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CH2MHILL

October 29, 2002

Ms. Kristy Chew
Siting Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: Data Responses, Informal Set 7
Cosumnes Power Plant (01-AFC-19)

On behalf of the Sacramento Municipal Utility District, please find attached 12 copies and one original of the Informal Data Responses, Set 7, Revised Analysis of Air Quality Impacts During Project Construction. Five copies of the CDs are being provided.

Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

c: Colin Taylor/SMUD
Kevin Hudson/SMUD
Steve Cohn/SMUD

COSUMNES POWER PLANT (01-AFC-19)

INFORMAL DATA RESPONSE, SET 7

Submitted by

SACRAMENTO MUNICIPAL UTILITY DISTRICT (SMUD)

October 29, 2002

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October 28, 2002

Kristy Chew
Project Manager
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Re: SMUD Cosumnes Power Plant, 01-AFC-19
Revised Analysis of Air Quality Impacts During Project Construction

Dear Ms. Chew:

We have prepared a revised air quality analysis of project construction impacts for the Cosumnes Power Plant; that revised analysis is enclosed for your review. Five copies of the modeling files are enclosed on CD.

If you have further questions or need additional information regarding this issue, please don't hesitate to call me.

Sincerely,

Tom Andrews
Senior Engineer

encl

cc: (w/o CD)
Tuan Ngo, CEC
Mike Ringer, CEC
Stu Husband, SMUD
Bob Nelson, SMUD
Kevin Hudson, SMUD
John Carrier, CH2M Hill

REVISED CONSTRUCTION EMISSIONS
AND IMPACT ANALYSIS
COSUMNES POWER PLANT
October 24, 2002

This revised construction impacts analysis includes several refinements to better assess the potential impacts of construction activities on local air quality. These refinements include:

- Improved estimates of construction equipment use, based on observations of construction activities at other power plant construction sites and on a more detailed construction schedule;
- Improved estimates of control efficiencies based on site-specific factors; and
- Improved characterization of combustion exhaust in ISCST3 to better represent behavior of hot Diesel exhaust plumes.

1. CONSTRUCTION PHASES

Construction of the project is expected to last approximately 24 months, with the construction occurring in the following four main phases:

- Site preparation;
- Foundation work;
- Installation of major equipment; and
- Construction/installation of piping, electrical and smaller equipment.

Site preparation, which includes clearing, grading, excavation of footings and foundations, piledriving and backfilling operations, is expected to take about 4 months. 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.

Fugitive dust emissions from the construction of the Project will result from:

- Dust entrained during site preparation and 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; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel-fueled 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 other trucks used to transport workers and materials around the construction site;
- Exhaust from Diesel-fueled trucks used to deliver concrete, fuel, and construction supplies to the construction site; and
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Maximum daily dust and exhaust emissions are expected to occur at the beginning of the construction schedule during the site preparation phase, when large pieces of equipment such as bulldozers and excavators are operating and generating exhaust emissions as well as fugitive dust. Annual emissions are based on the average equipment mix during the 24-month construction period.

2. AVAILABLE MITIGATION MEASURES

The following mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment used during construction of the Project:

- Operational measures, such as limiting time spent with the engine idling by shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases due to engine problems;
- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle Diesel fuel; and
- To the extent feasible, use of low-emitting Diesel engines meeting federal emissions standards for construction equipment.

The following mitigation measures are proposed to control fugitive dust emissions during construction of the project:

- Use either water application or chemical dust suppressant application to control dust emissions from unpaved road travel and unpaved parking areas;
- Use vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Limit vehicle freeboard, require cargo wetting and cargo covers;
- Limit traffic speeds on unpaved roads;

- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Prewater or stabilize excavation areas to reduce fugitive dust generation;
- Replant vegetation in disturbed areas as quickly as possible;
- As needed, use wheel washers or wash off tires of all trucks exiting construction site that carry track-out dirt from unpaved roads; and
- Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant.

3. ESTIMATION OF EMISSIONS WITH MITIGATION MEASURES

Tables 1 and 2 (replacing Tables 8.1A-1 and 8.1A-2 of the original application) show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures. The emission rates used in the original construction impacts analysis are shown in parenthesis for comparison. Detailed emission calculations are included in the attachment.

TABLE 1 (September 2001 Version)

Maximum Daily Emissions During Onsite Construction (Month 7; Maximum Dust and Exhaust Emissions), Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}
		Onsite			
Construction Equipment, Fugitive Dust	136.1 (129.7)	64.9 (35.4)	10.7 (10.0)	0.1 (3.6)	34.9 (46.2)
		Offsite			
Worker Travel, Truck Deliveries	51.3 (176.8)	391.4 (1,430.2)	32.0 (116.6)	0.8 (2.6)	1.8 (3.5)
		Total Emissions			
Total	187.5 (306.5)	456.3 (1,465.6)	42.7 (126.6)	0.9 (6.2)	36.7 (49.6)

TABLE 2 (September 2001 Version)

Annual Emissions During Construction, Tons Per Year

	NOx	CO	VOC	SOx	PM_{10}
		Onsite			
Construction Equipment, Fugitive Dust	10.4 (11.1)	7.3 (3.3)	1.1 (0.9)	0.0 (0.3)	1.6 (4.0)
		Offsite			
Worker Travel, Truck/Rail Deliveries	6.5 (13.3)	49.0 (104.2)	4.0 (8.5)	0.1 (0.2)	0.2 (0.4)
		Total Emissions			
Total	16.9 (24.3)	56.3 (107.5)	5.1 (9.4)	0.1 (0.5)	1.9 (4.4)

4. ANALYSIS OF AMBIENT IMPACTS FROM FACILITY CONSTRUCTION

As for the original analysis, this revised analysis used the EPA-guideline ISCST3 ambient air quality model to evaluate ambient air quality impacts during construction of the project. 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.

4.1 Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1.5.2.2), the Elk Grove, Stockton Boulevard, Del Paso Manor, and T Street monitoring stations for 1997 through 2000 were used to establish the ambient background levels for the construction impact modeling analysis.

4.2 Dispersion Model

As in the original analysis, the EPA-approved Industrial Source Complex Short Term (ISCST3) model was used to estimate ambient impacts from construction activities. A detailed discussion of the ISCST3 dispersion model is included in Section 8.1.5.2.2 of the original application.

The emission sources for the construction site were grouped into two categories: exhaust emissions and dust emissions. An effective emission plume height of 4.15 meters was used for all exhaust emissions.[1] For construction dust emissions, an effective plume height of 0.5 meters was used in the modeling analysis. The exhaust and dust emissions were modeled as area sources that covered the total area of the construction site. The construction impacts modeling analysis used the same receptor locations as used for the project operating impact analysis. A detailed discussion of the receptor locations is included in Section 8.1.5.2.2 of the AFC.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Table 1 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 2 were used. The same meteorological data set used for the project operating modeling analysis was used for the construction emission impacts analysis.

[1] This release height is based on the data used in ARB's Diesel Risk Reduction Plan for Diesel vehicles.

4.3 MODELING RESULTS

Based on the emission rates of NOx, SO_2, CO, and PM_{10} and the meteorological data, the ISCST3 model calculates hourly 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 worst-case daily emission rates of NOx, SO_2, CO, and PM_{10}. The annual impacts are based on the annual average emission rates of these pollutants.

The one-hour and annual average concentrations of NO_2 were computed following the revised EPA guidance for computing these concentrations (August 9, 1995 *Federal Register,* 60 FR 40465). The OLM_ISC model was used for the one-hour average NO_2 impacts, with hourly ozone data collected at Elk Grove during 1999. The annual average NO_2 impact was calculated using the ambient ratio method (ARM) with the EPA default value of 0.75 for the annual average NO_2/NOx ratio.

The modeling analysis results are shown in Table 3. Also included in the table are the maximum background levels that have occurred in the last 5 years and the resulting total ambient impacts. As shown in Table 3, with the exception of the state 24-hour average PM_{10} standard, construction impacts combined with maximum measured background concentrations for all modeled pollutants are expected to be below the most stringent state and national standards. However, it is important to note that the CPP does not cause a new violation of the state 24-hour average PM_{10} standard because this standard was already exceeded in the absence of the construction emissions for the Project.

The dust mitigation measures already proposed by the applicant, which reflect the requirements of SMAQMD Rule 403, are expected to be very effective in minimizing fugitive dust emissions. The attached isopleth diagrams show the extent of the modeled impacts from construction PM_{10} for the 24-hour and annual averaging periods. As shown on these isopleths, while maximum impacts occur next to the project site fenceline, concentrations decrease rapidly at locations only a couple of hundred meters away from the project site. For example, as shown on the isopleths for 24-hr average PM_{10} impacts, along the fenceline PM_{10} impacts are approximately 70 $\mu g/m^3$. However, at locations only 200 meters way from the fenceline PM_{10} impacts decrease to approximately 15 $\mu g/m^3$ (only approximately one-fifth of the level at the fenceline).

It is also important to note that emissions in an exhaust plume are dispersed through the entrainment of ambient air, which dilutes the concentration of the emissions as they are carried away from the source by winds. The process of mixing the pollutants with greater and greater volumes of cleaner air is controlled primarily by the turbulence in the atmosphere.

This dispersion occurs both horizontally, as the exhaust plume rises above the emission point, and vertically, as winds carry the plume horizontally away from its source.

The rise of a plume above its initial point of release is a significant contributing factor to the reductions in ground-level concentrations, both because a rising plume entrains more ambient air as it travels downwind, and because it travels farther downwind (and thus also undergoes more horizontal dispersion) before it impacts the ground. Vertical plume rise occurs as a result of buoyancy (plume is hotter than ambient air, and hot air, being less dense, tends to rise) and/or momentum (plume has an initial vertical velocity).

In ISCST3, area sources are not considered to have either buoyant or momentum plume rise, and therefore the model assumes that there is no vertical dispersion taking place. Thus a significant source of plume dilution is ignored when sources are modeled as area sources in ISCST3.

The project construction site impacts are not unusual in comparison to most construction sites; construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause violations of air quality standards. The input and output modeling files are being provided electronically.

TABLE 3
Modeled Maximum Onsite Construction Impacts

POLLUTANT	AVERAGING TIME	MAXIMUM CONSTRUCTION IMPACTS ($\mu g/m^3$)[1]	BACK-GROUND ($\mu g/m^3$)	TOTAL IMPACT ($\mu g/m^3$)	STANDARD ($\mu g/m^3$)	FEDERAL STANDARD ($\mu g/m^3$)
NO_2[2]	1-hour	234.2	152	386	470	--
	Annual	12.7	21	34	--	100
SO_2	1-hour	0.6	79	80	650	--
	24-hour	0.2	47	47	105	365
	Annual	0.0	13	13	--	80
CO	1-hour	340	9,200	9,540	23,000	40,000
	8-hour	199	8,165	8,364	10,000	10,000
PM_{10}	24-hour	77	88	165	50	150
	Annual[3]	4.5	21	26	30	--
	Annual[4]	4.5	25	26	--	50

Notes: 1. Based on maximum daily emissions during Month 7.
2. Ozone limiting method applied for 1-hour average. ARM applied for annual average, using national default 0.75 ratio.
3. Annual Geometric Mean.
4. Annual Arithmetic Mean.

4.4 HEALTH RISK OF DIESEL EXHAUST

The combustion portion of annual PM_{10} emissions from Table 3 above were modeled separately to determine the annual average Diesel PM_{10} exhaust concentration. This was used with the ARB-approved unit risk value of 300 in one million for a 70-year lifetime to determine the potential carcinogenic risk from Diesel exhaust during construction. The exposure was also adjusted by a factor of 2/70, or 0.0286, to correct for the 24-month exposure during the construction period.

The maximum modeled annual average concentration of Diesel exhaust PM_{10} is 1.081 ug/m^3. Using the unit risk value and adjustment factors described above, the carcinogenic risk due to exposure to Diesel exhaust during construction activities is expected to be approximately 9.3 in one million. This is above the 1 in one million level considered to be significant under the Sacramento Metropolitan AQMD's CEQA guidelines. However, these impacts are highly localized near the project site and are much lower at the nearest residences, which are approximately one mile away. As shown in the attached annual average Diesel combustion PM_{10} isopleth diagram, the area in which the risk may exceed 1 in one million (i.e., ambient annual average Diesel PM_{10} impact equal to or greater than 0.1 ug/m^3) extends only about 300 meters from the facility fenceline.

This analysis remains conservative because, as discussed above, the modeled PM_{10} concentrations from construction operations are overpredicted by the ISCST3 model.

ATTACHMENT 1
DETAILED CONSTRUCTION EMISSIONS CALCULATIONS

Worker Travel Daily Emissions (Month 7)
Cosumnes Power Plant

Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Vehicle Miles Traveled Per Day (Miles)	Emission Factors (lbs/vmt)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
205	1.3	158	70	11038	0.0029	0.0343	0.0027	0.0000	0.0001	31.71	379.11	30.27	0.02	0.64

Notes:
(1) See notes for combustion emissions.

Worker Travel Daily Emissions (Month 16)
Cosumnes Power Plant

Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Vehicle Miles Traveled Per Day (Miles)	Emission Factors (lbs/vmt)(1) NOx	CO	POC	SOx	PM10	Daily Emissions (lbs/day) NOx	CO	POC	SOx	PM10
386	1.3	297	70	20784.62	0.0029	0.0343	0.0027	0.0000	0.0001	59.71	713.83	57.00	0.04	1.21

Notes:
(1) See notes for combustion emissions.

Worker Travel Annual Emissions
Cosumnes Power Plant

Average Number of Workers Per Day	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Days per Year	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(1) NOx	CO	POC	SOx	PM10	Annual Emissions (tons/yr) NOx	CO	POC	SOx	PM10
205	1.3	158	70	250	2759615	0.0029	0.0343	0.0027	0.0000	0.0001	3.96	47.39	3.78	0.00	0.08

Notes:
(1) See notes for combustion emissions.

Daily Fugitive Dust Emissions (Month 7)
Cosumnes Power Plant

Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM10 Emissions (lbs/day)
Bulldozer D6H	1	8.00	8.0	hours	0.7528	88%	0.75
Bulldozer D4C	1	8.00	8.0	hours	0.7528	88%	0.75
Excavator- Trencher Excavation	0						
Excavator- Earth Scraper Excavation	3	8.00	24.0	hours	0.7528		18.07
Excavator- Earth Scraper Unpaved Road Travel	3	14.52	43.6	vmt	0.2656	88%	1.44
Excavator-Motor Grader	1	24.00	24.0	vmt	0.2754	88%	0.82
Excavator- Backhoe Excavation	0						
Excavator - Loader Excavation	1	3250.00	3250.0	tons	0.0004	88%	0.17
Excavator - Loader Unpaved Road Travel	1	28.39	28.4	vmt	0.1148	88%	0.41
Water Truck Unpaved Road Travel	1	20.00	20.0	vmt	0.1522	88%	0.38
Forklift Unpaved Road Travel	1	16.00	16.0	vmt	0.0970	88%	0.19
Dump Truck Unpaved Road Travel	2	13.64	27.3	vmt	0.1589	88%	0.54
Dump Truck Unloading	2	1625.00	3250.0	tons	0.0004		1.38
Service Truck Unpaved Road Travel	0						
Fuel/Lube Truck Unpaved Road Travel	1	3.41	3.4	vmt	0.1181	88%	0.05
Concrete Pumper Truck Unpaved Road Travel	0						
Tractor Truck 5th Wheel Unpaved Road Travel	0						
Pickup Truck Unpaved Road Travel	2	17.05	34.1	vmt	0.0599	88%	0.25
3 ton Truck Unpaved Road Travel	1	8.52	8.5	vmt	0.0803	88%	0.09
Windblown Dust (active construction area)	N/A	816927.00	816927.0	sq.ft.	0.0000	88%	2.57
Worker Gravel Road Travel	205	0.49	100.9	vmt	0.0477	88%	0.60
Delivery Truck Gravel Road Travel	10	0.49	4.9	vmt	0.1266	88%	0.08
Delivery Truck Unpaved Road Travel	10	0.17	1.7	vmt	0.1589	88%	0.03
Total =							28.58

Notes:
(1) See notes for fugitive dust emission calculations.

Annual Fugitive Dust Emissions
Cosumnes Power Plant

Activity	Average Daily PM10 Emissions(1) (lbs/day)	Days per Year	Annual PM10 Emissions (tons/yr)
Construction Activities	6.73	250	0.84
Windblown Dust	0.66	365	0.12
Total =			0.96

Notes:
(1) Based on average of daily emissions during 24 month construction period.

Daily Construction Emissions (Month 7)
Cosumnes Power Plant

Daily Emissions (lbs/day)

	NOx	CO	POC	SOx	PM10
Onsite					
Construction Equipment	136.13	64.92	10.69	0.12	6.36
Fugitive Dust					28.58
Subtotal =	136.13	64.92	10.69	0.12	34.94
Offsite					
Worker Travel	31.71	379.11	30.27	0.02	0.64
Truck Deliveries	19.61	12.27	1.76	0.81	1.14
Subtotal =	51.32	391.38	32.03	0.83	1.79
Total =	187.45	456.30	42.72	0.95	36.72

Annual Construction Emissions
Cosumnes Power Plant

Annual Emissions (tons/yr)

	NOx	CO	POC	SOx	PM10
Onsite					
Construction Equipment	10.42	7.26	1.10	0.01	0.67
Fugitive Dust					0.96
Subtotal =	10.42	7.26	1.10	0.01	1.63
Offsite					
Worker Travel	3.96	47.39	3.78	0.00	0.08
Truck Deliveries	2.55	1.60	0.23	0.11	0.15
Subtotal =	6.51	48.98	4.01	0.11	0.23
Total =	16.93	56.25	5.11	0.12	1.86

Notes - Combustion Emissions

(1) For Construction Equipment
For heavy Diesel construction equipment, emission factors based on equipment meeting EPA 1996 off-road Diesel standards and use of CARB ultra low-sulfur fuel.
For trucks, depending on size of truck, emissions factors based on MVE17G version 1.0c for heavy-heavy duty or medium duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.
For portable equipment, emission factors based on EPA's "Non-road Engine and Vehicle Emission Study Report", 11/91, Table 2-07, for generator sets, welders, pumps, and air compressors less than 50 hp.

(2) For Delivery Trucks
From MVE17G version 1.0c, heavy-heavy duty Diesel trucks, fleet average for calendar year 2000, San Francisco Air Basin.

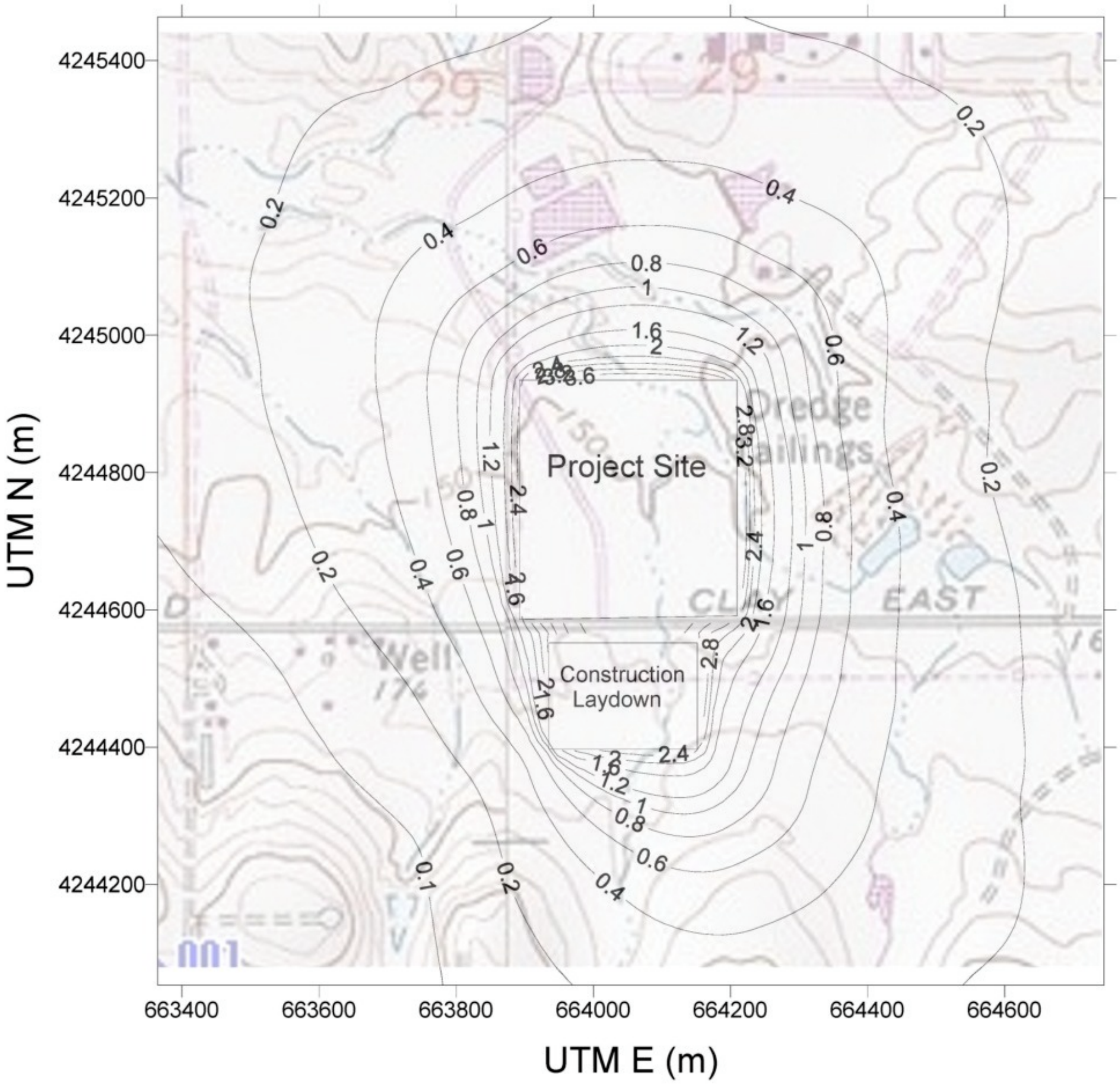
(3) For Worker Travel
From MVE17G version 1.0c, average of light duty automobiles and light duty trucks, fleet average for calendar year 2000, San Francisco Air Basin.

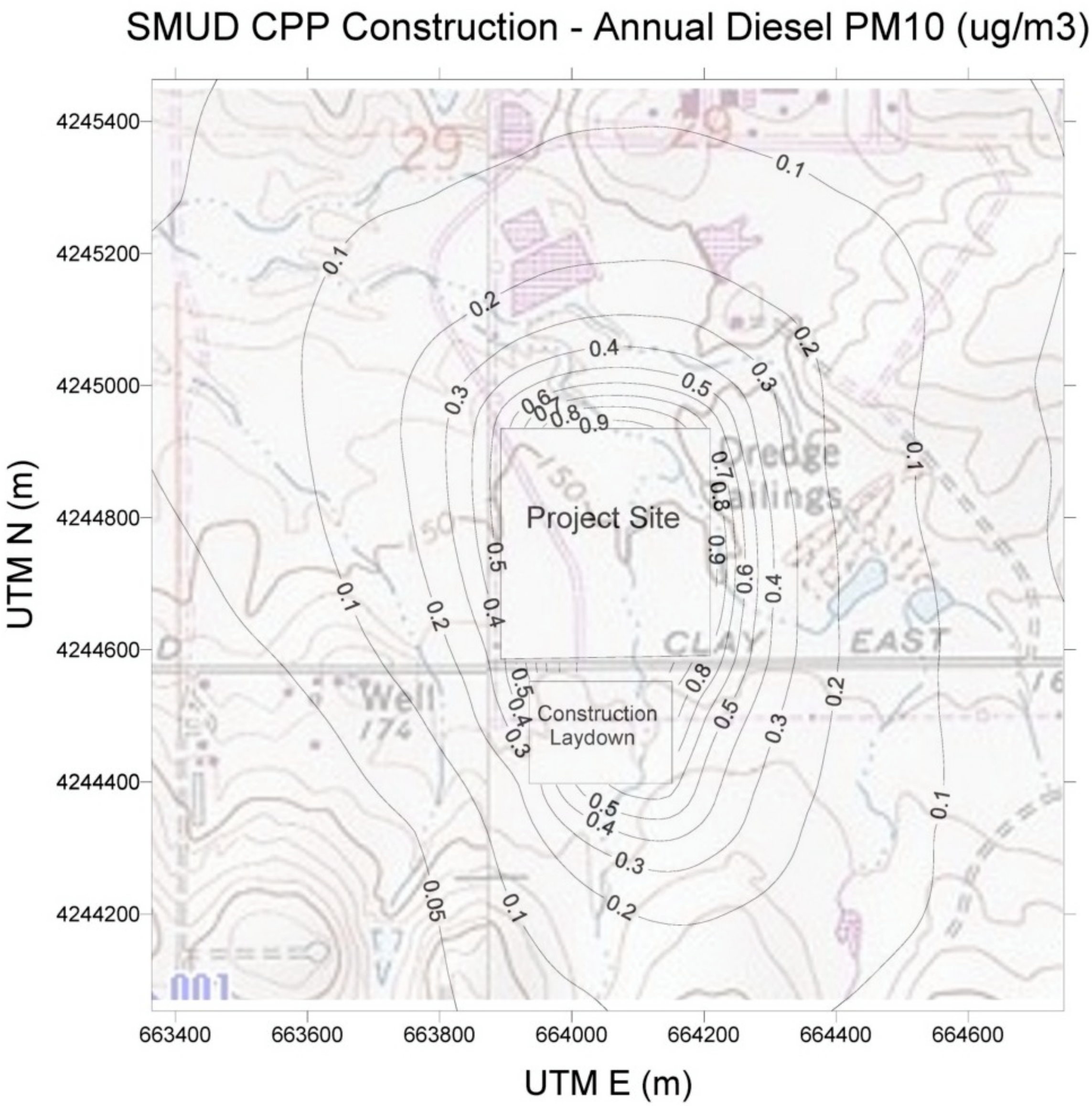
Notes - Fugitive Dust Emission Calculations

(1) Paved road travel emission factors for delivery trucks and worker automobiles are based on AP-42, Section 13.2.1, 10/97.
(Based on default road silt loading shown in AP-42, page 13.2.1-5, 10/97, limited access roads.)
(2) Wind erosion emission factor for active construction area is based on "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996.
(3) Finish grading emission factor is based on AP-42, Table 11.9-1, 7/98.
(4) Bulldozer excavation emission factor is based AP-42, Table 11.9-1, 7/98.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(5) Material unloading emission factors are based on AP-42, p. 13.2.4-3, 1/95.
(Based on average annual wind speed recorded onsite and default soil moisture content shown in AP-42, Table 11.9-3, 7/98, overburden.)
(6) Loader unpaved surface travel emission factor is based on AP-42, Section 13.2.2, 1/95.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(7) Trenching emission factor is based on AP-42, Table 11.9-2 (dragline operations), 1/95.
(Based on default soil moisture content shown in AP-42, Table 11.9-3, 7/98, overburden.)
(8) Unpaved surface travel emission factors for water trucks, fuel trucks, service trucks, dump trucks, forklifts, pickup trucks, delivery trucks, and concrete trucks are based on AP-42, Section 13.2.2, 9/98.
(Based on default soil silt and moisture contents shown in AP-42, Table 11.9-3, 7/98, overburden.)
(9) Dust control efficiency for unpaved road travel and active excavation area is based on "Control of Open Fugitive Dust Sources", U.S. EPA, 9/88.
(Based on default evaporation rate shown in EPA document, Figure 3-2, 9/88, and typical water application rate shown in EPA document, page 3-23, 9/88.)

ATTACHMENT 2
PM_{10} ISOPLETHS

SMUD CPP Construction - Annual PM10 (ug/m3)





SMUD CPP Construction - Annual Diesel PM10 (ug/m3)
UTM N (m)
UTM E (m)
4245400
4245200
4245000
4244800
4244600
4244400
4244200
663400
663600
663800
664000
664200
664400
664600
Project Site
Construction
Laydown
0.05
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

SMUD CPP Construction - 24-hr PM10 (ug/m3)