0.0946	0.3237	0.7142	0.0017	0.0244	149	0.0085
	500	0.1440	0.5256	1.0103	0.0023	0.0363	237	0.0130
	750	0.2966	1.0762	2.1374	0.0049	0.0758	486	0.0268
1000	0.3912	1.4170	4.4558	0.0060	0.1188	594	0.0353	
Rubber Tired Loaders Compos		0.0861	0.4470	0.5831	0.0012	0.0300	109	0.0078
Scrapers	120	0.1382	0.6686	0.8165	0.0011	0.0661	93.9	0.0125
	175	0.1579	0.8954	1.0712	0.0017	0.0603	148	0.0142
	250	0.1704	0.5324	1.3558	0.0024	0.0501	209	0.0154
	500	0.2458	0.9165	1.8678	0.0032	0.0707	321	0.0222
	750	0.4267	1.5807	3.3123	0.0056	0.1238	555	0.0385
Scrapers Composite		0.2135	0.8418	1.6042	0.0027	0.0653	262	0.0193
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0018	6.2	0.0006
	50	0.0649	0.2966	0.2820	0.0005	0.0172	36.2	0.0059
	120	0.0695	0.4999	0.5256	0.0009	0.0356	80.2	0.0063
	175	0.0955	0.8276	0.7968	0.0017	0.0385	155	0.0086
	250	0.1151	0.4857	1.1305	0.0029	0.0337	255	0.0104
Signal Boards Composite		0.0143	0.0916	0.1029	0.0002	0.0050	16.7	0.0013
Skid Steer Loaders	25	0.0176	0.0582	0.1081	0.0002	0.0048	13.8	0.0016
	50	0.0263	0.2035	0.1787	0.0003	0.0065	25.5	0.0024
	120	0.0248	0.2680	0.1970	0.0005	0.0095	42.8	0.0022
Skid Steer Loaders Composite		0.0253	0.2146	0.1799	0.0004	0.0074	30.3	0.0023
Surfacing Equipment	50	0.0317	0.1242	0.1139	0.0002	0.0077	14.1	0.0029
	120	0.0668	0.4072	0.4651	0.0007	0.0334	63.8	0.0060
	175	0.0637	0.4677	0.5082	0.0010	0.0257	85.8	0.0058
	250	0.0733	0.2858	0.7013	0.0015	0.0230	135	0.0066
	500	0.1120	0.5047	1.0316	0.0022	0.0350	221	0.0101
	750	0.1782	0.7911	1.6685	0.0035	0.0558	347	0.0161
Surfacing Equipment Compos		0.0923	0.4187	0.8043	0.0017	0.0291	166	0.0083
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0034	11.9	0.0011
	25	0.0237	0.0808	0.1495	0.0002	0.0056	19.6	0.0021
	50	0.0522	0.2974	0.2539	0.0004	0.0137	31.6	0.0047
	120	0.0647	0.4983	0.4442	0.0009	0.0291	75.0	0.0058
	175	0.0966	0.8030	0.6280	0.0016	0.0337	139	0.0087
	250	0.0894	0.3218	0.6073	0.0018	0.0204	162	0.0081
Sweepers/Scrubbers Compos		0.0681	0.4946	0.4308	0.0009	0.0251	78.5	0.0061
Tractors/Loaders	25	0.0191	0.0653	0.1211	0.0002	0.0046	15.9	0.0017
	50	0.0497	0.2839	0.2342	0.0004	0.0121	30.3	0.0045
	120	0.0435	0.3426	0.2937	0.0006	0.0184	51.7	0.0039
	175	0.0669	0.5845	0.4264	0.0011	0.0218	101	0.0060
	250	0.0914	0.3483	0.5964	0.0019	0.0200	172	0.0082
	500	0.1788	0.6771	1.0736	0.0039	0.0385	345	0.0161
	750	0.2691	1.0154	1.6525	0.0058	0.0585	517	0.0243
Tractors/Loaders/Backhoes C		0.0513	0.3647	0.3331	0.0008	0.0189	66.8	0.0046
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0024	8.5	0.0009
	25	0.0397	0.1355	0.2509	0.0004	0.0094	32.9	0.0036
	50	0.1142	0.3647	0.2965	0.0004	0.0255	32.9	0.0103
	120	0.0959	0.4498	0.5899	0.0008	0.0477	64.9	0.0087
	175	0.1505	0.8436	1.1021	0.0016	0.0607	144	0.0136
	250	0.1783	0.5823	1.5446	0.0025	0.0582	223	0.0161
	500	0.2312	0.9564	1.9434	0.0031	0.0740	311	0.0209
	750	0.4382	1.7994	3.7533	0.0059	0.1413	587	0.0395
Trenchers Composite		0.1061	0.4368	0.5117	0.0007	0.0393	58.7	0.0096

Welders	15	0.0084	0.0392	0.0522	0.0001	0.0028	6.2	0.0008
	25	0.0161	0.0504	0.0927	0.0001	0.0047	11.3	0.0015
	50	0.0563	0.2339	0.2108	0.0003	0.0144	26.0	0.0051
	120	0.0398	0.2540	0.2787	0.0005	0.0205	39.5	0.0036
	175	0.0703	0.5400	0.5536	0.0011	0.0283	98.2	0.0063
	250	0.0617	0.2348	0.5828	0.0013	0.0179	119	0.0056
	500	0.0825	0.3196	0.7244	0.0016	0.0239	168	0.0074
Welders Composite		0.0388	0.1876	0.1941	0.0003	0.0133	25.6	0.0035