URS

DOCKET
08-AFC-6
DATE JAN 05 2009
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January 5, 2009

Dockets Unit
California Energy Commission
1516 Ninth Street, MS 4
Sacramento, CA 95814

RE: Willow Pass Generating Station
Application for Certification 08-AFC-06

On behalf of Mirant Willow Pass, LLC, the applicant for the above-referenced Willow Pass Generating Station AFC, we are pleased to submit the following:

- Responses to CEC Data Requests (#49-57) (one hard copy to Dockets Unit; electronic mail to Proof of Service)
- A CD containing Appendix E, Air Quality Modeling Files (five copies to Dockets Unit)

Please note that the Responses to CEC Data Requests (#49-57) submittal was also filed today via electronic mail to your attention and to the Proof of Service List.

URS Corporation

Kathy Rushmore
Project Manager

Enclosures

CC: Ivor Benci-Woodward

URS Corporation
221 Main Street, Suite 600
San Francisco, CA 94105
Tel: 415.896.5858
Fax: 415.882.9261
www.urscorp.com

Responses to CEC Data Requests (#49–57)

Application for Certification (08-AFC-6)

for

WILLOW PASS GENERATING STATION

Pittsburg, California

January 2009

Prepared for:

MIRANT℠
WILLOW PASS, LLC

Prepared by:

URS

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN RESPONSES

AAQS	ambient air quality standard
AERMOD	American Meteorological Society and Environmental Protection Agency preferred atmospheric dispersion model
AFC	Application for Certification
AQMD	Air Quality Management District
ATC	Authority to Construct
BAAQMD	Bay Area Air Quality Management District
CAAQS	California ambient air quality standard
CARB	California Air Resources Board
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
°F	degrees Fahrenheit
FP10	Flex Plant 10
FSNL	full speed-no load
g/gal	grams per gallon
g/hr	grams per hour
GHG	greenhouse gases
gr	grain
GT	gas turbine
lb/day	pounds per day
lb/day/CT	pounds per day per combustion turbine
lb/day/unit	pounds per day per unit
lb/hr	pounds per hour
lb/hr/CT	pounds per hour per combustion turbine
lb/hr/unit	pounds per hour per unit
lbs	pounds
lbs/mile	pounds per mile
LDA	light-duty automobile
LDT	light-duty truck
m	meters
$\mu g/m^3$	micrograms per cubic meter
MLGS	Marsh Landing Generating Station
N_2O	nitrous oxide
NAAQS	national ambient air quality standard
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
PDOC	Preliminary Determination of Compliance
PM	particulate matter
PM_{10}	particulate matter less than 10 microns
$PM_{2.5}$	particulate matter less than 2.5 microns
ppm	parts per million
PPP	Pittsburg Power Plant
PTO	Permit to Operate
scf	standard cubic foot
SD	shutdown
SO_2	sulfur dioxide
SU	startup
tpd	tons per day
tpm	tons per month

tpy	tons per year
URBEMIS2007	2007 release of the Urban Emissions Model
UTM	Universal Transverse Mercator
VOC	volatile organic compounds
WPGS	Willow Pass Generating Station

Technical Area: Air Quality
Author: Brewster Birdsall

BACKGROUND

Greenhouse Gas Emissions

Energy Commission staff plans to use AFC Appendix J3, p. J3-2, to quantify the emissions of greenhouse gases (GHG) caused during construction of the project. These include carbon dioxide, nitrous oxide, and methane (unburned natural gas). However, it is not clear whether activity for construction of linear facilities, worker commutes, and material deliveries using diesel trucks during demolition of retired Pittsburg Power Plant Units 1 through 4 and construction (including those shown in AFC Figure 2.7-5 and in Section 7.10.2.2) are included in the GHG totals. AFC Section 2.7.5 shows the proposed general construction emission control measures that may also reduce GHG emissions from construction. Staff also seeks to quantify emissions from worker commutes and material deliveries, which are expected to be approximately 40 daily worker trips and 20 daily delivery truck trips (AFC Section 7.10.2.3) during operation of the proposed project.

DATA REQUEST

49. Please show the total and annual GHG emissions for the demolition and construction phases of the proposed project including all activities at the construction site and any construction activities for linear facilities (gas and water pipelines and transmission lines), worker commutes, construction equipment and material deliveries, and demolition waste removal.

RESPONSE

The Application for Certification (AFC) (Appendix J, page J3-3) included a table of estimated emissions from the construction of the Willow Pass Generating Station (WPGS) and the linear facilities. This information is repeated and summarized in Table 49-1. Estimated emissions of greenhouse gases (GHG) from construction worker commutes and from deliveries of construction materials are not included in this table but are provided later in this response. Estimated GHG emissions for the demolition phase of the project were not calculated in the table provided in Appendix J, and a table with these emissions is included later in the response.

Table 49-1
Estimated Greenhouse Gas Emissions from Construction Equipment Usage or the WPGS and Linear Facilities

	CO_2 Emissions	CH_4 Emissions	N_2O Emissions
Maximum Monthly Total (tpm)	240	0.02	0.02
Maximum Rolling 12-month Total (tpy)	1,553	0.16	0.17
Project Total (tons/metric ton)	**4,400/3,992**	**0.45/0.41**	**0.48/0.44**

CO_2 = carbon dioxide
CH_4 = methane
N_2O = nitrous oxide
lbs/mile = pounds per mile
tpm = tons per month
tpy = tons per year
Source: AFC Appendix J, page J3-3.
Note:
Total project for the construction period is 34 months. Total emissions conservatively used annual rate for entire period.

Off-road mobile emission factors used in calculating the GHG emissions from operation of the demolition equipment were obtained from the South Coast Air Quality Management District (AQMD) CEQA Handbook Off-Road Mobile Source Emission Factors (South Coast AQMD, 2008). These emission factors for the demolition equipment are presented in Table 49-2.

Table 49-2
Emission Factors for Greenhouse Gases for Demolition Equipment

Equipment Type	CO_2 (lb/hr)	CH_4 (lb/hr)	N_2O (lb/hr)
Hydraulic Excavator	287.5	0.008	0.003
1-Ton Flatbed Truck	172.5	0.005	0.002
Forklift	46	0.001	0.000
Fuel/Lube Truck	172.5	0.005	0.002
Water Truck	345	0.010	0.003
Articulating Boom Manlift (120, 80, 60, and 40 Feet)	86.25	0.003	0.001
Air Compressor	57.5	0.002	0.001
Hydraulic Crane (75-Ton)	402.5	0.012	0.004
Service truck	172.5	0.005	0.002

CH_4 = methane lbs/hr = pounds per hour
CO_2 = carbon dioxide N_2O = nitrous oxide

Notes:

Emission factors for off-road vehicles correspond to the maximum values for model years 2009 to 2011 in the South Coast Air Quality Management District data. Linear interpolation was used to calculate the emission factors for horsepower values that were not listed.

CO_2 emissions for off-road vehicles were estimated using U.S. Environmental Protection Agency AP-42 Chapter 3.3 – Gasoline and Diesel Industrial Engines, and Chapter 3.4 – Large Stationary Diesel and All Stationary Dual-Fuel Engines.

CH_4 and N_2O factors for off-road vehicles were derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (distillate fuel factors for the industrial sector).

Using the emission factors from South Coast AQMD, the horsepower of the equipment, and the number of equipment units expected to be used per month at the site, the GHG emissions for each equipment type were calculated. The horsepower ratings for the equipment and the monthly equipment usage at the project site were obtained from AFC Table 2.7-3.

The average number of demolition equipment delivery trips was estimated to be 28 round trips per year originating at the Port of Stockton, a distance of 31.23 miles from the site. The maximum number of vehicle trips to transport demolition debris from the site and to provide fill for the demolition area is 9,723 per year. The assumed distance for all these trips is 15 miles one-way, and all trips are heavy-heavy duty trucks. Emission factors for all on-road vehicles during construction and demolition are presented in Table 49-3. The estimated emissions from truck trips delivering demolition equipment and hauling demolition debris or demolition fill materials, as well as the operation of the on-site demolition equipment, are provided in Table 49-4. Appendix B provides supporting calculations for the demolition activities.

Table 49-3
Operational Greenhouse Gas Emission Factors for Vehicles During WPGS Construction and Demolition

Vehicle Description	CO_2		CH_4		N_2O	
	tpd	lbs/mile	tpd	lbs/mile	tpd	lbs/mile
Light-Duty Automobile	5,880	0.89	0.56	0.00000844	—	0.000108
Light-Duty Truck	4,930	1.09	0.45	0.0000995	—	0.000168
Heavy-Heavy Duty Diesel Truck	870	4.04	0.04	0.000186	0.02	0.000110

CH_4 = methane
CO_2 = carbon dioxide
lbs/mile = pounds per mile
N_2O = nitrous oxide
tpd = tons per day

Notes:

Emission factors for CO_2 and CH_4 are based on results from EMFAC Emissions Model 2007 Version 2.3 (BURDEN output). The values are the projected values for the LDA and LDT (both Class I and II) vehicles within Costa Contra County in 2009. Emission factors in lbs/mile are calculated by dividing emission factor (tpy) by vehicle miles traveled from EMFAC2007.

N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.5 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

Table 49-4
Estimated Greenhouse Gas Emissions from Equipment Deliveries, Debris Removal/Fill Deliveries, and Equipment Operation during Demolition Phase

Activity	Distance Traveled per year (miles)	CO_2 Emissions (tpy)	CH_4 Emissions (tpy)	N_2O Emissions (tpy)
Demo Equipment Deliveries	1,749	3.53	0.000162	0.0000964
Demo Debris Removal and Fill Deliveries	291,690	589	0.0271	0.0161
Demo Equipment Operation		1,826.66	0.05	0.02
Total Annual Average (tpy)		2,419	0.08	0.03
Total (tons/ metric ton)		**3,628/3,292**	**0.12/0.11**	**0.05/0.05**

CH_4 = methane
CO_2 = carbon dioxide
N_2O = nitrous oxide
tpy = tons per year

Note:

Total demolition period is 18 months. Total emissions conservatively used annual rate for entire period.

Details regarding the number of construction workers throughout the construction effort are provided in AFC Tables 2.7-1a and 2.7-1b. The average one-way worker commute distance within Contra Costa County was estimated using default values in the 2007 release of the Urban Emissions Model (URBEMIS2007). WPGS construction workers were assumed to commute 22 days per month. To account for potential trips made by these construction workers during their lunch hour, an average rate of 3.02 one-way trips is assumed per worker per day. This trip rate value is obtained from URBEMIS2007 for General Light Industry (Rimpo and Associates Inc., 2007).

The average number of monthly vehicle trips for delivery of construction equipment for the WPGS (not including heavy equipment) is 29 trips (AFC Table 2.7-2). Construction equipment was assumed to be transported from the Port of Stockton to the project site (i.e., the same travel distance as for delivery of demolition equipment).

Certain heavy equipment used in the construction of the WPGS and linear facilities will be transported by rail to the existing spur at the project site. A total of six rail deliveries are assumed over the course of the construction period (average of two locomotive deliveries per year). It is assumed that only two rail cars per locomotive delivery will be used for WPGS equipment. GHG emissions associated with these deliveries were estimated based on the distance traveled from the California state line to the WPGS site along the Burlington Northern & Santa Fe railway tracks.

On-road vehicle emission factors were based on the vehicle fleet mix for Contra Costa County from the Emfac 2007 v. 2.3 model (CARB, 2007). See Appendices A and B for more details.

On-road construction vehicle emission factors are summarized in Table 49-3. Emission factors for rail delivery are summarized in Table 49-5. The worker vehicle fleet is assumed to be 50 percent light-duty automobiles (LDA) and 50 percent light-duty trucks (LDT). The material delivery truck fleet is assumed to consist only of heavy-heavy duty trucks.

Table 49-5
Greenhouse Gas Emission Factors for Construction Material Deliveries by Rail

Vehicle Description	CO_2 Emissions	CH_4 Emissions	N_2O Emissions
Locomotive in Motion (g/gal)	10,084	0.3	0.1
Locomotive Idling (g/hr)	40,336	1.2	0.4

CH_4 = methane
CO_2 = carbon dioxide
g/gal = grams per gallon
g/hr = grams per hour
N_2O = nitrous oxide

Notes:

Per EPA's Emission Facts (http://www.epa.gov/otaq/climate/420f05001.pdf), CO_2 emissions from a gallon of diesel fuel are 10,084 g/gal diesel.

CH_4 and N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Sector and Fuel Type).

Fuel consumed during idling period is assumed to be 4 gallons per hour and is based on switcher idling information on the U.S. EPA web page: http://www.epa.gov/smartway/idlingimpacts.htm

Average annual and total project GHG emission estimates for the construction worker commute and delivery of construction materials are provided in Table 49-6. Appendix A provides backup for these calculations.

Table 49-7 summarizes the estimated annual GHG emissions for all activities during the demolition and construction phase. The total project emissions for the demolition and construction are also represented in this table. Detailed emission calculations are provided in Appendices A and B.

Table 49-6
Estimated Greenhouse Gas Emissions from Worker Commutes and Material Deliveries during Construction Phase

Activity	Distance Traveled per year (miles)	CO_2 Emissions (tpy)	CH_4 Emissions (tpy)	N_2O Emissions (tpy)
Worker Commute	2,848,259	1,407	0.08	0.20
Material Delivery	14,241	28.75	0.00132	0.000785
Rail Delivery	836	1.16	0.0000344	0.0000115
Total Annual Average (tpy)		1,437	0.08	0.20
Total (tons/ metric ton)		**4,072/3,694**	**0.23/0.21**	**0.57/0.51**

CH_4 = methane N_2O = nitrous oxide
CO_2 = carbon dioxide tpy = tons per year

Note:

Total construction period is 34 months. Total emissions conservatively used annual rate for entire period.

Table 49-7
Estimated Greenhouse Gas Emissions from All Activities during Construction and Demolition Phase

Activity	CO_2 Emissions	CH_4 Emissions	N_2O Emissions
Construction (Equipment Usage for the WPGS and Linear Facilities) (tpy)	1,553	0.16	0.17
Demolition (tpy)	2,419	0.08	0.03
Worker Commutes and Material Deliveries during Construction Phase (tpy)	1,437	0.08	0.2
Maximum Annual Emissions[1] (tpy)	5,409	0.32	0.40
Total Project[2,3] (tons/metric ton)	**12,100/10,978**	**0.80/0.73**	**1.10/1.00**

CH_4 = methane N_2O = nitrous oxide
CO_2 = carbon dioxide tpy = tons per year

Notes:

1. Maximum annual emissions are the total of the worst annual emissions from each activity during construction phase.
2. Total construction period is 34 months. Total construction emissions conservatively used annual rate for entire period.
3. Total demolition period is 18 months. Total demolition emissions conservatively used annual rate for entire period.

References

CARB (California Air Resources Board), 2007. Emfac 2007, v. 2.3: http://www.arb.ca.gov/msei/onroad/latest_version.htm] and the California Climate Action Registry General Reporting Protocol [http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html.

Rimpo and Associates Inc., 2007. Urbemis 2007 for Windows, v. 9.2.4: http://www.urbemis.com/.

South Coast AQMD (South Coast Air Quality Management District), 2008. CEQA Handbook Off-road mobile source emission factors; http://www.aqmd.gov/ceqa/handbook/offroad/offroadEF07_25.xls.

DATA REQUEST

50. Please quantify emissions of criteria pollutants and GHG from worker commutes and material deliveries (for example, for ammonia delivery or for waste removal) during operation of the proposed project.

RESPONSE

Natural gas, which is used for fuel at the site, will be delivered to the WPGS through a pressurized pipeline. Emissions associated with natural gas delivery will thus be negligibly small. Aqueous ammonia, which will be used as the reagent for the selective catalytic reduction system, will be transported to the site by 8,000-gallon capacity California Department of Transportation-certified trucks. Other miscellaneous materials, such as liquid nitrogen and lubricating oil, are assumed to be transported to the site at the same combined frequency used for aqueous ammonia delivery.

The average number of workers at the WPGS during operation is provided in AFC Table 2.8-1. The average miles commuted during a one-way trip in Contra Costa County is estimated using default values in URBEMIS2007. The plant operators are assumed to commute 30 days per month and other plant personnel are assumed to commute 22 days per month. To account for trips made by plant personnel during their lunch hours, a total average rate of 3.02 one-way trips is assumed per worker per day. This trip rate value is obtained from URBEMIS2007 for General Light Industry.

The maximum number of vehicle trips for aqueous ammonia delivery is 60 one-way trips per year (or five one-way trips per month), as described in AFC Section 7.12.2.2. The aqueous ammonia currently used at the site is transported to the project site from suppliers located in either Dixon, California or La Mirada, California. For the purpose of the WPGS calculations, it is assumed that half of the ammonia for the WPGS will be transported to the project site from Dixon and the other half is transported site from La Mirada. The maximum number of vehicle trips for other miscellaneous materials deliveries is assumed to be five one-way trips per month, with each one-way trip covering a distance of 50 miles.

Vehicle emission factors based on the vehicle fleet mix for Contra Costa County are required to estimate emissions. Vehicle emission factors are summarized in Table 50-1. The worker fleet is assumed to be 50 percent LDA and 50 percent LDT. The material delivery truck fleet is assumed to consist only of heavy-heavy duty trucks.

Vehicle emission factors from Table 50-1 were used along with the mileage estimates to estimate emissions. GHG emission estimates for the plant personnel commute and delivery of materials for operations is provided in Table 50-2. Appendix C provides backup for these calculations.

Table 50-1
Vehicle Emission Factors for Greenhouse Gases and Criteria Pollutants for Contra Costa County

Vehicle Description	CO (tpd)	CO_2 (tpd)	CH_4 (tpd)	N_2O (tpd)	NO_X (tpd)	PM_{10} (tpd)	$PM_{2.5}$ (tpd)	SO_2 (tpd)	VOC (tpd)
Light-Duty Automobile (LDA)	50.32	6,030	0.47	0.74	4.32	0.50	0.29	0.06	5.33
Light-Duty Truck (LDT)	48.18	5,020	0.41	0.77	5.23	0.45	0.30	0.05	4.75
Heavy-Heavy Duty Diesel Truck	4.04	880	0.03	0.02	7.02	0.27	0.23	0.01	0.64

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
N_2O = nitrous oxide
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns
$PM_{2.5}$ = particulate matter less than 2.5 microns
SO_2 = sulfur dioxide
tpd = tons per day
VOC = volatile organic compounds

Notes:

[1] Emission factors are based on results from EMFAC Emissions Model 2007 Version 2.3 (BURDEN output). The values are the projected values for the LDA and LDT (Both Class I and II) vehicles within Costa Contra County in 2009. Emission factors in lbs/mile are calculated by dividing emission factor (tpy) by vehicle miles traveled from EMFAC2007.

[2] N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.3 (March 2007), Table C.5, using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

Table 50-2
Greenhouse Gas and Criteria Pollutant Emissions from Worker Commutes and Deliveries during Operations Phase

Activity	Distance Traveled per year (miles)	CO (tpy)	CO_2 (tpy)	CH_4 (tpy)	N_2O (tpy)	NO_X (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	VOC (tpy)
Plant Personnel Commute	306,851	1.37	151	0.01	0.02	0.14	0.01	0.01	1.51E-03	0.14
Material Delivery	33,402	0.31	68	2.31E-03	1.84E-03	0.54	0.02	0.02	7.70E-04	0.05
Total Average Annual (tpy)		**1.68**	**219**	**0.01**	**0.02**	**0.68**	**0.03**	**0.03**	**2.28E-03**	**0.19**

CH_4 = methane
CO = carbon monoxide
CO_2 = carbon dioxide
N_2O = nitrous oxide
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns
$PM_{2.5}$ = particulate matter less than 2.5 microns
SO_2 = sulfur dioxide
tpd = tons per day
VOC = volatile organic compounds

BACKGROUND

Fire Pump or Emergency Generator

The AFC does not mention whether a fire pump or an emergency generator is proposed for the project.

DATA REQUEST

51. Please confirm whether a fire pump or an emergency generator would be needed for the project.

RESPONSE

The WPGS will not include a fire pump or an emergency diesel generator.

As explained on page 2-18 of the AFC, the existing Pittsburg Power Plant (PPP) fire pumps will be used to discharge to the new WPGS dedicated extension of the existing underground firewater loop system. AFC Figure 2.5-6 shows the proposed WPGS firewater loop that connects to the existing PPP system. The WPGS is not anticipated to result in nonemergency increase in the use of the PPP fire pumps. [Note: AFC Table 2.7-2 incorrectly lists a fire pump skid. This was an oversight. There is no new fire pump or fire pump skid.]

DATA REQUEST

52. If either a fire pump or the emergency generator is needed, please provide their manufacturer's specifications and their respective operating schedule and emissions estimated.

RESPONSE

Please see the response to Data Request 51. No manufacturer's specifications or other data are included because no new diesel fire pumps or diesel emergency generators are proposed for this project.

BACKGROUND

Estimated Facility Emissions

In AFC Section 7.1.2.2, operational emissions are described with assumptions and explanations of calculations. Emissions for worst-case scenarios are summarized in AFC Table 7.1-16 without total emissions per period for all pollutants. However, without calculations and assumptions that lead to facility-wide emission rates, staff does not have complete information supporting the facility's emissions in AFC Table 7.1-16. Similarly, there is no vendor information supporting the proposed startup and shutdown emission rates shown in AFC Table 7.1-14 and Table 7.1-23. The AFC is not clear on whether multiple startup and shutdown events could occur during the worst-case hour.

DATA REQUEST

53. Please provide calculations, assumptions, and methods used to estimate the total facility hourly and daily emissions provided in AFC Table 7.1-16, showing all sources and pollutants.

RESPONSE

Assumptions for the hourly, daily, and annual emission rates for pollutants and sources are provided in the "Worst-Case Emission Scenario by Operating Equipment" column in AFC Table 7.1-16 for the combinations of pollutants and averaging times required for modeling purposes for the WPGS. Further information on all emissions is provided in Tables 53-1 and 53-2, which include emission estimates by source and the WPGS total for the hourly and daily time periods, respectively. The operating assumptions used in these calculations are shown in footnotes to the tables and are consistent with those in AFC Table 7.1-16 and AFC Appendix J4, except for revised estimates of the maximum hourly emissions operating scenario. The maximum hourly emission estimates for the Flex Plant 10 (FP10) units were revised to include more starts during the worst-case hour, as discussed in more detail in the response to Data Request 54 below.

Table 53-1
Maximum Hourly Emissions for All Sources

Pollutant[1]	FP10 Units (lb/hr/CT)	Fuel Gas Preheater[2] (lb/hr/unit)	WPGS Total[3] (lb/hr)
NO_X	68.6	0.15	137.4
CO	677.3	0.18	1,355
VOC	33.6	0.01	67.2
SO_2 (1 gr/100 scf)	6.7	0.01	13.4
PM_{10}	12.1	0.01	24.2

CO = carbon monoxide
gr = grain
lb/hr = pounds per hour
lb/hr/CT = pounds per hour per combustion turbine
lb/hr/unit = pounds per hour per unit
NO_X = nitrogen oxide
PM_{10} = particulate matter less than 10 micrometers in diameter
scf = standard cubic foot
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Notes:
1 Maximum hourly emissions for all pollutants for FP10 Units are based on two startups, one shutdown, and the remaining time in the hour at normal operating rate. See the response to Data Request 55 for more details on startups.
2 There is one Fuel Gas Preheater. The preheater has a maximum heat input capacity of 5 million British thermal units per hour.
3 WPGS total emissions are based on emissions from two FP10 Units, and one Fuel Gas Preheater.

Table 53-2
Maximum Daily Emissions for All Sources

Pollutant	FP10 Units[1,2] (lb/day/CT)	Fuel Gas Preheater[3] (lb/day)	WPGS Total[4] (lb/day)
NO_X	507.0	3.6	1,017.6
CO	1,574.1	4.1	3,152
VOC	196.6	0.3	393.5
SO_2 (1 gr/100 scf)	154.3	0.3	308.9
PM_{10}	243.0	0.3	486.3

CO = carbon monoxide
gr = grain
lb/day = pounds per day
lb/day/CT = pounds per day per combustion turbine
lb/day/unit = pounds per day per unit
NO_X = nitrogen oxide
PM_{10} = particulate matter less than 10 micrometers in diameter
scf = standard cubic foot
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Notes:

[1] Maximum daily emissions for all pollutants except SO_2 for FP10 Units are based on three startups, three shutdowns, and the remaining time in 24 hours at normal operating rate.

[2] Maximum daily emissions for SO_2 for FP10 Units are based on normal operating conditions over 24 hours.

[3] There is one Fuel Gas Preheater. The preheater has a maximum heat input capacity of 5 million British thermal units per hour. Daily worst case scenario assumes the preheater is operating over 24 hours.

[4] WPGS total emissions are based on emissions from two FP10 Units, and one Fuel Gas Preheater.

DATA REQUEST

54. Please provide vendor guarantees to support the proposed startup and shutdown emissions values listed in AFC Table 7.1-14 and Table 7.1-23 and cited in Appendix J4.

RESPONSE

Estimated startup and shutdown times and the emissions during startup and shutdown were provided by Siemens, the gas turbine manufacturer for the WPGS. These data are approximate and are not guaranteed by Siemens. Copies of the information provided by Siemens for the FP10 units are included in Appendix D and were the source of the information provided in AFC Tables 7.1-14 and 7.1-23. Originally this information was labeled as proprietary; however, Siemens has now authorized the release of this information, which is summarized in Table 54-1. FP10 emissions data presented in the WPGS application for Authority to Construct (ATC) and Permit to Operate (PTO) submitted to the Bay Area Air Quality Management District (BAAQMD) is consistent with the information provided by Siemens (the only difference is the number of significant digits shown). The application used the emissions corresponding to the 41 degree Fahrenheit case, which were provided by Siemens, as seen in Table 54-1 and in Appendix D, because emissions are higher in that case.

The applicant requests that the Conditions of Certification *not* limit the durations of startup and shutdown events. The longest estimated durations are summarized in the AFC and in Table 54-1.

This response provides a revision of the maximum hourly emissions for both the FP10 units to account for the possibility of multiple turbine startup events during an hour. The revised data are provided in Table 54-2. The maximum hourly emissions are now based on one startup, one shutdown, a second startup, and the remainder of the hour at full load emissions all occurring within the same clock hour. This is considered as a more conservative but potentially realistic operating scenario, taking into account a unit trip during the first start and a subsequent re-start immediately thereafter.

Please note that the startup time used here reflects the time from ignition to 100 percent load. The shutdown time reflects the time from 100 percent load to full speed-no load (FSNL) without any cool down at FSNL. Siemens has provided mass emission estimates that include all emissions during the expected 12-minute startup plus the next 10 minutes of operation. The maximum 1-hour emissions for a turbine startup were represented very conservatively in the AFC and in the ATC application to the BAAQMD. Even though startup duration is conservatively estimated to take no longer than 22 minutes in the AFC, URS included all of those emissions as if they occur within a 12-minute period, as expected by Siemens.

Because of this conservatism it is acceptable to the applicant to include a condition on the maximum mass pollutant emission rates during an hour. See the response to Data Request 55.

Table 54-1
Total Estimated Startup and Shutdown Emissions:
SGT6-5000F in Flex Plant 10 Combined Cycle
Operation on Natural Gas at 62 °F and 41 °F

Mode	Approximate Time (minutes)	Total Emissions per Event (lbs)				Fuel Usage (lbs)
		NO_X	CO	VOC	PM	
Startup on Natural Gas at 62 °F	12	24	259	12	3	23,029
Shutdown on Natural Gas at 62 °F	7	10	131	5	1	6,239
Startup on Natural Gas at 41 °F	12	25	267	13	3	24,173
Shutdown on Natural Gas at 41 °F	7	10	135	5	1	6,525

CO = carbon monoxide
°F = degrees Fahrenheit
lbs = pounds
NO_X = nitrogen oxides
PM = particulate matter
VOC = volatile organic compounds

General Notes

1. All data is ESTIMATED, NOT guaranteed, and is for ONE FP10 unit.
2. Gas fuel must be in compliance with Siemens fuel specifications.
3. Emissions are at the heat recovery steam generator exhaust stack outlet and exclude ambient air contributions.
4. Emissions are based on new and clean conditions.
5. Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only. Such information is not intended to be used for evaluation of plant design and/or performance relative to contractual commitments. Data included in any permit application or Environmental Impact Statement is strictly the customer's responsibility. Siemens is available to review permit application data upon request.

Startup Emissions Notes

1. Estimated startup (SU) data are from gas turbine (GT) ignition through 100% GT load plus 10 minutes
2. Estimated SU and shutdown (SD) data are based on the assumed times noted above and will be higher for longer times.
3. Estimated SU and SD data are based on the ambient temperatures noted above and will be higher at lower ambient temperatures.
4. NO_X emissions assume selective catalytic reduction is not in operation (no removal).
5. CO emissions assume 20% removal from ignition to 100% GT load and 90% removal from 100% GT load on.
6. SU assumes 5 minutes from turning gear to synchronization.
7. SD assumes 100% load to FSNL with no cool-down at FSNL.
8. Operator actions do not extend startup or shutdown.
9. It is assumed that there is no restriction from the interconnected utility for loading the GT from synchronization to 100% load within the SU times considered.

Table 54-2
Criteria Pollutant Emission Rates during Startup and Shutdown

Pollutant	FP10 Units		
	Maximum hourly (lb/hr)	Individual Startup (12 min)	Individual Shutdown (7 min)
		Total Emissions (lb/event)	Total Emissions (lb/event)
NO_X (2.0 or 2.5 ppm)	68.6	24.8	10.5
CO (3 ppm)	677.3	267.1	135.4
VOC (2 ppm)	33.6	12.7	5.2
SO_2 (0.4 gr/100 scf)	2.7	0.6	0.2
SO_2 (1 gr/100 scf)	6.7	1.6	0.4
PM_{10}	12.1	3.1	1.1

CO = carbon monoxide
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns in diameter
ppm = parts per million
SD = shutdown
SO_2 = sulfur dioxide
SU = startup
VOC = volatile organic compounds

Notes:

Startup/shutdown duration defined as operation of CTG below 60 percent load for the FP10s when gaseous emission rates (lb/hr basis) exceed the controlled rates defined as normal operation.

Startup and shutdown SO_2 emissions are calculated based on the total amount of fuel used and the emission rate of SO_2 at a winter extreme of 20°F; 100% load.

Maximum hourly emissions assume two startups, one shutdown, and the remainder of the hour at maximum normal operating rate.

DATA REQUEST

55. Please describe whether the worst-case hour of operation could involve multiple startup and shutdown events and whether a condition limiting operation to one startup per hour would be acceptable.

RESPONSE

A condition limiting operation to one startup per hour would not be acceptable. As stated in the response to Data Request 54, a potentially realistic scenario may occur when maximum hourly emissions reflect two startups and one shutdown, with the remaining part of the hour at full load emissions. See the response to Data Request 54 for more information on startup and shutdown emissions.

New American Meteorological Society and Environmental Protection Agency preferred atmospheric dispersion model (AERMOD) modeling was conducted to assess maximum potential impacts from incorporating additional startups and shutdowns in a given hour. The results of this modeling are included in this response. Consistent with the WPGS AFC, stack parameters were set to a reduced stack exhaust velocity and temperature for the startup/ shutdown modeling analyses. Table 53-1 presented the maximum hourly emissions for NO_X and CO, including two startups and one shutdown per turbine. These emission rates were used in modeling maximum impacts due to turbine startup and shutdown conditions. Modeling results are provided in Table 55-1. Modeling input and output files are included on a CD provided as Appendix E.

Table 55-1
AERMOD Modeling Results for Pollutants
with Revised Maximum Hourly Emission Rates[1]
(All Project Sources Combined)

Pollutant	Averaging Period	Maximum Predicted Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)[2]	Total Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	Maximum UTMX NAD27 (m)	Maximum UTMY NAD27 (m)
NO_2	1 hour[3]	168.1	109.04	277.1	NA	339	593,750	4,206,725
CO	1 hour	1,746	3,762	5,508	40,000	23,000	593,750	4,206,725

AERMOD = American Meteorological Society and Environmental Protection Agency preferred atmospheric dispersion model
CAAQS = California ambient air quality standard
CO = carbon monoxide
m = meters
$\mu g/m^3$ = micrograms per cubic meter
NAAQS = national ambient air quality standard
NO_2 = nitrogen dioxide

Notes:

1 Pollutants having AAQSs of 1 hour whose maximum hourly emissions rate increased.
2 Background represents the maximum values measured at the monitoring stations
3 Results for NO_2 during operations used ozone limiting method with ambient ozone data collected at the Pittsburg monitoring station for the years 2002 through 2005

BACKGROUND

Dispersion Modeling

The applicant submitted updated dispersion modeling files to the Energy Commission in October 2008 in response to the BAAQMD comments. Staff has not yet reviewed these files. Of particular concern would be adherence to BAAQMD recommendations for meteorological data. Staff may develop additional data requests upon review of the new modeling files.

DATA REQUEST

56. Please provide documentation (such as a copy of the BAAQMD comments, a Report of Conversation, or email correspondence with BAAQMD staff) that confirms that the October 2008 dispersion modeling was completed to the satisfaction of the BAAQMD.

RESPONSE

Per a conversion with Ted Hull of BAAQMD on December 17, 2008, the applicant has been informed that any final modeling requests from BAAQMD are to be expected in January 2009 (Hull, 2008). Furthermore, Mirant Willow Pass understands that that the BAAQMD's Preliminary Determination of Compliance (PDOC) for the WPGS will include the confirmation that the dispersion modeling has been completed to the satisfaction of the BAAQMD. Based on the comments of BAAQMD staff at the December 19, 2008 workshop, the PDOC is expected to be issued for public review in February 2009.

Reference

Hull, Ted, 2008. Personal communication between Ted Hull, Bay Area Air Quality Management District, and John Lague, URS Corporation. December 17.

BACKGROUND

Cumulative Modeling Analysis

AFC Section 7.1.3 describes a cumulative modeling impact assessment that has not yet been filed with the Energy Commission.

DATA REQUEST

57. Please provide the analysis of cumulative air quality impacts and ensure that the existing Pittsburg Power Plant Units 5, 6, and 7 and the proposed Marsh Landing Generating Station are included.

RESPONSE

As required by California Energy Commission policy, a dispersion modeling analysis has been conducted to evaluate the maximum cumulative air quality effects of WPGS, the Marsh Landing Generating Station (MLGS), and other sources within 6 miles of either site. Because the WPGS and the MLGS projects are separated by only slightly more than 6 miles, CEC requested that the cumulative analysis for either of these projects include emissions from both plants. Accordingly, emissions from MLGS are included in the WPGS cumulative modeling, as well as emissions from other sources within 6 miles of either the MLGS or WPGS facility that have not yet begun operation and are either under construction, or currently in the permitting process.

In order to facilitate the cumulative impact analysis, staff at the BAAQMD were contacted to obtain a list of permitted emission sources within 6 miles of the two Mirant plant sites. The listed sources with emissions and stack parameters, including the proposed MLGS and WPGS projects, are presented in Table 57-1. The same emissions and screening stack parameters that were used for MLGS and WPGS in each respective revised AFC section were also used in cumulative modeling. Because ABA Energy Corporation's exempt heater has criteria pollutant emissions of less than 1 ton/year, this source was not included in the cumulative analysis. Sources that only emit volatile organic compounds (VOCs) were not included in cumulative modeling analysis because there are no ambient air quality standards for VOCs.

Cumulative modeling with AERMOD used the same 5-year record of hourly meteorological input data from the onsite Contra Costa Power Plant meteorological station that was used in the modeling for the MLGS ATC/PTO application revision (October 3, 2008). The ozone limiting method was applied to nitrogen dioxide modeling using Bethel Island Road monitoring station data for the same years as the meteorological data. The meteorological data and the ozone data closer to MLGS are more appropriate for this dual analysis than the corresponding set of data closer to WPGS because the combined emissions of the MLGS and other sources in the vicinity of MLGS, including the Contra Costa Power Plant and the Gateway Generating Station, are much larger than the expected emissions from WPGS and other sources in the vicinity of WPGS. Receptors spaced 25 meters apart were placed along the CCPP and PPP fencelines out to 100 meters. Beyond 100 meters from either fenceline, 100-meter, 500-meter, and 1,000-meter spaced receptors were generated out to 10 kilometers. Similar to the analysis presented in the AFC, tighter grids of receptors were used for the hills to the south of WPGS and southeast of MLGS.

Maximum concentrations due to the combined emissions of the eight additional facilities and proposed MLGS and WPGS power generation facilities were calculated and the results were added to conservative background pollutant concentrations reported in the MLGS AFC. The

results are presented in Table 57-2. Results of modeling are included on a CD provided as Appendix E.

Maximum concentrations for all pollutants except PM-annual are caused almost entirely by emissions from internal combustion engines at the Ameresco Keller Canyon facility, which is located south of the PPP. Maximum concentrations occur several hundred meters south of the Ameresco Keller Canyon sources, in the hills south of West Leland Drive in Pittsburg, CA. The maximum concentration for PM-annual is caused almost entirely by emissions from the United Spiral Pipe LLC Manufacturing Plant, the maximum impact occurring a few hundred meters south of the United Spiral Pipe sources.

As demonstrated by these results, maximum predicted concentrations for all pollutants are below applicable ambient standards, except for particulate matter less than 10 microns and particulate matter less than 2.5 microns, whose maximum background concentrations alone exceed the state and federal standards. However, the maximum contributions from the modeled facilities are relatively small. Based on these results it is concluded that the combined effects of the MLGS, WPGS, and other cumulative sources close to the Mirant sites will be below a level of significance.

Table 57-1
Cumulative Sources for Mirant Marsh Landing Generating Station and Mirant Willow Pass Generating Station

Source Name	Address	Type of Source	Distance to Willow Pass Generating Station (miles)	Distance to Marsh Landing Generating Station (miles)	Emissions (tons/yr)					Stack Parameters				UTM Coordinates NAD83 Zone 10		Notes
					VOC	NO_X	SO_X	CO	PM_{10}	Diameter (m)	Height (m)	Exit velocity (m/s)	Temp (K)	Easting (km)	Northing (km)	
Calpine Natural Gas	South End of Nichols Road Bay Point, CA 94565	Calpine Natural Gas Ryer Island Station – 70 Barrel Water/ Condensate Storage Tank	5.13	12.20	1.39	0.162	0	0.041	0.004	0.05	3.66	1.94	295.9	588.848	4,210.009	Emissions and stack parameters provided by BAAQMD
Silgan Containers Manufacturing Corporation	2200 Wilbur Avenue, Antioch, CA 94509	Silgan Containers Mfg Corp Thermal Oxidizer Modification	6.12	1.28	0	1.922	0.006	7.688	0.072	0.65	14.63	8.80	616.5	606.519	4,207.724	Emissions and stack parameters provided by BAAQMD
Ameresco Keller Canyon LLC	901 Bailey Road, Pittsburg, CA 94565	Ameresco Keller Canyon LLC 2 LFG-Fired Inter-nal Combustion Engines	3.19	9.67	9.64	31.02	8.637	95	5.17	0.51	10.67	40.68	740.4	592.879	4,207.727	Emissions and stack parameters provided by BAAQMD
		Ameresco Keller Canyon LLC TSA Waste Gas Flare	3.19	9.67	0.603	2.168	1.805	20.796	1.212	1.52	9.14	4.57	1144.3	592.879	4,207.727	Emissions and stack parameters provided by BAAQMD
United Spiral Pipe LLC Manufacturing Plant	900 E 3rd Street, Pittsburg, CA 94565	United Spiral Pipe LLC Manufacturing Plant welding, cleaning, misc.	1.44	5.80	4.584	0	0	0	4.781	0.26	12.19	73.89	294.3	599.200	4,209.700	Emissions and stack parameters provided by BAAQMD
Freedom High School	1050 Neroly Road Oakley, CA 94561	Freedom High School Generator set	10.41	3.98	1.67	1.67	0	1.67	0.083	0.08	3.66	21.03	416.5	612.095	4,203.127	Emissions and stack parameters provided by BAAQMD
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS Natural Gas FP10 Turbine 1	7.11	0.07	14.23	38.552	5.261	71.186	19.7	6.50	45.87	18.78	440.4	608.34	4,208.436	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS Natural Gas FP10 Turbine 2	7.17	0.02	14.23	38.552	5.261	71.186	19.7	6.50	45.87	18.78	440.4	608.439	4,208.439	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS Natural Gas Simple Cycle Turbine 1	7.23	0.05	3.01	9.115	0.972	23.379	3.495	9.55	45.87	11.35	672.0	608.538	4,208.442	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008

Table 57-1
Cumulative Sources for Mirant Marsh Landing Generating Station and Mirant Willow Pass Generating Station (Continued)

Source Name	Address	Type of Source	Distance to Willow Pass Generating Station (miles)	Distance to Marsh Landing Generating Station (miles)	Emissions (tons/yr)					Stack Parameters				UTM Coordinates NAD83 Zone 10		Notes
					VOC	NO_X	SO_X	CO	PM_{10}	Diameter (m)	Height (m)	Exit velocity (m/s)	Temp (K)	Easting (km)	Northing (km)	
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS Natural Gas Simple Cycle Turbine 2	7.29	0.11	3.01	9.115	0.972	23.379	3.495	9.55	45.87	11.35	672.0	608.638	4,208.444	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS FP10 Natural Gas Preheater 1	7.15	0.06	0.03	0.329	0.013	0.376	0.032	0.20	7.93	15.27	486.3	608.422	4,208.506	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008
Marsh Landing Generating Station	3201 Wilbur Avenue Antioch, CA 94509	MLGS Simple Cycle Natural Gas Preheater 2	7.15	0.06	0.006	0.066	0.003	0.075	0.0065	0.20	7.93	15.27	486.3	608.422	4,208.509	Emissions from Application for Certification for Marsh Landing Generating Station, Volume 2, Appendix J3, May 2008
Contra Costa Power Plant	3201 Wilbur Avenue, Antioch, CA 94509	CCPP Natural Gas Boiler 9 and 10 Stack Units 6 and 7	7.39	0.24	18.966	21.043	1.086	144.83	13.104	5.70	137.16	28.70	411.0	608.825	4,208.561	Emissions from 2005-2007 CEMS data
Gateway Generating Station	3223 Wilbur Avenue, Antioch, CA 94509	Gateway Natural Gas Boiler A	7.44	0.27	23.3	87.15	18.5	277.15	50.85	5.11	59.44	19.92	355.2	608.9	4,208.454	From BAAQMD Engineering Evaluation For Proposed Amended Authority to Construct and Draft PSD Permit, June 2008.
Gateway Generating Station	3223 Wilbur Avenue, Antioch, CA 94509	Gateway Natural Gas Boiler B	7.45	0.27	23.3	87.15	18.5	277.15	50.85	5.11	59.44	19.92	355.2	608.9	4,208.413	From BAAQMD Engineering Evaluation For Proposed Amended Authority to Construct and Draft PSD Permit, June 2008.
Willow Pass Generating Station	696 West 10th Street, Pittsburg, CA, 94565	WPGS Natural Gas FP10 Turbine 1	0.04	7.19	14.23	38.552	5.261	71.186	19.7	6.50	45.87	21.49	449.8	597.091	4,210.737	Emissions from Application for Certification for Willow Pass Generating Station, Volume 2, Appendix J4, June 2008
Willow Pass Generating Station	696 West 10th Street, Pittsburg, CA, 94565	WPGS Natural Gas FP10 Turbine 2	0.06	7.13	14.23	38.552	5.261	71.186	19.7	6.50	45.87	21.49	449.8	597.186	4,210.709	Emissions from Application for Certification for Willow Pass Generating Station, Volume 2, Appendix J4, June 2008
Willow Pass Generating Station	696 West 10th Street, Pittsburg, CA, 94565	WPGS FP10 Natural Gas Preheater 1	0.12	7.30	0.03	0.329	0.013	0.376	0.032	0.20	7.93	15.27	486.3	596.909	4,210.665	Emissions from Application for Certification for Willow Pass Generating Station, Volume 2, Appendix J4, June 2008
Pittsburg Power Plant	696 West 10th Street, Pittsburg, CA 94565	PPP Natural Gas Boiler 5	0.12	7.26	20.438	17.558	1.171	156.07	14.121	4.18	137.16	32.64	403.0	597.003	4,210.849	Emissions from 2005-2007 CEMS data

Table 57-1
Cumulative Sources for Mirant Marsh Landing Generating Station and Mirant Willow Pass Generating Station (Continued)

Source Name	Address	Type of Source	Distance to Willow Pass Generating Station (miles)	Distance to Marsh Landing Generating Station (miles)	Emissions (tons/yr)					Stack Parameters				UTM Coordinates NAD83 Zone 10		Notes
					VOC	NO_X	SO_X	CO	PM_{10}	Diameter (m)	Height (m)	Exit velocity (m/s)	Temp (K)	Easting (km)	Northing (km)	
Pittsburg Power Plant	696 West 10th Street, Pittsburg, CA 94565	PPP Natural Gas Boiler 6	0.14	7.28	11.803	11.266	0.676	90.129	8.1546	4.18	137.16	32.64	403.0	596.974	4,210.856	Emissions from 2005-2007 CEMS data
Pittsburg Power Plant	696 West 10th Street, Pittsburg, CA 94565	PPP Natural Gas Boiler 7	0.15	7.33	7.3935	11.292	0.4234	56.46	5.1083	6.10	137.16	25.00	398.0	596.862	4,210.726	Emissions from 2005-2007 CEMS data

Table 57-2
AERMOD Cumulative Impact Modeling Result

Pollutant	Averaging Period	Maximum Modeled Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)[1]	Maximum Total Predicted Concentration ($\mu g/m^3$)	Most Stringent AAQS ($\mu g/m^3$)	UTM Coordinates NAD27	
						East (m)	North (m)
CO	1 hour	403.34	4,715	5,118	23,000	593,500	4,207,000
	8 hour	259.31	2,222	2,481	10,000	593,500	4,206,800
NO_2	1 hour[2]	104.59	122.1	227	339	592,250	4,207,000
	Annual[2]	2.73	22.4	25	57	593,525	4,207,000
PM_{10}	24 hour[3,4]	6.48	84	90	50	593,500	4,206,800
	Annual[3,4]	0.70	22	23	20	599,500	4,209,500
$PM_{2.5}$	24 hour[3,4]	6.48	74	80	35	593,500	4,206,800
	Annual[3,4]	0.70	12	13	12	599,500	4,209,500
SO_2	1 hour	36.40	235.8	272	655	593,500	4,207,000
	3 hour	26.75	114.4	141	1,300	593,500	4,206,800
	24 hour	10.57	26.3	37	105	593,500	4,206,800
	Annual	0.86	5.3	1	80	593,525	4,207,000

AAQS = ambient air quality standard
AERMOD = American Meteorological Society and Environmental Protection Agency preferred atmospheric dispersion model
CO = carbon monoxide
m = meters
$\mu g/m^3$ = micrograms per cubic meter
NO_2 = nitrogen dioxide
PM_{10} = particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter. All PM emissions during operation were assumed to be $PM_{2.5}$
SO_2 = sulfur dioxide
UTM = Universal Transverse Mercator

[1] Background represents the maximum values measured at the monitoring stations in Marsh Landing AFC
[2] Results for NO_2 used ozone limiting method with ambient ozone data collected at Bethel Island monitoring station for the years 2000-2002 and 2004-2005
[3] PM_{10} and $PM_{2.5}$ background levels exceed ambient standards.
[4] All PM_{10} emissions from project sources were also considered to be $PM_{2.5}$.

APPENDIX A

WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS

Appendix A
WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS - SUMMARY

Pittsburg, California

Construction Emissions tons/yr	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Workers Commute	15.24	1407.10	0.08	0.20	1.52	0.12	0.07	0.01	1.53
Material Delivery	0.24	43.88	2.02E-03	1.20E-03	0.42	1.61E-02	1.41E-02	5.04E-04	0.04
Rail Delivery	0.00	1.16	3.44E-05	1.15E-05	0.02	6.77E-04	6.23E-04	1.14E-05	1.11E-03
Total	**15.48**	**1452.13**	**0.08**	**0.20**	**1.96**	**0.14**	**0.09**	**0.01**	**1.56**

Note:
[1] Assuming ROGs are equivalent to VOCs

Appendix A
WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS - WORKER VEHICLE EXHAUST

Pittsburg, California

Transportation Information		**Comment**
- Average Number of Construction Workers (per month) =	213	- Information Provided By Applicant
- Average Miles Per Trip (1-way) =	16.8	- URBEMIS2007 default values for Contra Costa County
- Trips Per Month Per Worker =	66.44	- Assumes 22 working days per month and 3.02 one-way trips per day. The trip rate is based on URBEMIS2007 value for General Light Industry
- Total Miles Per Month =	237,355	- Worst-case scenario; each worker drives his own car.
- Total Miles Per Year =	2,848,259	

DATA FROM EMFAC2007

		Tons Per Day								
Vehicle Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Light Duty Automobile (LDA)	13,268,000	61.54	5880.00	0.56	--	5.32	0.48	0.28	0.06	6.59
Light Duty Trucks (LDT)	9,048,000	54.84	4930.00	0.45	--	6.01	0.44	0.28	0.05	5.20

Note:
- Emission factors for on-road vehicles are based on results from Emfac Emissions Model 2007 Version 2.3 (BURDEN output). The values are the projected values for the LDA and LDT (Both Class I and II) vehicles within Costa Contra County in 2009. PM_{10} and PM2.5 values include brake wear and tire wear.
- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).
- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.5 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Vehicle Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Light Duty Automobile (LDA)	9.28E-03	8.86E-01	8.44E-06	1.08E-04	8.02E-04	7.24E-05	4.22E-05	9.04E-06	9.93E-04
Light Duty Trucks (LDT)	1.21E-02	1.09E+00	9.95E-05	1.68E-04	1.33E-03	9.73E-05	6.19E-05	1.11E-05	1.15E-03
Fleet Average Emission Factor	**1.07E-02**	**9.88E-01**	**5.40E-05**	**1.38E-04**	**1.07E-03**	**8.48E-05**	**5.20E-05**	**1.00E-05**	**1.07E-03**

Note:
- The values are based on above tons/day and miles traveled. The average emission factor is based on the assumption from URBEMIS2007 that the worker vehicle fleet mix will consist of 50% LDA and 50% LDT.

WORKER VEHICLE EMISSIONS - CONSTRUCTION

	Tons Emitted Per Year								
	CO	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Worker Vehicle Fleet Mix	15.2	1,407.1	0.1	0.2	1.5	0.1	0.1	0.0	1.5

Note:
[1] Assuming ROGs are equivalent to VOCs

Appendix A

WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS - CONSTRUCTION MATERIAL TRUCK DELIVERY

Pittsburg, California

Transportation Information		**Comment**
- No. of Vehicle Trips =	29	- Information provided by applicant in AFC table 2.7-2
- Average Miles Per Trip (1-way) =	31.23	- Distance to transport construction material from Port of Stockton to Project Site
- Total Miles Per Year =	21,736	- Worst case scenario calculated from average miles per trip, max. no. of vehicle trips per month

DATA FROM EMFAC2007

		Tons Per Day								
Equipment Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	431,000	4.75	870.00	0.04	0.02	8.40	0.32	0.28	0.01	0.74

Note:

- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT vehicles within Contra Costa County in the respective year. PM10 and PM2.5 values include break wear and tire wear.

- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).

- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck 2007	2.20E-02	4.04E+00	1.86E-04	1.10E-04	3.90E-02	1.48E-03	1.30E-03	4.64E-05	3.43E-03

Note:

- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile
ER = Emission Rate in tons per day
VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

CONSTRUCTION DELIVERY TRUCK EMISSIONS

	Tons Emitted Per Year								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	0.24	43.88	2.02E-03	1.20E-03	0.42	1.61E-02	1.41E-02	5.04E-04	0.04

Note:

- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year
EF= emission factor in pounds per mile
D = Distance traveled by trucks to the project site in miles per year.

[1] Assuming ROGs are equivalent to VOCs

Appendix A
WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS - CONSTRUCTION MATERIAL RAIL DELIVERY

Pittsburg, California

Assumptions

Average Round Trip Distance Traveled per Locomotive =	209	miles/locomotive

Reference: National Transportation Statistics for Locomotives, 2008 (http://www.bts.gov/publications/national_transportation_statistics)

Rail-cars per Locomotive =	62	rail-cars
Average Miles Traveled Per Locomotive =	69,900	miles/yr
Average Fuel Consumed Per Locomotive =	176,600	gallon/yr
Locomotive Fuel Efficiency =	0.13	mile/gal

Calculations For Locomotives in Motion

Reference: EPA's Technical Highlights: Emission Factors for Locomotives , 1997

EMISSION FACTORS (g/gal, except SOx)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
2012	27.4	10084.0	0.30	0.10	158.5	5.6	5.152	15.0	8.9
2011	27.4	10084.0	0.30	0.10	161.0	5.7	5.2	15.0	9.1
2010	27.4	10084.0	0.30	0.10	163.0	5.7	5.2	15.0	9.1
2009	27.4	10084.0	0.30	0.10	168.3	5.9	5.4	15.0	9.4

Note:

- $PM_{2.5}$ emission factors were determined by multiplying PM_{10} numbers by a "$PM_{2.5}$ fraction of PM_{10}" value. Fractional values for $PM_{2.5}$ were taken from the SCAQMD guidance: Final - Methodology to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds, October
  - $PM_{2.5}$ Fraction of PM_{10}, Train: 0.92
- California state regulation requires intrastate diesel-electric locomotives that operate 90 percent of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel.
- Per EPA's Emission Facts <http://www.epa.gov/otaq/climate/420f05001.pdf>, CO_2 emissions from a gallon of diesel fuel are 10,084 g/gal diesel.
- CH_4 and N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Sector and Fuel Type).

Calculations

# of Locomotives (Incremental) =	2	per year
# of Rail Cars =	2	per locomotive
Locomotive Fuel Efficiency =	0.13	mile/gal
Total Locomotive Distance Traveled =	418	mile/year
Locomotive Fuel Consumption =	3,215	gal/year
Average Density of Locomotive Diesel (taken from msds) =	7.32	lb/gallon
Total Weight of Locomotive Fuel =	23,524.78	lb/yr

MOBILE MASS EMISSION (tons/year)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
2012	0.10	35.74	1.06E-03	3.54E-04	0.56	0.02	0.02	3.52E-04	0.03
2011	0.10	35.74	1.06E-03	3.54E-04	0.57	0.02	0.02	3.52E-04	0.03
2010	0.10	35.74	1.06E-03	3.54E-04	0.58	0.02	0.02	3.52E-04	0.03
2009	0.10	35.74	1.06E-03	3.54E-04	0.60	0.02	0.02	3.52E-04	0.03

Appendix A
WILLOW PASS GENERATING STATION CONSTRUCTION EMISSIONS CALCULATIONS - CONSTRUCTION MATERIAL RAIL DELIVERY

Pittsburg, California

Calculations For Locomotives in Idle Mode

References: NOX and PM10 Emission Factors from EPA's Technical Highlights: Guidance for Quantifying and Using Long Duration Switch Yard Locomotive Idling Emission Reductions in State Implementation Plans, January 2004. ROG and CO Emission Factors from Sierra Research Group: Development of Railroad Emissions Methodology Development, June 2004

EMISSION FACTORS (g/hr, except SOx)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
NA	492	40336	1.20E+00	4.00E-01	620	32	29	15	478

Note:

- $PM_{2.5}$ emission factors were determined by multiplying PM_{10} numbers by a "$PM_{2.5}$ fraction of PM_{10}" value. Fractional values for $PM_{2.5}$ were taken from the SCAQMD guidance: Final - Methodology to Calculate $PM_{2.5}$ and $PM_{2.5}$ Significance Thresholds, October
  - $PM_{2.5}$ Fraction of PM_{10}, Train: 0.92
- California state regulation requires intrastate diesel-electric locomotives that operate 90 percent of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel.
- Per EPA's Emission Facts <http://www.epa.gov/otaq/climate/420f05001.pdf>, CO_2 emissions from a gallon of diesel fuel are 10,084 g/gal diesel. This factor was multiplied by fuel consumed per idle hour to get a factor in units of gal/hr
- CH_4 and N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.6 (Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Sector and Fuel Type). The CH_4 and N_2O emission factors are multiplied by the fuel consumed per idle hours to get

Calculations

# of idling events per year =	2	per year
Idling time per event=	60	min
Total idling time per year =	2	hr
Fuel consumed per idle hour = **	4	gal/hr
Average Density of Locomotive Diesel (taken from msds) =	7.32	lb/gallon
Total Weight of Locomotive Fuel (idle) =	58.53	lb/yr

** Based on switcher idling information on EPAs web page: http://www.epa.gov/smartway/idlingimpacts.htm

IDLE MASS EMISSION (tons/year)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
NA	1.08E-03	0.09	2.65E-06	8.82E-07	1.37E-03	7.05E-05	6.49E-05	8.77E-07	1.05E-03

Total Emissions

TOTAL MASS EMISSION (tons/year)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
NA	0.10	35.83	1.07E-03	3.55E-04	0.60	0.02	0.02	3.53E-04	0.03

TOTAL MASS EMISSION FOR MLGS (tons/year)

Year	CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
NA	0.00	1.16	3.44E-05	1.15E-05	0.02	6.77E-04	6.23E-04	1.14E-05	1.11E-03

Note:
[1] Assuming ROGs are equivalent to VOCs

APPENDIX B

WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - SUMMARY

Pittsburg, California

Demolition Emissions tons/yr	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Demo Equipment Delivery	0.02	3.53	1.62E-04	9.64E-05	0.03	0.00	0.00	4.06E-05	0.00
Demo Debris Removal and Fills Delivery	3.21	588.79	2.71E-02	1.61E-02	5.68	0.22	0.19	6.77E-03	0.50
Demo Equipment Operations	4.59	1826.66	0.05	0.02	10.16	0.53	0.49	0.01	1.41
Total	**7.82**	**2418.98**	**0.08**	**0.03**	**15.88**	**0.75**	**0.68**	**0.02**	**1.92**

Note:
[1] Assuming ROGs are equivalent to VOCs

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION MATERIAL TRUCK DELIVERY

Pittsburg, California

Transportation Information		**Comment**
- Max. No. of Vehicle Trips Per Year =	28	- Assumed the project will deliver all the demo equip to the project site 2 times in the year for the worst case
- Average Miles Per Trip (1-way) =	31.23	- Distance to transport demolition equipment from Port of Stockton to Project Site
- Total Miles Per Year =	1,749	- Worst case scenario calculated from average miles per trip and max. no. of vehicle trips

DATA FROM EMFAC2007

		Tons Per Day								
Equipment Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	431,000	4.75	870.00	0.04	0.02	8.40	0.32	0.28	0.01	0.74

Note:
- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT vehicles within Contra Costa County in the respective year. PM10 and PM2.5 values include break wear and tire wear.

- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).

- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck 2007	2.20E-02	4.04E+00	1.86E-04	1.10E-04	3.90E-02	1.48E-03	1.30E-03	4.64E-05	3.43E-03

Note:
- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile
ER = Emission Rate in tons per day
VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

DEMOLITION TRUCK EMISSIONS (Equip Delivery)

	Tons Emitted Per Year								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	0.02	3.53	1.62E-04	9.64E-05	0.03	1.30E-03	1.14E-03	4.06E-05	0.00

Note:
- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year
EF= emission factor in pounds per mile
D = Distance traveled by trucks to the project site in miles per year.

[1] Assuming ROGs are equivalent to VOCs

Appendix B

WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION MATERIAL TRUCK DELIVERY

Pittsburg, California

Transportation Information		**Comment**
- Max. No. of Vehicle Trips Per Year =	9,723	- Information referred to the traffic report spreadsheet
- Average Miles Per Trip (1-way) =	15	- Assumption: distance to transport demolition debris and fills from the Project Site to the dump or fills site
- Total Miles Per Year =	291,690	- Worst case scenario calculated from average miles per trip and max. no. of vehicle trips

DATA FROM EMFAC2007

		Tons Per Day								
Equipment Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	431,000	4.75	870.00	0.04	0.02	8.40	0.32	0.28	0.01	0.74

Note:

- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT vehicles within Contra Costa County in the respective year. PM10 and PM2.5 values include break wear and tire wear.

- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).

- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck 2007	2.20E-02	4.04E+00	1.86E-04	1.10E-04	3.90E-02	1.48E-03	1.30E-03	4.64E-05	3.43E-03

Note:

- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile
ER = Emission Rate in tons per day
VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

DEMOLITION TRUCK EMISSIONS (Debris Removal & Fills Delivery)

	Tons Emitted Per Year								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	3.21	588.79	2.71E-02	1.61E-02	5.68	2.17E-01	1.89E-01	6.77E-03	0.50

Note:

- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year
EF= emission factor in pounds per mile
D = Distance traveled by trucks to the project site in miles per year.

[1] Assuming ROGs are equivalent to VOCs

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	October, 2009 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	2	182.07	126500.00	3.72	1.24	706.16	24.42	22.47	0.79	67.28
1 - Ton Flatbed Truck	150	1	191.01	75900.00	2.23	0.74	552.44	38.93	35.82	0.55	82.76
Forklift	40	1	41.16	10120.00	0.30	0.10	27.55	3.29	3.03	0.04	16.93
Fuel/Lube Truck	150	1	191.01	37950.00	1.12	0.37	276.22	19.47	17.91	0.28	41.38
Water Truck	300	2	230.90	151800.00	4.46	1.49	828.61	29.77	27.38	0.89	83.61
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.86	37950.00	1.12	0.37	225.38	20.41	18.78	0.25	54.77
Air Compressor	50	2	126.15	25300.00	0.74	0.25	106.30	12.08	11.12	0.13	53.70
Hydraulic Crane (75 Ton)	350	1	111.34	88550.00	2.60	0.87	338.16	13.01	11.97	0.32	34.17
Service truck	150	2	382.02	75900.00	2.23	0.74	552.44	38.93	35.82	0.55	82.76
Total Emissions		**14**	**1,628**	**629,970**	**19**	**6**	**3,613**	**200**	**184**	**4**	**517**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:
  Em = EF x hrs x Equipment #
  Em = Mass of emissions (lbs)
  EF = Emission Factor for each piece of equipment operated (lbs/hr)
- Equipment # = The number of equipment that will be used during the month (This was provided by the applicant in ACF table 2.7-3)

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	November, 2009 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	3	273.1023	189750	5.575868	1.858623	1059.24	36.63594	33.70507	1.178399	100.9243
1 - Ton Flatbed Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Forklift	40	1	41.15783	10120	0.29738	0.099127	27.55327	3.293391	3.02992	0.036177	16.93406
Fuel/Lube Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Water Truck	300	2	230.9009	151800	4.460694	1.486898	828.6102	29.76503	27.38383	0.894848	83.61392
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.8554	37950	1.115174	0.371725	225.3811	20.40848	18.7758	0.2514	54.76819
Air Compressor	50	2	126.1465	25300	0.743449	0.247816	106.2997	12.08233	11.11574	0.126681	53.6989
Hydraulic Crane (75 Ton)	350	1	111.3425	88550	2.602072	0.867357	338.1604	13.00888	11.96817	0.322144	34.17426
Service truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Total Emissions			**1,528**	**617,320**	**18**	**6**	**3,414**	**174**	**160**	**4**	**468**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

			December, 2009 Emissions Per Month (lbs/month)								
Equipment Description	**Horsepower**	**# of Equipment**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Off-Road Vehicles											
Hydraulic Excavator	250	3	273.1023	189750	5.575868	1.858623	1059.24	36.63594	33.70507	1.178399	100.9243
1 - Ton Flatbed Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Forklift	40	1	41.15783	10120	0.29738	0.099127	27.55327	3.293391	3.02992	0.036177	16.93406
Fuel/Lube Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Water Truck	300	2	230.9009	151800	4.460694	1.486898	828.6102	29.76503	27.38383	0.894848	83.61392
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.8554	37950	1.115174	0.371725	225.3811	20.40848	18.7758	0.2514	54.76819
Air Compressor	50	2	126.1465	25300	0.743449	0.247816	106.2997	12.08233	11.11574	0.126681	53.6989
Hydraulic Crane (75 Ton)	350	1	111.3425	88550	2.602072	0.867357	338.1604	13.00888	11.96817	0.322144	34.17426
Service truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Total Emissions			**1,528**	**617,320**	**18**	**6**	**3,414**	**174**	**160**	**4**	**468**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	January, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	3	273.1023	189750	5.575868	1.858623	1059.24	36.63594	33.70507	1.178399	100.9243
1 - Ton Flatbed Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Forklift	40	1	41.15783	10120	0.29738	0.099127	27.55327	3.293391	3.02992	0.036177	16.93406
Fuel/Lube Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Water Truck	300	2	230.9009	151800	4.460694	1.486898	828.6102	29.76503	27.38383	0.894848	83.61392
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.8554	37950	1.115174	0.371725	225.3811	20.40848	18.7758	0.2514	54.76819
Air Compressor	50	2	126.1465	25300	0.743449	0.247816	106.2997	12.08233	11.11574	0.126681	53.6989
Hydraulic Crane (75 Ton)	350	1	111.3425	88550	2.602072	0.867357	338.1604	13.00888	11.96817	0.322144	34.17426
Service truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Total Emissions			**1,528**	**617,320**	**18**	**6**	**3,414**	**174**	**160**	**4**	**468**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	February, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	3	273.1023	189750	5.575868	1.858623	1059.24	36.63594	33.70507	1.178399	100.9243
1 - Ton Flatbed Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Forklift	40	1	41.15783	10120	0.29738	0.099127	27.55327	3.293391	3.02992	0.036177	16.93406
Fuel/Lube Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Water Truck	300	2	230.9009	151800	4.460694	1.486898	828.6102	29.76503	27.38383	0.894848	83.61392
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.8554	37950	1.115174	0.371725	225.3811	20.40848	18.7758	0.2514	54.76819
Air Compressor	50	2	126.1465	25300	0.743449	0.247816	106.2997	12.08233	11.11574	0.126681	53.6989
Hydraulic Crane (75 Ton)	350	1	111.3425	88550	2.602072	0.867357	338.1604	13.00888	11.96817	0.322144	34.17426
Service truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Total Emissions			**1,528**	**617,320**	**18**	**6**	**3,414**	**174**	**160**	**4**	**468**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	March, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	2	182.0682	126500	3.717245	1.239082	706.1599	24.42396	22.47004	0.7856	67.28285
1 - Ton Flatbed Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Forklift	40	1	41.15783	10120	0.29738	0.099127	27.55327	3.293391	3.02992	0.036177	16.93406
Fuel/Lube Truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Water Truck	300	2	230.9009	151800	4.460694	1.486898	828.6102	29.76503	27.38383	0.894848	83.61392
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	2	171.8554	37950	1.115174	0.371725	225.3811	20.40848	18.7758	0.2514	54.76819
Air Compressor	50	2	126.1465	25300	0.743449	0.247816	106.2997	12.08233	11.11574	0.126681	53.6989
Hydraulic Crane (75 Ton)	350	1	111.3425	88550	2.602072	0.867357	338.1604	13.00888	11.96817	0.322144	34.17426
Service truck	150	1	191.0116	37950	1.115174	0.371725	276.2197	19.46744	17.91004	0.275432	41.37792
Total Emissions			**1,437**	**554,070**	**16**	**5**	**3,061**	**161**	**148**	**3**	**435**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	April, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	May, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	June, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	July, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	August, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	September, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	October, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	November, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	December, 2010 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	January, 2011 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

Equipment Description	Horsepower	# of Equipment	February, 2011 Emissions Per Month (lbs/month) CO	CO_2	CH_4	N_2O	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG[1]
Off-Road Vehicles											
Hydraulic Excavator	250	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1 - Ton Flatbed Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forklift	40	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fuel/Lube Truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water Truck	300	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Articulating Boom Manlift (120, 80, 60 and 40 Ft.)	75	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Air Compressor	50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydraulic Crane (75 Ton)	350	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Service truck	150	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Note:

[1] Assuming ROGs are equivalent to VOCs

- Mass emissions are calculated by the following equation:

  Em = EF x hrs x Equipment #

  Em = Mass of emissions (lbs)

  EF = Emission Factor for each piece of equipment operated (lbs/hr)

- Equipment # = The number of equipment that will be used during the month (This

Appendix B
WILLOW PASS GENERATING STATION DEMOLITION EMISSIONS CALCULATIONS - DEMOLITION EQUIPMENT

Pittsburg, California

	Emissions (lb/month)								
Month	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
October-09	1,627.52	629,970.00	18.51	6.17	3,613.26	200.32	184.29	3.79	517.36
November-09	1,527.54	617,320.00	18.14	6.05	3,413.90	173.60	159.71	3.64	468.25
December-09	1,527.54	617,320.00	18.14	6.05	3,413.90	173.60	159.71	3.64	468.25
January-10	1,527.54	617,320.00	18.14	6.05	3,413.90	173.60	159.71	3.64	468.25
February-10	1,527.54	617,320.00	18.14	6.05	3,413.90	173.60	159.71	3.64	468.25
March-10	1,436.51	554,070.00	16.28	5.43	3,060.82	161.38	148.47	3.24	434.61
April-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
January-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum Monthly (tpm)	**0.81**	**314.99**	**0.01**	**0.00**	**1.81**	**0.10**	**0.09**	**0.00**	**0.26**
Maximum Project Rolling 12 Month (tpy)	**4.59**	**1,826.66**	**0.05**	**0.02**	**10.16**	**0.53**	**0.49**	**0.01**	**1.41**
Project Total (tpy)	**4.59**	**1,826.66**	**0.05**	**0.02**	**10.16**	**0.53**	**0.49**	**0.01**	**1.41**

APPENDIX C

WILLOW PASS GENERATING STATION OPERATIONAL EMISSIONS CALCULATIONS

Appendix C
WILLOW PASS GENERATING STATION OPERATIONAL EMISSIONS CALCULATIONS - SUMMARY

Pittsburg, California

Operational Emissions tons/yr	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Operation Staff Commute	1.37	151.23	0.01	0.02	0.14	0.01	0.01	1.51E-03	0.14
Materials Delivery	0.31	67.73	2.31E-03	1.84E-03	0.54	0.02	0.02	7.70E-04	0.05
Total	**1.68**	**218.96**	**0.01**	**0.02**	**0.68**	**0.03**	**0.03**	**2.28E-03**	**0.19**

Note:
[1] Assuming ROGs are equivalent to VOCs

Appendix C
WILLOW PASS GENERATING STATION OPERATIONAL EMISSIONS CALCULATIONS - WORKER VEHICLE EXHAUST

Pittsburg, California

Transportation Information		Comment
- Average Number of Plant Operators (per month) =	8	- Information Provided By Applicant in Table 2.8-1
- Average Number of Other Plant Personnel (per month)	12	- Information Provided By Applicant in Table 2.8-1
- Average Miles Per Trip (1-way) =	16.8	- URBEMIS2007 default values for Contra Costa County
- Trips Per Month Per Plant Operator =	90.6	- Assumes 30 working days per month for plant operators and 22 working days per month for other plant personnel. Assumes 3.02 one-way trips per day. The trip rate is based on URBEMIS2007 value for General Light Industry
- Trips Per Month Per Other Plant Personnel =	66.44	
- Total Miles Per Month = 25,571		- Worst-case scenario; each worker drives his own car.
- Total Miles Per Year = 306,851		

DATA FROM EMFAC2007

		Tons Per Day								
Vehicle Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Light Duty Automobile (LDA)	13,697,000	50.32	6030.00	0.47	--	4.32	0.50	0.29	0.06	5.33
Light Duty Trucks (LDT)	9,203,000	48.18	5020.00	0.41	--	5.23	0.45	0.30	0.05	4.75

Note:
- Emission factors for on-road vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the LDA and LDT (Both Class I and II) vehicles within Costa Contra County in 2009. PM_{10} values include brake wear and tire wear

- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).

- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.3 (March 2007), Table C.5 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for gasoline fueled light duty automobiles and trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Vehicle Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Light Duty Automobile (LDA)	7.35E-03	8.80E-01	6.86E-05	1.08E-04	6.31E-04	7.30E-05	4.23E-05	8.76E-06	7.78E-04
Light Duty Trucks (LDT)	1.05E-02	1.09E+00	8.91E-05	1.68E-04	1.14E-03	9.78E-05	6.52E-05	1.09E-05	1.03E-03
Fleet Average Emission Factor	**8.91E-03**	**9.86E-01**	**7.89E-05**	**1.38E-04**	**8.84E-04**	**8.54E-05**	**5.38E-05**	**9.81E-06**	**9.05E-04**

Note:
- The values are based on above tons/day and miles traveled. The average emission factor is based on the assumption from URBEMIS2007 that the worker vehicle fleet mix will consist of 50% LDA and 50% LDT.

OPERATIONS STAFF VEHICLE EMISSIONS - CONSTRUCTION

	Tons Emitted Per Year								
	CO	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Worker Vehicle Fleet Mix	1.37	151.23	0.01	0.02	0.14	0.01	0.01	1.51E-03	0.14

Note:
[1] Assuming ROGs are equivalent to VOCs

Appendix C
WILLOW PASS GENERATING STATION OPERATIONAL EMISSIONS CALCULATIONS - OPERATION MATERIAL DELIVERY

Pittsburg, California

Transportation Information		Comment
- No. of Ammonia Delivery Trips/ mo. =	5	- Information provided by applicant in Section 7.12.2.2 shows an maximum of 60 1-way vehicle trips per year.
- No. of Misc. Delivery Trips/ mo. =	5	
- Average Miles Per Ammonia Delivery Trip from Dixon, CA (1-way) =	56.7	
- Average Miles Per Ammonia Delivery Trip from La Mirada, CA (1-way) =	400	
- Average Miles Per Misc. Delivery Trip (1-way) =	50	
- Total Miles Per Year =	33,402	- Worst case scenario, assuming 2 one-way trips per delivery. Assuming half of the ammonia delivery comes from Dixon, CA and other half from La Mirada, Ca

DATA FROM EMFAC2007

		Tons Per Day								
Equipment Description	**Vehicle Miles Traveled per Day**	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	434,000	4.04	880.00	0.03	0.02	7.02	0.27	0.23	0.01	0.64

Note:
- Emission factors for on-road, heavy-heavy-duty vehicles are based on results from Emfac Emissions Model 2007 Version 2.3. The values are the projected values for the HHDT vehicles within Contra Costa County in the respective year. PM10 values include brake wear and tire wear.
- Vehicle Miles Traveled per Day represents the vehicle miles traveled in Contra County on average and is based on the output from Emfac Emissions Model 2007 Version 2.3 (BURDEN output).
- N_2O factors are derived from California Climate Action Registry General Reporting Protocol Version 2.2 (March 2007), Table C.4 using the mileage accrual rates by age table from EMFAC2007 Version 2.3, November 1, 2006, California Air Resources Board, normalized accrual rates (annual odometer mileage weighted by population) for heavy heavy duty diesel fueled trucks.

CALCULATION OF EMISSION FACTOR

	Pounds per Mile								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck 2007	1.86E-02	4.06E+00	1.38E-04	1.10E-04	3.24E-02	1.24E-03	1.06E-03	4.61E-05	2.95E-03

Note:
- The following equation was used to obtain the emission factors:

$$EF = ER / VMT * 2000$$

Where: EF= emission factor in pounds per mile
ER = Emission Rate in tons per day
VMT = Average vehicle miles traveled per day by heavy-heavy duty trucks

AQUEOUS AMMONIA DELIVERY TRUCK EMISSIONS

	Tons Emitted Per Year								
Equipment Description	**CO**	**CO_2**	**CH_4**	**N_2O**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG[1]**
Heavy-Heavy Duty Diesel Truck	0.31	67.73	0.00	0.00	0.54	0.02	0.02	7.70E-04	0.05

Note:
- The following equation was used to obtain the emission factors:

$$M = EF * D / 2000$$

Where: M = Mass emissions rate from refinery related activities in tons per year
EF= emission factor in pounds per mile
D = Distance traveled by trucks to the refinery in miles per year.

[1] Assuming ROGs are equivalent to VOCs

APPENDIX D

SIEMENS FLEX PLANT 10 STARTUP AND SHUTDOWN EMISSIONS

SIEMENS

Project x - Total Estimated Startup and Shutdown Emissions
SGT6-5000F in Flex Plant 10 Combined Cycle Operation on Natural Gas @ 62 °F and 41 °F

Mode	~ Time (minutes)	Total Emissions per Event (pounds)				Fuel Usage (lbs)
		NO_X	CO	VOC	PM	
Startup on Natural Gas @ 62 °F	12	24	259	12	3	23,029
Shutdown on Natural Gas @ 62 °F	7	10	131	5	1	6,239
Startup on Natural Gas @ 41 °F	12	25	267	13	3	24,173
Shutdown on Natural Gas @ 41 °F	7	10	135	5	1	6,525

General Notes

1.) All data is ESTIMATED, NOT guaranteed and is for ONE unit.
2.) Gas fuel must be in compliance with Siemens fuel specifications.
3.) Emissions are at the HRSG exhaust stack outlet and exclude ambient air contributions.
4.) Emissions are based on new and clean conditions.
5.) Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only. Such information is not intended to be used for evaluation of plant design and/or performance relative to contractual commitments. Data included in any permit application or Environmental Impact Statement is strictly the customer's responsibility. Siemens is available to review permit application data upon request.

Startup Emissions Notes

1.) Estimated startup (SU) data are from gas turbine (GT) ignition through 100% GT load plus 10 minutes.
2.) Estimated SU and shutdown (SD) data are based on the assumed times noted above and will be higher for longer times.
3.) Estimated SU and SD data are based on the ambient temperatures noted above and will be higher at lower ambient temperatures.
4.) NO_X emissions assume SCR is not in operation (no removal).
5.) CO emissions assume 20% removal from ignition to 100% GT load and 90% removal from 100% GT load on.
6.) SU assumes 5 minutes from turning gear to synchronization.
7.) SD assumes 100% load to FSNL with no cooldown at FSNL.
8.) Operator actions do not extend startup or shutdown.
9.) It is assumed that there is no restriction from the interconnected utility for loading the GT from synchronization to 100% load within the SU times considered.

APPENDIX E

CD WITH AIR QUALITY MODELING FILES
(FILED UNDER SEPARATE COVER)

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION FOR THE *WILLOW PASS GENERATING STATION*	**Docket No. 08-AFC-6** **PROOF OF SERVICE** **(Revised 12/15/2008)**

☒ **Transmission via electronic mail and by depositing one original signed document with FedEx overnight mail delivery service at San Francisco, California with delivery fees thereon fully prepaid and addressed to the following:**

DOCKET UNIT

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-6
1516 Ninth Street, MS-15
Sacramento, CA 95814-5512
docket@energy.state.ca.us

☒ **Transmission via electronic mail addressed to the following:**

APPLICANT

Chuck Hicklin, Project Manager
Mirant Corporation
P.O. Box 192
Pittsburg, CA 94565
chuck.hicklin@mirant.com

Jonathan Sacks, Project Director
Steven Nickerson
Mirant Corporation
1155 Perimeter Center West
Atlanta, GA, 30338
jon.sacks@mirant.com
steve.nickerson@mirant.com

APPLICANT CONSULTANT

Kathy Rushmore
URS Corporation
221 Main Street, Suite 600
San Francisco, CA 94105-1917
Kathy_Rushmore@URSCorp.com

COUNSEL FOR APPLICANT

Lisa Cottle
Winston & Strawn LLP
101 California Street
San Francisco, CA 94111-5802
lcottle@winston.com

INTERESTED AGENCIES

California ISO
P.O. Box 639014
Folsom, CA 95763-9014
e-recipient@caiso.com

Garrett D. Evans
General Manager, Pittsburg Power Company
65 Civic Avenue
Pittsburg, CA 94565
gevans@ci.pittsburg.ca.us

*indicates change

*Greggory L. Wheatland
Ellison, Schneider & Harris
2015 H Street
Sacramento, CA 95811-3109
glw@eslawfirm.com

INTERVENORS

*California Unions for Reliable Energy ("CURE")
Gloria D. Smith & Marc D. Joseph
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, California 94080
gsmith@adamsbroadwell.com
mdjoseph@adamsbroadwell.com

ENERGY COMMISSION

KAREN DOUGLAS
Commissioner & Presiding Member
kldougla@energy.state.ca.us

JAMES D. BOYD
Vice Chair & Associate Member
jboyd@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Ivor Benci-Woodward
Project Manager
Ibenciwo@energy.state.ca.us

Dick Ratliff
Staff Counsel
dratliff@energy.state.ca.us

Elena Miller
Public Adviser
publicadviser@energy.state.ca.us

DECLARATION OF SERVICE

I, Kathy Rushmore, declare that on January 5, 2009, I deposited copies of the attached Responses to CEC Data Requests (#49-57) in the United States mail at San Francisco, California with first-class postage thereon fully prepaid and addressed to the California Energy Commission.

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 5, 2009 at San Francisco, California.

Kathy Rushmore