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May 17, 2018

Ms. Vicky Lee
South Coast Air Quality Management District
21865 E. Copley Drive
Diamond Bar, CA 91765

Subject: MGS (Facility ID# 155474) Response Package to the SCAQMD May 1st Comment Letter

Dear Ms. Lee;

Malburg Generating Station (MGS) has provided the attached response package to your May 1st, 2018 information request. As summarized below, we have responded to all of the questions with the exception of the requested PM10 emissions basis and guarantee from Siemens, which will be provided under separate cover as soon as we have obtained the requested information. Additionally, there are several attachments and modeling files associated with the responses including the signed application forms for the cooling towers. We will provide Melissa Sheffer a separate modeling CD via overnight delivery and as such, those modeling files are not included with this response package.

Responses to SCAQMD MGS Letter dated 5/1/18

Comment 1.a.ii. The STG rating at 38 °F is also 55 MW. The STG has a maximum design rating of 55 MW cannot accept additional steam inputs from the HRSG once this maximum limit is reached. Thus, the steam turbine design at 55 MW would cover all facility operational scenarios.

Comment 2.a. The SGT-800 is a single shaft engine that consists of inlet housing, 15 stage axial compressor, an annular serial cooled combustor, a 3-stage axial turbine and an outlet diffuser. In order to meet the engine operation requirements, the first three stages of the compressor are made of variable guide vanes. The combustor is equipped with a Dry Low Emissions (DLE) dual fuel burners with a capability of NOx less than 25 ppmv and CO at 5 ppmv in the load range of 50-100 percent. The first two turbine stages are air cooled and for the stage 1 blades, a single crystal material is used.

The upgrade package is called the Siemens SGT-800 A-Plus Upgrade which will raise the generator's output to approximately 47 MW. The A-Plus Upgrade will result in the redesign of the stage 1 vanes and blades in the hot gas path along with an improved cooling system from vanes 1 and 2 which will result in an increase in turbine efficiency. Specifically:

- Replace the row 1 compressor blades with a functionally different design to increase the air flow
- The redesigned row 1 Turbine vanes will contain a new coating and vent holes to accommodate the changes to heat and air flow from the updated Row 1 compressor blades.
- Redesigned row 2 vanes r which will also incorporate a new coating and additional vent holes to accommodate the changes to heat and air flow.
- Optimized Cooling Air System

Based on the redesigned bladed and vanes, the following design changes are noted:

- The compressor efficiency has been improved due to the increase of the mass flow. The new compressor blade 1 has a slightly opened profile but there will be no change in the blade material. Additionally, several improvements have been done on turbine blade 1 which will include a new thermal barrier coating and the optimization of the number and positioning of the cooling holes which will result in a reduction of metal temperature.
- For vanes 1 and 2, the cooling air consumption has been optimized but the vane shape, vane material and vane coatings remain unchanged.

The enhanced performance based on the exchanged parts is primarily the result of increased air mass flow and the optimized cooling air of the main turbine section. In addition to the increased mass flow, the new blade design also offers increased compressor efficiency and operating range in terms of pressure ratio and temperature. This results in improved compressor stability which would then allow the compressor to operate with fully open inlet guide vanes at higher ambient temperatures which will maintain a high mass flow and consequently, will allow for increased turbine output during hot ambient conditions.

There will be a slight increase in the exhaust temperature along with a small increase in mass flow. Overall, the efficiency improvement of the turbine is expected to result in a two percent decrease in fuel consumption per kWh.

Comment 3a. The nearest school to the project site is:
Pacific Boulevard Elementary School
2660 E. 57th St.
Huntington Park, Ca. 90255

Comment 3b. The distance between the middle of the MGS site and the northern boundary of the school site is listed as 0.57 miles or approximately 3009 ft. The distance between the nearest stack outlet (south MGS stack) and the northern boundary of the school which lies on the south side of E. 57th St., is 0.54 miles, 873.5 m, or 2866 ft.

Comment 3c. UTM coordinates obtained from Google Earth Pro for the points noted in item 3b above were as follows:

- South MGS Stack UTME 387265 UTMN 3762702
- Northeast School Boundary UTME 387199 UTMN 3761831

Based on these locations, the distance between the stack location and the school boundary is 873.5 meters (2866 feet). All sensitive receptor locations and distances were provided in Attachment 7, Table 1. Thus, this school is well beyond the 1000 ft distance threshold.

Comment 3d. Yes, that is correct.

Comment 4.a.i.aa. Siemens will provide the basis for the PM10 emission rates provided in the application under separate cover at a later date.

Comment 4.a.i.bb. Siemens has been asked to provide a guarantee and we will forward that guarantee to the AQMD once it has been received. However, given the age of the turbine, MGS is not expecting to receive a particulate matter guarantee. The original basis for the 3.89 lb/hr PM10 emission rate used to permit the facility is AP-42 which was adjusted to reflect the conversion of SO_x into secondary particulate matter. Thus, the basis for the existing PM10 permit limit of 3.89 lb/hr is conservatively based.

Siemens, as is similar with other turbine manufacturers does not always provide a guarantee for particulate emission rates or if a guarantee is provided, the guaranteed emission limit is often overly conservative and is not representative of the actual emissions from similar sized turbines based on source test data results. The guarantees, where they are provided, are typically based on AP-42 emission factors for the simple reason that there is nothing the turbine manufacturer can do to limit the emissions of particulate matter either through the use of add on controls or turbine design. Thus, applicants often use source test data as the basis for establishing individual PM limits, also known as owners guarantees. This is a well-established practice for natural gas fired turbines.

The applicant does not understand the basis for the AQMD's position that source test data, utilizing AQMD method 5.1 for PM10, cannot be used to support the use of a lower emission rate. As discussed below, source test data is the basis for determining whether new BACT limits can be achieved based on achieved in practice data, either from source tests or CEMs. If the AQMD is concerned that the reduction of the PM10 emission rate from 3.89 lb/hr down to 2.407 is not supported by the source test data, then as a compromise to support the efficiency upgrade, the applicant would propose the use of the source test data to lower the maximum PM10 emission rate from 3.89 lb/hr down to 3.386 lb/hr (0.504 lbs/hr decrease) which would retain the monthly limit of 4876 pounds while allowing for the monthly fuel increase to be raised to 405.24 mmscf.

Comments 4.a.ii.aa and 4.a.ii.bb. It should be noted that MGS is not proposing to revise the definition of particulate matter BACT/LAER as per SCAQMD Rule 1302 which requires an emission limitation or a control technique. The existing permit is based on the exclusive use of pipeline quality natural gas and the use of 3.89 lb/hr as an emission limitation as the basis for the particulate matter BACT/LAER limits for MGS. In order to ensure sufficient offsets were provided, the annual average PM10 emission rate of 3.78 lb/hr with the duct burner and 3.19 lb/hr without the duct burner were used to establish a monthly fuel limit of 330 MMScf per turbine. While it appears that the use of the Siemens PM10 emission rate of 2.407 lb/hr is too low to be supported without a vendor guarantee and the AQMD believes that the existing MGS source test data, based on AQMD Method 5.1 is not valid to support the lower emission rate, we propose the use of source test data from similar turbines to lower the maximum PM10 emission rate from 3.89 lb/hr down to 3.386 lb/hr (0.504 lbs/hr decrease) which would retain the monthly limit of 4876 pounds while allowing for the monthly fuel increase up to 405.24 mmscf.

The use of PM10 source test data from natural gas fired turbines is a well-established method to demonstrate compliance with emission limits and is one of the fundamental methods used to demonstrate that BACT based emission limits have been achieved in practice (AIP). SCAQMD Ruled 1302 -Definitions define BACT as (for non PSD sources):

> *BEST AVAILABLE CONTROL TECHNOLOGY (BACT) means the most stringent emission limitation or control technique which:*
>
> *(1) has been achieved in practice for such category or class of source; or*
>
> *(2) is contained in any state implementation plan (SIP) approved by the United States Environmental Protection Agency (EPA) for such category or class of source. A specific limitation or control technique shall not apply if the owner or operator of the proposed source demonstrates to the satisfaction of the Executive Officer or designee that such limitation or control technique is not presently achievable; or*
>
> *(3) is any other emission limitation or control technique, found by the Executive Officer or designee to be technologically feasible for such class or category of sources or for a specific source, and cost effective as compared to measures as listed in the Air Quality Management Plan (AQMP) or rules adopted by the District Governing Board.*

The May 1st AQMD comments on the MGS permit application state that the source test data is not valid for lowering the emission limits without providing any statement of basis, even though the District, State and Federal BACT guidelines allow for source test data to be used to establish AIP. Without more information on the basis of this statement from the AQMD, it appears that because the PM10 tests only utilized AQMD Method 5.1, which were based on a 4-hour sample period, and did not use the additional test method of 201A that the test results are not valid for establishing new emission limits.

To verify this statement, the source test firm, Montrose Air Quality Services, LLC (via personal communication with Matt McCune May 4, 2018) provided the following with regards to the validity of SCAQMD Method 5.1 along with EPA reference method 201A.

> *"At MGS Generating Station, Condition D29.2 of your Permit requires a tri-annual test for PM emissions per an "Approved District method" for a "District-approved averaging time". We have used SCAQMD Method 5.1 to satisfy this test requirement and it has been approved. SCAQMD Method 5.1 is a total particulate method that uses wet impingement as the methodology. The results of these tests showed very low total PM emissions (less than 1 lb/hr) in 2017.*
>
> *A "true" PM10 test would use EPA Method 201A which is essentially a cyclone at the probe tip to separate PM greater than 10um in combination with another PM Methodology (EPA Methods 5 or 202 or SCAQMD Method 5.1 or 5.2). When required to perform a true PM10 test on a gas turbine in the SCAQMD, we typically will perform EPA Method 201A in combination with SCAQMD Method 5.1.*
>
> *In reality, PM emissions from gas turbines are typically very low. Any particles that may be present are expected to be small (<10 um and probably <2.5 um). SCAQMD has allowed the use of a total PM Method to report PM10 for gas fired units. If there is an error in this methodology, it would over-report PM10.*
>
> *There is a difference in the way samples are collected between EPA Method 201A and any of the total PM methods. EPA Method 201A samples at a constant rate (to maintain separation of particles at the desired size) and varies the time sampled at each point based on the flue gas velocity at each point. The total PM Methods sample for the same time at each point but vary the sample rate proportional to the flue gas velocity at each point. Because of these differences, the total PM test will typically collect a significantly higher volume of stack gas than a PM10 test over the same sample duration. For cases where the total PM weight gain is very low (gas-fired units), we can actually measure a lower total PM than PM10 because we are dividing a very small number (weight gain) by a larger number (sample volume). In the cases where PM emissions are low and small, the weight gain can be similar for both methodologies. We have done side by side tests on gas-fired sources using these two methodologies and obtained very similar results. SCAQMD has allowed the use of total PM methods for PM10 reporting. I would expect that the numbers we are getting from your total PM tests are a very good representation of the PM10 emissions as well. If anything, they would over-report PM10 emissions."*

Additionally, source test data from similarly sized turbines, both combined cycle and simple cycle utilizing the GE LM6000 turbine and the Alstom GTX 100 were obtained and are summarized in Table 1 along with the test years, test methods and system ratings. All tests were for a minimum of four (4) hours each. While we do note that some of these turbines are non-identical models with non-identical ratings and are located in different geographic locations, these factors do not result in dramatically different emission rates even when considering the scale effects of higher exhaust flow or background PM10 in the ambient air.

Table 1 Source Test Data Summary

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10
PM10 Test Data Summary									
		Test		**System**	**Test**	**PM**			
Site Name	**Test Year**	**Method**	**GT Model**	**Rating MW**	**Load %**	**lbs/hr**	**Notes**		
Delano EC	2013	EPA 5	LM6000	47.6	>90%	1.14			
	2014	EPA 5	LM6000	47.6	>90%	1.18			
	2015	EPA 5	LM6000	47.6	>90%	0.66			
	2016	EPA 5	LM6000	47.6	>90%	2.78			
	2017	EPA 5	LM6000	47.6	>90%	2.33			
Fresno Cogen	2013	EPA 201A/202	LM6000	55	>90%	1.03	w/duct burners on		
	2014	EPA 201A/202	LM6000	55	>90%	0.8	w/duct burners on		
	2015	EPA 201A/202	LM6000	55	>90%	0.56	w/duct burners on		
	2016	EPA 201A/202	LM6000	55	>90%	0.51	w/duct burners on		
	2017	EPA 201A/202	LM6000	55	>90%	0.86	w/duct burners on		
OELLC Bakersfield (1)	2011	EPA 5	LM6000	40	>90%	1.16	Data derived from emissions reports to APCD.		
	2012	EPA 5	LM6000	40	>90%	2.43	Assuming data is test results.		
	2013	EPA 5	LM6000	40	>90%	2.34			
	2014	EPA 5	LM6000	40	>90%	2.35			
	2015	EPA 5	LM6000	40	>90%	2.27			
Redding EU	2018	EPA 5, 201A	Alstom GTX 100	47	>90%	1.7	Siemens SGT-800 Upgrade Source Test		
Roseville Electric	2007 Unit 1	EPA 201A/202	Alstom GTX 100	43	>60%	1.93	no duct burners		
	2007 Unit 2	EPA 201A/202	Alstom GTX 100	42	>60%	2.06	no duct burners		
	2008 Unit 1	EPA 201A/202	Alstom GTX 100	62.6	>90%	1.08	w/duct burners		
	2008 Unit 2	EPA 201A/202	Alstom GTX 100	69.3	>90%	1.1	w/duct burners		
	2009 Unit 1	EPA 201A/202	Alstom GTX 100	78.1	>90%	0.95	w/duct burners		
	2009 Unit 2	EPA 201A/202	Alstom GTX 100	76.9	>90%	0.89	w/duct burners		
	2010 Unit 1	EPA 201A/202	Alstom GTX 100	77.5	>90%	1.15	w/duct burners		
	2010 Unit 2	EPA 201A/202	Alstom GTX 100	79.1	>90%	0.31	w/duct burners		
	2012 Unit 1	EPA 201A/202	Alstom GTX 100	81.8	>90%	1.01	w/duct burners		
	2012 Unit 2	EPA 201A/202	Alstom GTX 100	80.8	>90%	1.1	w/duct burners		
	2012 Unit 1	EPA 201A/202	Alstom GTX 100	75.1	>90%	1.08	w/duct burners		
	2012 Unit 2	EPA 201A/202	Alstom GTX 100	74.4	>90%	0.87	w/duct burners		
	2013 Unit 1	EPA 201A/202	Alstom GTX 100	77.3	>90%	0.54	w/duct burners		
	2013 Unit 2	EPA 201A/202	Alstom GTX 100	71.9	>90%	0.7	w/duct burners		
	2014 Unit 1	EPA 201A/202	Alstom GTX 100	75.2	>90%	1.04	w/duct burners		
	2014 Unit 2	EPA 201A/202	Alstom GTX 100	74.5	>90%	0.64	w/duct burners		
	2015 Unit 1	EPA 201A/202	Alstom GTX 100	77.2	>90%	0.87	w/duct burners		
	2015 Unit 2	EPA 201A/202	Alstom GTX 100	76.2	>90%	1	w/duct burners		
	2016 Unit 1	EPA 201A/202	Alstom GTX 100	75.1	>90%	1	w/duct burners		
	2016 Unit 2	EPA 201A/202	Alstom GTX 100	73.7	>90%	1	w/duct burners		
SVP-Von Raesfeld	2012 Unit 1	EPA 5	LM6000	49	>90%	0.205	No duct burners		
	2015 Unit 1	EPA 5	LM6000	48	>90%	1.2	No duct burners		
	2017 Unit 1	EPA 5	LM6000	73	>90%	1.5	w/duct burners on		
	2012 Unit 2	EPA 5	LM6000	72	>90%	0.289	w/duct burners on		
	2015 Unit 2	EPA 5	LM6000	73.2	>90%	1	w/duct burners on		
	2017 Unit 2	EPA 5	LM6000	72	>90%	1.91	w/duct burners on		
Malburg Unit 1	2011	AQMD 5.1	Alstom GTX 100	71	>95%	0.54	w/duct burners on		
	2014	AQMD 5.1	Alstom GTX 100	71.7	>95%	0.55	w/duct burners on		
	2017	AQMD 5.1	Alstom GTX 100	71.7	>95%	0.88	w/duct burners on		
Malburg Unit 2	2011	AQMD 5.1	Alstom GTX 100	71	>95%	0.21	w/duct burners on		
	2014	AQMD 5.1	Alstom GTX 100	71.7	>95%	0.62	w/duct burners on		
	2017	AQMD 5.1	Alstom GTX 100	71.7	>95%	0.57	w/duct burners on		
					Average	1.12			

These test results in Table 1 clearly demonstrate that a proposed maximum emission rate of 3.386 lb/hr (with duct burner) could be achieved with an adequate margin of safety and that the facility emission limitations under condition D29.2 would be maintained.

As an added note, MGS installed HEPA filtration on each of the turbine air inlets in order to eliminate compressor blade fouling from particulate matter. The HEPA filtration is designed to reduce up to 99.5% of the ambient particulate matter greater than 0.1 microns which is a possible explanation of the very low PM10 source test results at MGS (which utilized a four-hour sampling method).

Based on the input from Montrose, the use of AQMD Method 5.1 would demonstrate that the lowering of the emission rate from 3.89 lb/hr down to 3.386 lb/hr is supported.

In the current permit, the AQMD allowed MGS to base the monthly PM10 emissions on the annual average case (S15) at 65^{o}F with only 240 hours of duct burner operation in order to avoid the purchase of additional PM10 ERCs. We would propose to modify that methodology to be based on the 3.386 lb/hr emission rate (720 hours with duct burners operational) but with fuel use during the cold winter month of 35^{o}F in place of the 65^{o}F case.

As requested in the permit application, we are seeking to increase the allowed fuel use while maintaining the existing monthly limits for CO, PM10, SOx and VOCs. Thus, as in place of the use of the 2.407 lb/hr emission rate, the maximum hourly emissions would be based on the following adjusted hourly rate, which would be a compromise between the existing permitted limits, the emissions data provided by Siemens and the source test data results:

2438 lbs/month PM10 per turbine
720 hours 30-day month

2438 lbs/month ÷ 720 hr/month = 3.386 lbs/hr

Then, the emissions calculation and fuel usage for PM10 are presented as follows:

Maximum monthly emissions (at 38 ^{O}*F ambient) = (3.386 lb/hr with duct burner) * (720) ~ 2438 lbs/month*

30 day average ~ 2438 lbs/30 days ~ 81 lbs/day

Maximum monthly fuel usage (at 38 ^{O}*F) = (0.56283 mmscf/hr with duct burner (Scenario S13)) * (720 hr) = 405.24 mmscf/month*

Reducing the maximum PM10 emission rate of 3.89 lb/hr by 0.5 lb/hr to 3.386 lb/hr would allow for the efficiency upgrade to utilize the proposed fuel increase while maintaining the monthly PM10 emission limits that have been fully offset. Therefore, increasing the monthly fuel limit from 330 mmscf/month to 405.24 mmscf/month and applying the adjusted maximum PM10 emission rate of 3.386 lb/hr, the project would comply with the monthly limit of 2438 lbs/month per turbine (4378 lbs/month for two turbines) during all months of the year.

The source test data clearly supports the reduction of PM10 emissions by 0.5 lb/hr. Additionally, MGS would also be willing to source test both turbines at the facility utilizing the source test methods 5.1 and 201A and the four (4) hour sampling time as suggested in Comment 4.a.ii.bb to support the use of the revised 3.386 lb/hr emission rate. As noted earlier, the 4-hour sampling time had been used in the previous PM10 source tests.

Comment 4.b.i. The maximum monthly emissions would be for Scenario S13 (38^{o}F) rather than Scenario S15 (65^{o}F) and would produce the following:

VOC Emission Factor
0.859 lb/hr ÷ 0.5628 mmscf/hr (Table 2 in the application) = 1.53 lbs/mmscf

Comment 4.b.ii. The maximum monthly emissions would be for Scenario S13 (38^{o}F) rather than Scenario S15 (65^{o}F) and would produce the following:

SOx Emission Factor
0.158 lb/hr ÷ 0.5628 mmscf/hr = 0.28 lbs/mmscf

Comment 4.b.iii. The maximum monthly emissions would be for Scenario S13 (38^{o}F) rather than Scenario S15 (65^{o}F) and would produce the following utilizing the adjusted emission rate of 3.386 lb/hr (from above):

PM10 Emission Factor
3.386 lb/hr ÷ 0.5628 mmscf/hr = 6.016 lbs/mmscf

Comment 4.c. The fuel limits were proposed for modification based on the data presented in the application Table 2 and Attachment 3, Table 3. These tables are based on the data provided by Siemens in Attachment 4, Table 1. Thus, the applicant is proposing to revise the monthly fuel limits to 405.24 mmscf/month.

Comment 4.c.i. The applicant is not expecting a guarantee from Siemens but would propose the owners guarantee of 3.386 lb/hr, which would be verified by the AQMD source test requirement within 180 days for the commencement of the upgrade project. This test would verify the proposed emission limits in order to maintain the monthly limit of 4,876 lbs/month. There is no proposed increase in the monthly offset requirements based on the fuel use increase from 330 mmscf/month up to 405.24 mmscf/month.

Comment 4.c.ii. The applicant is proposing that condition C1.4 to be revised to reflect the 405.24 mmscf/month.

Comment 5.a.i. The 180 days will be sufficient for source testing after startup.

Comment 5.b.i. The 180 days will be sufficient for source testing after startup.

Comment 6a. A copy of the registration form for the cooling tower per Rule 222 is attached. The original form was submitted to the Permit Services Department at the address noted on the Form 400-A. In addition to the cooling tower registration form, a Form 400-A, 400-PS, and 400-CEQA are submitted to accompany the cooling tower form. Per Rule 301, the cooling tower registration fee is $203.08. In addition, the attached file titled *Attachment 3 Tables 5 and 7 Increase MGS Cool-Twr-PM-HAPsrev* contains the relevant emissions calculations for particulate matter and HAPs (as designated in the water analysis supplied).

Comment 6b.i. The cooling tower circulation water flow value was supplied by MGS staff in Attachment 3, Table 5 and is 26,927.4 gallons/minute. The basis for the circulation flow rate was from an assumed approximated increase in heat rejection of eight (8) percent after adjusting for the needed discharge pressure.

One pump Operation	Two pumps operation	
Flow [GPM]	Flow [GPM]	Discharge pressure [psi]
0	0	58.4
3112	6224.2	52.2
6220	12440.8	42.2
9218	18435.2	39.9
11947	23893.2	33.8
12697	25393.6	31.5
13464	26927.4	28.8
14103	28206.4	25.5
14677	29353	20.7

Comment 6b.ii. A copy of the referenced water analysis for TDS is attached.

Comment 6c.. A copy of the referenced water analysis for HAPS is attached.

Comment 7.a.i. As part of the April outage at MGS, a commissioning schedule with emissions, fuel use and hours for each event was provided by Siemens and submitted to the AQMD.

Comment 7.a.ii.

aa. The total commissioning hours were estimated to be 57 hours per turbine

bb. The commissioning hours without controls was estimated to be 32.5 hours per turbine.

cc. The uncontrolled emission factors during commissioning are as follows and were used in the previous submittal to the AQMD.

Uncontrolled

NO_x EF = 390.52 lb/mmscf*

CO EF = 869.57 lb/mmscf**
PM10 EF = 7.397 lb/mmscf
VOC EF = 2.56 lbs/hr
VOC EF = 22.26 lb/mmscf
SO_x EF = 0.6 lb/mmscf

SU/SD Data

NO_x CSU lbs/event 122.8
NO_x WSU lbs/event 51.3
NO_x SD*** lbs/event 22.46
CO CSU lbs/event 204.8
CO WSU lbs/event 59.9
CO SD**** lbs/event 50

*Emission factor based on 22 ppm or 44.01 lb/hr and 115,000 scfh
**Emission factor based on 100 lb/hr and 115,000 scfh
***Assumes 22 ppm uncontrolled emissions.
**** Uncontrolled at 100 lb/hr for 30 minutes

Comment 8.a.i.aa. The AERMOD screening analysis shows that Case 14 has the overall maximum 1-hour impacts for NO_x, CO, and SO_2 (as well as maximum short-term impacts for other averaging times and pollutants). Therefore, the 1-hour NO_x, CO, and SO_2 emission rates for Case 14 from the screening analysis of 4.115, 2.503, and 0.157 lbs/hour/turbine, respectively, were modeled in the refined analysis, corresponding to 0.5185, 0.3154, and 0.0198 g/s/turbine, respectively, as shown in the revised Table 16.

Comment 8.a.i.bb.1. The basis for the stack parameters (stack temperature and exit velocity) for the annual modeling is typically the 100% load case based on annual average conditions (59^{o} F) for normal operations (i.e., Case 15). However, the emissions for the annual modeling are usually calculated on a conservative basis as the worst-case 1-hour emission rate for normal operations (i.e., which happens to be Case 13) plus startup and shutdown emissions. Thus, the annual modeling is based on a total of 41,165.8 and 1398.86 lbs/year for NO_x and SO_2, respectively, which includes Case 13 emissions combined with startup and shutdown emissions for the year. Using Case 15 emissions for normal operations in the annual emissions would only reduce the impacts presented so far.

Comment 8.a.i.bb.2)a and 8.a.i.bb.2)b. The basis for the stack parameters (stack temperature and exit velocity) for the startup and shutdown modeling is the worst-case minimum load condition from the screening analysis, which is Case 1 for 60% load. Using the worst-case minimum load condition gives a reasonable estimate of the stack parameters averaged over the startup and shutdown periods (going from 0% to 100% loads and then back to 0%). For averaging times longer than the startup and shutdown periods (i.e., 8-hour CO), the emissions during transient operations are the sum of the startup and shutdown emissions (which would represent the minimum load case) and emissions during the intermediate periods of normal operations, for which the worst-case 1-hour short-term emission rate for normal operations is used (i.e., which happens to be Case 13). The 60% load case emissions could be used for normal operations, but then the resulting sum of startup, shutdown, and normal emissions would not be a conservative representation of total emissions during these periods.

Comment 8.a.ii.aa. The basis for the stack parameters (stack temperature and exit velocity) for commissioning modeling is the worst-case minimum load condition from the screening analysis, which is Case 1 for 60% load. Using the worst-case minimum load condition gives a reasonable estimate of the stack parameters during commissioning activities.

Comment 8.b.i.a.1. The modeling was revised to reflect the new maximum PM10 emission rate of 3.386 lb/hr for the 24-hour averaging period and is provided in the updated Tables 16, 17 and 18 as included with this response package.

Comment 8.b.ii and 8.b.ii.aa through 8.b.ii.bb. The annual modeling was revised to reflect the annual operation of the firepump at 200 hours per year. This also included the 1-hour NO_2 and SO_2 NAAQS analyses using the annual average emission rate for normal operations. Revised Table 16, 17, and 18 are attached.

Comment 8.b.ii.cc Table 16 and the MGS Emission Rates and Stack Parameters for Refined modeling table in Attachment 6 has been revised to reflect the increase in the PM10 emission rate for the cooling tower and to reflect the firepump D48.

Comment 8.c.i.aa. We acknowledge that the first hour of any cold start sequence would have larger emissions than during the second hour. However, it should be noted that for the application, the lb/hour start emissions were modeled based on the review of the MGS CEMs data during actual cold and non-cold start events. At no time during any of the cold start sequences did the NO_x emissions exceed the modeled emission rate of 61.4 lb/hr.

However, in order to be responsive, the applicant has revised the cold startup modeling for NO_x emissions of 102.14 lb/hr. Revised Tables 16, 17, and 18 are attached with these SCAQMD emission rates.

Comment 8.c.i.bb. Similar to response 8.c.i.aa, in order to be responsive, the applicant has revised the cold startup modeling for CO emissions to 203.13 lbs/hr. The results are presented in Tables 16, 17 and 18 and demonstrate compliance with the NAAQS and CAAQS for 1-hour CO.

Comment 8.c.i.cc. The MGS facility design limits that only one turbine can be in cold start mode for the first hour, thus having the second turbine in a simultaneous cold start was not considered for modeling. However, the NO_x modeling was revised to reflect one turbine in the first hour of a cold start with the second turbine in the second or last hour of a cold start (i.e., turbine 1 at 102.14 lb/hr with the second turbine at 20.66 lb/hr, based on the SCAQMD calculations of 122.8 lbs/event for cold start-ups minus 102.14 lbs for the first hour).

For CO, since the SCAQMD calculations only show 1.05 lbs/hour for the second hour of a cold start (204.18 lbs/event for cold start-ups minus 203.13 lbs for the first hour), the CO modeling was revised for a cold start with one turbine at 203.13 lb/hr for the first hour of a startup with the second turbine in base load at the worst-case 1-hour operating conditions for normal operations (Case 14) with an emission rate of 2.503 lb/hr.

For the non-cold starts (warm or hot starts), two turbines were simultaneously modeled, both in the non-cold startup mode of operation. The two turbine non-cold start would be considered the next worst-case as the emissions of two non-cold startups are greater than one turbine in base load with other turbine in a non-cold start.

Comment 8.d.i. Only one turbine at a time would be undergoing commission activities with the other turbine being non-operational. Baseload turbine operations would not occur until after both turbines are finished with commissioning. Thus, no baseload modeling was provided during the commissioning events. A permit condition supporting this operational scenario is acceptable. Additionally, dispersion modeling was performed based on the commissioning schedule as mentioned in Comment 7.

MALBURG GENERATING STATION (MGS) COMMISSIONING EMISSIONS MODELING

AERMOD for New Commissioning Emissions & Compton Met	***1-hour CO Commissioning***	***8-hour CO Commissioning***	***1-hour NO_x Commissioning***
Turbines 1 & 2 (lbs/hr/turbine)	102.4	121.225	61.4
Turbines 1 & 2 (g/s/turbine)	12.9024	15.2744	7.7364
AERMOD Modeling Results (µg/m³)			
Maximum Impact	185.2	117.8	83.8
98th Percentile 3-Year Average			62.3

Air Quality Impact Results from Commissioning– Ambient Air Quality Standards

Pollutant	**Averaging Period**	**Maximum Concentration (µg/m³)**	**Background (µg/m³)**	**Total (µg/m³)**	**Ambient Air Quality Standards (µg/m³)**	
					CAAQS	**NAAQS**
Start-up Periods						
NO_2*	1-hour maximum (CAAQS)	83.8	138.5	222.3	339	-
	3-year average of 1-hour yearly 98th % (NAAQS)	62.3	110.6	172.9	-	188
CO	1-hour maximum	185.2	6,871	7,056	23,000	40,000
	8-hour maximum	117.8	4,466	4,584	10,000	10,000

*1-hour NO_2 impacts evaluated using the new ARM2 model option with default conversion of NOx to NO_2.

Comment 9b.i. Please note that Table 2 and Attachment 3, Table 3 in the application lists the proposed fuel use and assumptions for the calculations. Part of the confusion surrounding this comment is caused by a typo error on our part. The annual average heat input on Attachment 3

Table 6 should read 4772.7, not 4774.8. The annual average heat input per turbine is calculated on Attachment 3 Table 3 as 4772.8 mmbtu/yr. This fuel rate is based on 127 hours of SU/SD at a heat rate of 474.61 mmbtu/hr, and 8633 hours of turbine ops with duct firing at an hourly heat rate of 555.83 mmbtu/hr.

> Annual emissions, lb/yr = (Emission Factor) [average hourly heat input rate of 474.61 MMBtu/hr, turbine + 81 MMBtu/hr duct burner (HHV) (Scenario S15, 100% load at 65 F)] (8,633 hours) + [474.61 MMBtu/hr, turbine in SU/SD] (Scenario S11 100% load at 65 F with no duct burner) (127 hours for SU/SD, per Table 2) (scf/1018 Btu) = (Emission Factor) (4772.68 MMscf/yr)

The AQMD has assumed 8760 hours at 555.83 mmbtu/hr which is not correct due to the fact that duct firing will not occur during SU/SD periods. This typo does not affect the hourly HAPs emissions rates, but the annual rates decrease by a miniscule amount. Based on the above and the HAPS emissions factor comparisons presented in the response to item 9d. below, the Applicant believes that a re-run of the HRA is not warranted.

Comment 9c.i. Table 2 presents the health risk values for the residential and worker sensitive receptors by turbine.

Comment 9c.ii. Since the CEC is the lead CEQA agency we will defer to the CEC to request this information. The CEC typically does not require or ask for a detailed data table on cancer risk, acute and chronic hazard indices for <u>all</u> the sensitive receptors categorized as residential and worker receptors. Notwithstanding the above, Table * presents the facility-wide risk values for all sources included in the HRA for the sensitive residential and worker receptors.

Comment 9d. There appears to be some confusion with the units in the table. The AQMD staff have presented data in column 2 of the table in units of lbs/mmbtu, but these values as presented in the turbine HAPs calculations are labeled as lb/mmscf, i.e., the conversion from lb/mmbtu to lb/mmscf using the fuel heat value has already been accomplished, therefore the AQMD lb/mmscf values presented in the comment table represent values that have been improperly calculated. The following table shows the conversion of the AP-42 emissions factor values from lb/mmbtu to lb/mmscf based upon the procedure per the EPA footnote "c" on Table 3.1-3, which reads as follows:

> Emissions factors (*in units of lb/mmbtu in the table*) are based on an average natural gas heating value (HHV) of 1020 btu/scf at 60 deg F. To convert from lb/mmbtu to lb/mmscf multiply by 1020. These emissions factors can be converted to other natural gas heating values by multiplying the given emission factor by <u>the **ratio** of the specified heating value to this heating value</u> *i.e., 1020 btu/scf*.

Heat Rate Conversion of HAPs Emissions Factors for Gas Turbines				
AP-42, Section 3.1, April 2000, Table 3.1-3				
Background Document for Section 3.1, April 2000, Table 3.4-1				
Footnote c: the EFs given in units of lb/mmbtu are based on a gas heat value of 1020 btu/scf.				
To convert the lb/mmbtu values to gas heat rates other than 1020, the conversion factor				
is calculated as the ratio of the specified heat rate to the base heat rate of 1020.				
Specified Gas Heat Content, btu/scf:		1018		
Conversion multiplier:		0.9980		
				Values used in last HRA
	lb/mmbtu (3)	**lb/mmscf**	**lb/mmscf**	Update
Pollutant	**at 1020 btu/scf**	**at 1020 btu/scf**	**at specified btu/scf**	lb/mmscf
1-3 Butadiene	0.000000429	0.00043758	0.000437	0.000438
Acetaldehyde (2)	0.000176	0.17952	0.179168	0.179168
Acrolein (2)	0.00000362	0.0036924	0.003685	0.003685
Benzene (2)	0.00000326	0.0033252	0.003319	0.003319
Ethylbenzene	0.000032	0.03264	0.032576	0.032576
Formaldehyde (2)	0.00036	0.3672	0.366480	0.366480
Naphthalene	0.00000127	0.0012954	0.001293	0.001323
PAH (1)	0.0000009	0.000918	0.000916	0.000916
Propylene Oxide	0.0000286	0.029172	0.029115	0.029522
Toluene	0.00013	0.1326	0.132340	0.132340
Xylenes	0.0000638	0.065076	0.064948	0.065152
(1) PAH w/o Naphthalene				
(2) Acetaldehyde, acrolein, benzene, and formaldehyde are based on AP-42. 3.1 Background				
Document, Table 3.4-1, and they represent factors controlled by a CO catalyst.				
(3) All EFs from Background Document, Section 3.4, table 3.4-1, for High Load Case (per SCAQMD)				

Comment 10.a.i. The facility is currently in compliance with all Acid Rain requirements and currently operates under the AQMD administered Acid Rain program. The NOx and O_2 acid rain monitors are subject to the 40 CFR 75 and Rule 2012 Appendices and Chapters as detailed above. The CEMS relative accuracy for NO_x ppm, NO_x lb/hr, O_2 percent concentration, and stack flow dscfm are regulated under the Rule 2012 requirements. The relative accuracy for NO_x lb/MMBtu is regulated under 40 CFR 75, App. A3.3 requirements.

Comment 10.b.i. Please see that attached CEMs QA/QC plan.

Comment 10.c.i. MGS, as outlined in the attached QA/QC plan, separately monitors NOx under both the requirements of RECLAIM and the Acid Rain Programs. No AMP is needed as both monitoring systems comply with the applicable requirements for each program individually.

Comment 11.a.i.aa and bb. The current CEMs system can comply with the monitoring requirements of Subpart KKKK, with DAHS modification provided by Teledyne Monitor Labs. The turbines commenced construction prior to the Subpart KKKK date of 2/18/05. The turbines began operation in July 2005. We would also note that:

1. MGS believes that Subpart KKKK will apply to the turbines after the modification, i.e., the upgrade project. We believe that the SCAQMD agrees with this determination.
2. MGS was originally constructed well prior to 2/18/2005 and was originally subject to NSPS Subpart GG. Since the upgrade project is a physical modification that results in an emissions increase, and since the modification is occurring after 2/18/2005, the provisions of Subpart KKKK will apply.

Comment 11.b.i.aa. We agree that since the modification of the turbine will occur after February 18, 2005, and the Subpart KKKK limit would be 42 ppm at 15% O_2. Note that Subpart KKKK defines peak load *"as 100 percent of the manufacturer's design capacity of the combustion turbine at ISO conditions"* which would then be 480 MMBtu/hr.

Comment 11.c.i. A copy of the current MGS CEMs QA/QC plan is included with this response. The existing CEMs system will be reviewed and updated as needed to reflect the requirements of Subpart KKKK. Prior to the commencement of operation, the plant will be submitted to the AQMD for review and approval. The plan will ensure that all of the requirements of 40 CFR Subpart KKKK will be met. Additionally, prior to the commencement of operation, the DAHS will be modified by Teledyne, Monitor Labs to ensure it meets all 40 CFR Subpart KKKK requirements.

Comment 11.c.ii.aa The NOx RECLAIM CEMs currently meets all compliance obligations, as is demonstrated with annual compliance audits performed by district air compliance personnel.

Comment 11.c.iii.aa Each fuel flowmeter is installed, calibrated, maintained and operated according to each manufacturers O&M manual(s). Also, note that AQMD personnel, on an annual basis, verifies the calibrations.

Comment 11.c.iii.bb. EPA approval was requested on the submitted monitoring plans which occurred at least 45 days prior to the initial certification tests and application submission. The fuel flowmeter meets all of the requirements of 40 CFR 75, Appendix D for certification and quality assurance.

Comment 11.c.iv.aa. Confirmed

Comment 11.c.v.aa. MGS maintains and updates as necessary a QAQC plant for the NO_x RECLAIM CEMs.

Comment 11.c.v.bb. Prior EPA approval was requested for the implemented QAQC program which meets the requirements of Appendix B.

Comments **11.d.i,11.e.i.aa,11.e.i.aa, 11.f.i.aa, 11.f.ii.aa, 11.f.iii.aa, 11.f.iv.aa.** At the time of the application submittal, MGS believed that some permit conditions may need to be changed to reflect the applicability of Subpart KKKK. A review of the permit only indicates references to Subpart GG in the Section D table, i.e., the NO_x and SO_x emissions limits for the turbines and duct burners. These descriptive references will need to be changed to reference Subpart KKKK and the revised NO_x and SO_x emissions limits presented in Subpart KKKK as follows:

- NO_x – 42 ppmv @ 15% O_2
- SO_x – 0.90 lb/Mw-hr (gross output basis), and,
- Use no fuel that contains total potential sulfur emissions in excess of 0.060 lb SO_x/mmbtu heat input.

Comment 11.g.i. This has already been completed.

Comment 12.a.i.1. The Siemens performance upgrade cost is approximately two (2) million dollars per turbine.

Comment 12.a.i.2. The unit cost for a complete turbine package would be $19 million per turbine.

Copies of this submittal will be sent to the California Energy Commission. Please feel free to contact me at (831) 620-0481 if you have any questions concerning our response to your May comments.

Regards,
Atmospheric Dynamics, Inc.

Gregory Darvin

Cc
Kyle McCormack, MGS
Scott Galati, Dayzen, LLC

Additional Tables and Attachments

Table 2 Health Risk Values By Turbine

Modeling Receptor #	Receptor ID #	Receptor Type	Receptor Sub_ID	Turbine 1 Cancer Risk	Turbine 1 Chronic HI	Turbine 1 Acute HI	Turbine 2 Cancer Risk	Turbine 2 Chronic HI	Turbine 2 Acute HI	Facility Wide Risk Values (1) Cancer Risk	Facility Wide Risk Values (1) Chronic HI	Facility Wide Risk Values (1) Acute HI
8029	1		SSW	3.29E-07	4.47E-04	1.25E-03	3.37E-07	4.58E-04	1.29E-03	8.25E-07	1.01E-03	2.54E-03
8030	2		S	2.29E-07	3.10E-04	6.86E-04	2.31E-07	3.14E-04	7.04E-04	5.60E-07	6.88E-04	1.39E-03
8031	3		ESE	2.72E-07	3.70E-04	3.94E-04	2.78E-07	3.77E-04	3.90E-04	6.16E-07	8.12E-04	7.84E-04
8032	4		NE	1.03E-07	1.39E-04	2.97E-04	1.02E-07	1.38E-04	2.95E-04	2.21E-07	3.00E-04	5.92E-04
8033	5	Residences	NNE	1.08E-07	1.46E-04	3.23E-04	1.07E-07	1.46E-04	3.24E-04	2.34E-07	3.16E-04	6.47E-04
8034	6		N	1.06E-07	1.43E-04	2.40E-04	1.05E-07	1.43E-04	2.40E-04	2.24E-07	3.08E-04	4.80E-04
8035	7		NW	1.03E-07	1.40E-04	2.31E-04	1.03E-07	1.40E-04	2.29E-04	2.27E-07	3.05E-04	4.60E-04
8036	8		W	1.13E-07	1.53E-04	2.00E-04	1.13E-07	1.53E-04	1.99E-04	2.49E-07	3.32E-04	3.99E-04
8037	9		SW	1.12E-07	1.51E-04	2.16E-04	1.12E-07	1.52E-04	2.15E-04	2.43E-07	3.28E-04	4.31E-04
8038	10		N	8.85E-07	1.20E-03	2.71E-03	8.73E-07	1.19E-03	2.64E-03	2.07E-06	2.69E-03	5.35E-03
8039	11		E	1.09E-06	1.47E-03	2.76E-03	1.11E-06	1.50E-03	2.78E-03	3.53E-06	3.68E-03	5.54E-03
8040	12		S	6.66E-07	9.04E-04	2.63E-03	6.77E-07	9.19E-04	2.65E-03	1.67E-06	2.05E-03	5.28E-03
8041	13	Worker	W	5.85E-07	7.93E-04	2.35E-03	5.84E-07	7.93E-04	2.36E-03	1.43E-06	1.81E-03	4.71E-03
8042	14		NE	9.56E-07	1.30E-03	2.60E-03	9.37E-07	1.27E-03	2.65E-03	2.26E-06	2.91E-03	5.25E-03
8043	15		NW	5.74E-07	7.79E-04	2.25E-03	5.66E-07	7.69E-04	2.14E-03	1.39E-06	1.78E-03	4.39E-03
8044	16		SW	3.84E-07	5.21E-04	1.66E-03	3.91E-07	5.30E-04	1.59E-03	9.56E-07	1.18E-03	3.25E-03
8045	17		SE	7.10E-07	9.64E-04	1.87E-03	7.91E-07	1.07E-03	1.96E-03	1.92E-06	2.27E-03	3.84E-03

(1) all sources included in the HRA.

(2) none of the sensitive receptors noted above represent the MIR, see the data below dated 1/30/18 for the MIR data.

(3) MIR data below is the facility-wide data for all sources at the site

MIR Data		Cancer Risk	Chronic HI	Acute HI
		3.97E-06	0.0048	0.0059
	Receptor #	2612	2671	2381

Table 8
Maximum Hourly, Daily, and Annual Criteria Pollutant Emissions per turbine/db

Pollutant	Exhaust Gas Concentration[1]	Max Hour Emissions, lbs Steady State (Case S13)	Max Hour Emissions, lbs w/SU-SD	Max Daily Emissions, lbs w/SU-SD	Max Monthly Emissions, lbs w/SU-SD[2]	Max Annual Emissions, tons W/SU-SD for Both Units
NO_x	2.0 ppmvd	4.16 (4.08)	61.40	263.88	-	41.17
CO	2.0 ppmvd	2.53 (2.48)	102.40	327.26	3,193 (3,816.5)	30.14
VOC	2.0 ppmvd	0.87 (0.85)	0.87	21.82	630 (1,618)	7.63
SO_x	-	0.16 (0.16)	0.16	3.84	113 (107)	1.40
$PM_{10}/PM_{2.5}$	-	3.386 (3.89)	3.386	81.26	2,438 (2,438)	29.25
NH_3	5 ppmvd	3.84	3.84	92.18	-	33.16

[1] NOx, CO, VOC, and SOx at 15% O2 dry. $PM_{2.5}$ = PM_{10}.

[2] Values in () represent existing permitted limits and for CO and VOCs, reflect the use of commissioning emissions for the monthly's

See Attachment 3, Table 1

Worst case day assumes 1 cold start, 1 shutdown, 1 hot start and 20.5 hours full load with DB for NO_x, CO and VOC for Case S13. For PM10/2.5, SO_x and NH_3, worst case day assumes 24 hours of full load with DB operation for Case S13.

Monthly emissions assume 720 hours with 5 cold starts, 5 non-cold starts, 10 shutdowns with the remaining 697.5 hours with full load+DB (assumes cold day emissions for the monthly emissions)

Annual assumes 8,633 hours with duct burners operational

Table 9
Fire Pump and Cooling tower emissions summary

Pollutant	Lbs/Hour	Lbs/Day	Tons/Year[3]
	Existing Fire Pump[1,2]		
NO_x	1.49	1.49	0.149
CO	0.15	0.15	0.015
VOC	0.04	0.04	0.004
SO_x	0.0019	0.0019	0.0002
$PM_{10/2.5}$	0.03	0.03	0.003
CO_2e	-	-	20.8
	Revised Cooling Tower[2]		
$PM_{10/2.5}$	0.303	7.271	1.327

[1] Emissions are exempt from modeling and offsets per Rule 1304.

[2] Annual assumes 8760 hours for the cooling tower and 200 hours for the fire pump.

Table 10 Summary of Maximum proposed Facility Emissions[1]				
Pollutant	**Lbs/Hour[1]**	**Lbs/Day[2]**	**Lbs/Month[3]**	**Tons/Year[3,4]**
		Both Turbines/DBs		
NO_x	122.80	523.6	-	41.17
CO	204.8	652.0	6,385 (7,633)	30.14 (45.81)
VOC	1.74	42.78	1,259 (3236)	7.63 (19.42)
SO_x	0.32	7.43	227 (214)	1.40 (1.28)
$PM_{10/2.5}$	6.772	162.53	4,876 (4,876)	29.25 (29.25)
NH_3	7.68	153.60	-	33.16
CO_2e	-	-	-	568,732
		Existing Fire Pump[5]		
NO_x	1.49	1.49	-	0.149
CO	0.15	0.15	-	0.015
VOC	0.04	0.04	-	0.004
SO_x	0.0019	0.0019	-	0.0002
$PM_{10/2.5}$	0.03	0.03	-	0.003
CO_2e	-	-	-	20.8
		Upgraded Cooling Tower		
$PM_{10/2.5}$	0.303	7.271	-	1.327

[1] Includes turbine startup and shutdown emissions

[2]Includes turbine startup and shutdown emissions

[3] Values in () represent currently permitted limits

[4] Includes turbine startup and shutdown emissions and 8,633 hours of duct burners

[5] Emissions are exempt from modeling and offsets per Rule 1304

Monthly emissions assume 720 hours with 5 cold starts, 5 non-cold starts, 10 shutdowns with the remaining 697.5 hours with full load+DB (assumes cold day emissions for the monthly emissions)

Table 11 Facility Startup Emission Rates for the Turbine(s)					
Scenario	**NO_x**	**CO**	**VOC**	**SO_x**	**PM10/2.5**
Cold Startup, Lbs/event	122.8	204.8	1.75	0.28	6.77
Warm Startup, Lbs/event	51.3	59.9	1.55	0.21	5.08
Hot Startup, Lbs/event	51.3	59.9	1.55	0.14	3.39
Shutdown, Lbs/event	4.5	10.8	0.71	0.07	1.69

Emissions data are based on previously permitted limits.

See Attachment 3 Tables 1 and 2 for detailed SU/SD emissions evaluation.

Table 12 Pre- and Post Modification Emissions Comparison					
Pollutant	**Pre-Modification, Lbs/Month**	**Pre-Modification, TPY[1]**	**Post-Modification, Lbs/Month**	**Post-Modification, TPY[1]**	**Proposed Emissions Limits**
NO_x	-	39.4	-	41.32	41.32 tpy
CO	7,633	45.81	6,385	30.16	7,633 lbs/mo
VOC	3,236	19.42	1,259	7.64	3,236 lbs/mo
SO_x	214	1.284	227	1.4	214 lbs/mo
PM10/2.5	4,876	29.25	4,876	29.25	4,876 lbs/mo

[1] Turbines/DBs and fire pump.
Cooling tower adds 1.327 tpy of PM to the total.

Table 16. Worst-Case Stack Parameters and Emission Rates

	Stack Height (m)	**Stack Temp. (Kelvin)**	**Exit Velocity (m/s)**	**Stack Diameter (m)**	**Emission Rates (g/s)**			
					NO_x	**SO_2**	**CO**	**PM10/ PM2.5**
Averaging Period: 1-hour for Normal Operating Conditions (Case 14)								
Each turbine	33.53	377.59	13.844	3.6576	0.5185	0.0198	0.3154	-
Firepump	3.51	738.15	69.458	0.1143	0.1877[a]	2.394E-4[a]	0.0189	-
Averaging Period: 3-hours for Normal Operating Conditions (Case14)								
Each turbine	33.53	377.59	13.844	3.6576	-	0.0198	-	-
Firepump	3.51	738.15	69.458	0.1143	-	7.980E-5	-	-
Averaging Period: 8-hours for Normal Operating Conditions (Case14)								
Each turbine	33.53	377.59	13.844	3.6576	-	-	0.3154	-
Firepump	3.51	738.15	69.458	0.1143	-	-	2.363E-3	-
Averaging Period: 24-hours for Normal Operating Conditions (Case 14)								
Each turbine	33.53	377.59	13.844	3.6576	-	0.0198	-	0.4266[b]
Cooling Tower (Each Cell)	13.73	316.00	10.028	6.7056	-	-	-	0.0127
Firepump	3.51	738.15	69.458	0.1143	-	9.975E-6	-	1.575E-4
Averaging Period: Annual (Case 15)								
Each turbine	33.53	378.15	13.743	3.6576	0.5921	0.0201	-	0.4207[b]
Cooling Tower (Each Cell)	13.73	316.00	10.028	6.7056	-	-	-	0.0127

Firepump	3.51	738.15	69.458	0.1143	4.286E-3[a]	5.466E-6[a]	-	8.630E-5
Averaging Period: 1-hour for Cold Start-up Periods (Case 1) for NOx Emissions								
One turbine 1^{st} hour start	33.53	375.37	9.556	3.6576	12.8696	-	-	-
Second turbine 2^{nd} hour start	33.53	375.37	9.556	3.6576	2.6032	-	-	-
Averaging Period: 1-hour for Cold Start-up Periods for CO Emissions								
One turbine 1^{st} hour start (Case 1)	33.53	375.37	9.556	3.6576	-	-	25.5944	-
Second turbine in baseload (Case 14)	33.53	377.59	13.844	3.6576	-	-	0.3154	-
Averaging Period: 1-hour for Hot Start-up Period (Case 1)								
Two turbines(each)	33.53	375.37	9.556	3.6576	6.4638	-	7.5474	-
Averaging Period: 8-hours for Start-up/Shutdown Periods (Case 1)								
Two turbines(each)	33.53	375.37	9.556	3.6576	-	-	4.6683	-
Firepump	3.51	738.15	69.458	0.1143	-	-	2.363E-3	-

[a] 1-hour NO_2 and SO_2 NAAQS assessment based on annual average emissions per USEPA guidance for intermittent sources.
[b] Annual PM10/PM25 emissions based on current permit limit 29.25 tons/year for both turbines, while the 24-hour PM10/PM25 emissions based on the proposed 3.386 lbs/hr/turbine.

Notes:
g/s = gram(s) per second
m/s = meter(s) per second
m = meter(s)

Table 17 Modeled Concentrations and SILs

Pollutant	Averaging Period	Maximum Concentration ($\mu g/m^3$)	SCAQMD-PM & USEPA-NAAQS Class II SILs ($\mu g/m^3$)
Normal Operating Conditions			
NO_2*	1-hour maximum (CAAQS)	126.6	7.5
	3-year average of daily 1-hour yearly maxima (NAAQS) [a]	4.46	7.5
	Annual maximum (CAAQS/NAAQS)	0.50	1.0
CO	1-hour maximum (NAAQS/CAAQS)	33.0	2,000
	8-hour maximum (NAAQS/CAAQS)	1.89	500
SO_2	1-hour maximum (CAAQS)	0.42	7.8
	3-year average of daily 1-hour yearly maxima (NAAQS) [a]	0.15	7.8
	3-hour maximum (NAAQS)	0.15	25
	24-hour maximum (CAAQS/NAAQS)	0.04	5
	Annual maximum (NAAQS)	0.016	1
PM10	24-hour maximum (CAAQS/NAAQS)	0.98	2.5 [a]
	Annual maximum (CAAQS)	0.35	1.0 [a]
PM2.5	3-year average of 24-hour yearly maxima (NAAQS) [a]	0.86	2.5 [a]
	Annual maximum (CAAQS)	0.35	1.0 [a]
	3-year average of annual concentrations (NAAQS) [a]	0.31	1.0 [a]
Cold Start-up Periods			
NO_2*	1-hour maximum (CAAQS)	85.58	7.5
	3-year average of daily 1-hour yearly maxima (NAAQS) [a]	78.59	7.5
CO	1-hour maximum	143.60	2,000
Non-Cold Start-up Periods			
NO_2*	1-hour maximum (CAAQS)	70.74	7.5
	3-year average of daily 1-hour maxima (NAAQS) [a]	65.15	7.5
CO	1-hour maximum	82.60	2,000

Table 17 Modeled Concentrations and SILs

Pollutant	Averaging Period	Maximum Concentration (µg/m³)	SCAQMD-PM & USEPA-NAAQS Class II SILs (µg/m³)
Start-up/Shutdown Periods			
CO	8-hour maximum	32.14	500

*1-hour NO_2 impacts for comparison to CAAQS under Normal Operating Conditions evaluated with the Ozone Limiting Method (OLM). All other NO_2 1-hour and annual impacts evaluated assuming 100% conversion of NOx to NO_2.

[a] SCAQMD PM10/PM2.5 SIL levels shown.

Table 18. Air Quality Impact Results– Ambient Air Quality Standards

Pollutant	Averaging Period	Maximum Concentration (µg/m³)	Background (µg/m³)	Total (µg/m³)	Ambient Air Quality Standards (µg/m³)	
					CAAQS	NAAQS
Normal Operating Conditions						
NO_2*	1-hour maximum (CAAQS)	126.60	138.5	265.1	339	-
	3-year average of 1-hour yearly 98th % (NAAQS)	3.48	110.6	114.0	-	188
	Annual maximum	0.50	31.8	32.3	57	100
CO	1-hour maximum	33.00	6,871	6,904	23,000	40,000
	8-hour maximum	1.89	4,466	4,468	10,000	10,000
SO_2	1-hour maximum (CAAQS)	0.42	35.1	35.5	655	-
	3-year average of 1-hour yearly 99th % (NAAQS)	0.14	11.5	11.6	-	196
	3-hour maximum	0.15	35.1	35.3	-	1,300
	24-hour maximum	0.04	3.7	3.74	105	365
	Annual maximum	0.016	0.8	0.82	-	80
PM10	24-hour maximum (CAAQS)	0.98	88	89.0	50	-
	24-hour 4^{th} highest over 3 years (NAAQS)	0.86	63	63.9	-	150
	Annual maximum (CAAQS)	0.35	35.4	35.8	20	-
PM2.5	3-year average of 24-hour yearly 98th %	0.70	31.5	32.2	-	35

Table 18. Air Quality Impact Results– Ambient Air Quality Standards

Pollutant	Averaging Period	Maximum Concentration (μg/m^3)	Background (μg/m^3)	Total (μg/m^3)	Ambient Air Quality Standards (μg/m^3)	
					CAAQS	NAAQS
	Annual maximum (CAAQS)	0.35	12.6	13.0	12	-
	3-year average of annual concentrations (NAAQS)	0.31	11.9	12.2	-	12.0
Cold Start-up Periods						
NO_2*	1-hour maximum (CAAQS)	85.58	138.5	224.1	339	-
	3-year average of 1-hour yearly 98th % (NAAQS)	65.78	110.6	176.4	-	188
CO	1-hour maximum	143.60	6,871	7,014.6	23,000	40,000
Non Cold Start-up Periods						
NO_2*	1-hour maximum (CAAQS)	70.74	138.5	209.2	339	-
	3-year average of 1-hour yearly 98th % (NAAQS)	54.90	110.6	165.5	-	188
CO	1-hour maximum	82.60	6,871	6,954	23,000	40,000
Start-up/Shutdown Periods						
CO	8-hour maximum	32.14	4,466	4,498	10,000	10,000

*1-hour NO_2 impacts for comparison to the CAAQS under Normal Operating Conditions evaluated with the Ozone Limiting Method (OLM) for CAAQS. All other NO_2 1-hour and annual impacts evaluated assuming 100% conversion of NOx to NO_2.

Attachment 3 Table 4 EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel			# of Identical Engines:	1
Engine Service:	Existing			
Fire Pump			Max Daily Op Hrs:	1
Mfg:	Deutz		Max Annual Op Hrs:	200
Model #:	BF6M2012			
Kw:	0			
BHP:	173			
RPM:				
Fuel:	#2 ULS Diesel			
Fuel Use:	9.2	gph (1)		
Fuel HHV:	139000	Btu/gal		
mmbtu/hr:	1.28	HHV		
EPA Tier:				
Fuel Wt:	6.87	Lbs/gal		
Fuel S:	0.0015	% wt.		
Fuel S:	0.10305	Lbs/1000 gal		
SO2:	0.2061	Lbs/1000 gal		

Notes:
1. Fuel consumption based on 0.055 gal/hp-hr (avg EPA and SCAQMD values)
if no value given by mfg for specific engine.
2. Emissions factors from SCAQMD Permit-Facility 155474, 11/3/15.
3. PM10 used in HRA to represent DPM emissions. PM2.5 = PM10.
4. GHG Efs: FR 74, #209, Part 98 Subpart C, 10-30-2009, Pg. 56409-56411, Tables C-1 and C-2. #2 Diesel Fuel.
5. Fuel density and heat values are EPA defaults unless otherwise specified
6. This engine is not subject to SCAQMD ERC requirements Rule 1304(a)(4)
7. This engine is not subject to SCAQMD HRA requirements Rule 1401(g)(F)

		Single Engine				***All Engines***			
EFs (g/bhp-hr)		**Lb/Hr**	**Lb/Day**	**Lbs/Yr**	**Tons/Yr**	***Lb/Hr***	***Lb/Day***	***Lbs/Yr***	***Tons/Yr***
NOx	3.9	1.49	1.49	297.22	0.149	*1.49*	*1.49*	*297.22*	*0.15*
CO	0.4	0.15	0.15	30.48	0.015	*0.15*	*0.15*	*30.48*	*0.02*
VOC	0.1	0.04	0.04	7.62	0.004	*0.04*	*0.04*	*7.62*	*0.004*
PM10	0.09	0.03	0.03	6.86	0.003	*0.03*	*0.03*	*6.86*	*0.003*
SOx	NA	0.0019	0.0019	0.3792	0.0002	*0.0019*	*0.0019*	*0.3792*	*0.0002*
	lbs/mmbtu								
CO2	163.052	208.5	208.5	41702.2	20.9	*208.5*	*208.5*	*41702.2*	*20.9*
Methane	0.002205	0.0028	0.003	0.56	0.000	*0.00*	*0.00*	*0.56*	*0.000*
N2O	0.0002205	0.0003	0.000	0.06	0.0000	*0.00*	*0.00*	*0.06*	*0.0000*
CO2e					20.9				*20.9*

Attachment 3 Table 5 Cooling Towers-Wet Surface Condensers

Scenario or Project ID:	Malburg				
Cooling Tower/Wet SAC Particulate Emissions			**Tower Physical Data (optional)**		
# of Identical Towers:	1		# of Fans:	3	
# of Cells:	3		Fan ACFM:	750000	
Operational Schedule: Hrs/day	24		Fan Diam (ft):	22 ft	6.7056 m
Days/Year	365		Exit Vel (ft/sec)	32.9 ft/sec	10.028 m/s
Hrs/Year	8760		Length (ft)	113.94 ft	34.73 m
Pumping rate of recirculation pumps (gal/min)	26927.4		Width (ft)	37.34 ft	11.38 m
Flow of cooling water (lbs/hr)	13464777.1		Deck Ht (ft)	35.042 ft	10.68 m
TDS from water analysis: (mg/l or ppmw)	1125.0		Fan Ht (ft)	45.042 ft	13.73 m
Cycles of Concentration:	4.0				
Avg TDS of circ water (mg/l or ppmw)	4500.0	annual avg value			
Flow of dissolved solids (lbs/hr)	60591.50				
Fraction of flow producing drift*	1.00	1= worst case			
Control efficiency of drift eliminators, %	0.0005	0.000005			
Calculated drift rate (lbs water/hr)		67.32	1615.773252	Calc lbs/day	

	Per Tower	Per Cell	All Towers
PM10 emissions (lbs/hr)	**0.303**	**0.101**	**0.303**
PM10 emissions (lbs/day)	**7.271**	**2.424**	**7.271**
PM10 emissions (tpy)	**1.327**	**0.442**	**1.327**
PM2.5 fraction of PM10	1.00	1= worst case	
PM2.5 emissions (lbs/hr)	**0.303**	**0.101**	**0.303**
PM2.5 emissions (lbs/day)	**7.271**	**2.424**	**7.271**
PM2.5 emissions (tpy)	**1.327**	**0.442**	**1.327**

Notes:
Based on Method AP 42, Section 13.4, Jan 1995
*Technical Report EPA-600-7-79-251a, Page 63
Effects of Pathogenic and Toxic Materials Transported Via Cooling Device Drift - Volume 1.

Attachment 3 Table 6

Calculation of Hazardous and Toxic Pollutant Emissions from Combustion Turbines

# of Units:	2	
Fuel HHV:	1018	btu/scf

				Single Turbine			**All Turbines**				
Pollutant	EF Src	Emission Factor, lb/MMscf	CO Catalyst Control Multiplier	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Annual Emissions, lb/yr	Maximum Hourly Emissions, lb/hr	Maximum Daily Emissions, lb/day	Annual Emissions, lb/yr	Annual Emissions, tons/yr	Federal HAP
Acetaldehyde	EPA	0.179168	1.00E+00	0.1008	2.4202	855.1151	0.2017	4.8404	1710.2302	0.8551	Yes
Acrolein	EPA	0.003685	1.00E+00	0.0021	0.0498	17.5874	0.0041	0.0996	35.1748	0.0176	Yes
Ammonia		(3)		3.8400	92.16	33638.40	7.6800	184.32	67276.80	33.64	No
Benzene	EPA	0.003319	1.00E+00	0.0019	0.0448	15.8406	0.0037	0.0897	31.6812	0.0158	Yes
1,3-Butadiene	EPA	0.000438	1.00E+00	0.0002	0.0059	2.0904	0.0005	0.0118	4.1809	0.0021	Yes
Ethylbenzene	EPA	0.032576	1.00E+00	0.0183	0.4400	155.4755	0.0367	0.8801	310.9510	0.1555	Yes
Formaldehyde	EPA	0.366480	1.00E+00	0.2063	4.9504	1749.0991	0.4125	9.9008	3498.1982	1.7491	Yes
Hexane		0.000000	1.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	Yes
Naphthalene	EPA	0.001323	1.00E+00	0.0007	0.0179	6.3143	0.0015	0.0357	12.6286	0.0063	Yes
PAHs as (BaP)	EPA	0.000916	1.00E+00	0.0005	0.0124	4.3718	0.0010	0.0247	8.7436	0.0044	Yes
Propylene		0.000000	1.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	No
Propylene oxide	EPA	0.029522	1.00E+00	0.0166	0.3988	140.8996	0.0332	0.7976	281.7993	0.1409	Yes
Toluene	EPA	0.132340	1.00E+00	0.0745	1.7876	631.6191	0.1490	3.5753	1263.2382	0.6316	Yes
Xylene	EPA	0.065152	1.00E+00	0.0367	0.8801	310.9510	0.0733	1.7601	621.9019	0.3110	Yes
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
*		0.000000	0.00E+00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
				0							
								Federal HAPs, tons/yr:		3.8894	

Notes:

(1) EPA AP-42, Section 3.1 Background Document, Table 3.4-1, 4/2000.
and EPA AP-42 Section 3.1, Table 3.1-3, 4/2000

(2) Based on maximum hourly turbine fuel use (cold day conditions): 5.6283E-01 mmscf/hr

Based on a maximum daily turbine fuel use (cold day conditions): 1.3508E+01 mmscf/day

Based on maximum annual turbine fuel use (annual avg conditions): 4.7727E+03 mmscf/yr

(3) Values for ammonia slip: calculated or derived from run case data.

(4) Fuel use values include HRSG duct burners (Yes or No) Yes

CO Catalyst HAP Control Efficiencies*	Control Frac.	Multiplier
Organic HAPs	0.80	0.20
Inorganic HAPs	0.50	0.50

Each Turbine	24	Max hrs/day
Each Turbine	8760	Max Hrs/yr

* Ref: AP-42, Section 3.1, Background Document, Table 3.4-1, April 2000.
* Ref: AP-42, Section 3.1, April 2000, subsection 3.1.4.3, Catalytic Reduction Systems.
*Control efficiency was opnly applied to those pollutants as stated in the above references.

Attachment 3 Table 7 Calculation of Hazardous and Toxic Pollutant Emissions from Cooling Towers

Scenario:	Malburg				Ops Data	
					Hrs/Day:	24
Total Cells:	3	Max Drift Rate:	67.3	lbs/hr	Hrs/Yr:	8760

			Total All Cells			Single Cell		
Constituent	Concentration in Cooling Tower Water		Emissions, lb/hr	Emissions, lb/day	Emissions, lbs/yr	Emissions, lb/hr	Emissions, lb/day	Emissions, lb/yr
Arsenic*	0.01	ppm	6.73E-07	1.62E-05	5.90E-03	2.24E-07	5.39E-06	1.97E-03
Beryllium*	0.0025	ppm	1.68E-07	4.04E-06	1.47E-03	5.61E-08	1.35E-06	4.91E-04
Cadmium*	0.0025	ppm	1.68E-07	4.04E-06	1.47E-03	5.61E-08	1.35E-06	4.91E-04
Chromium*	0.005	ppm	3.37E-07	8.08E-06	2.95E-03	1.12E-07	2.69E-06	9.83E-04
Copper	0.031	ppm	2.09E-06	5.01E-05	1.83E-02	6.96E-07	1.67E-05	6.09E-03
Lead*	0.005	ppm	3.37E-07	8.08E-06	2.95E-03	1.12E-07	2.69E-06	9.83E-04
Manganese	0.116	ppm	7.81E-06	1.87E-04	6.84E-02	2.60E-06	6.25E-05	2.28E-02
Mercury	0.0005	ppm	3.37E-08	8.08E-07	2.95E-04	1.12E-08	2.69E-07	9.83E-05
Nickel	0.015	ppm	1.01E-06	2.42E-05	8.85E-03	3.37E-07	8.08E-06	2.95E-03
Selenium	0.025	ppm	1.68E-06	4.04E-05	1.47E-02	5.61E-07	1.35E-05	4.91E-03
Silica	106	ppm	7.14E-03	1.71E-01	6.25E+01	2.38E-03	5.71E-02	2.08E+01
Vanadium	0.012	ppm	8.08E-07	1.94E-05	7.08E-03	2.69E-07	6.46E-06	2.36E-03
		ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
		ppm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Notes: (1) Water analysis data supplied by project applicant on 10/20/17, sample date 10/18/17, Table page 2.
(2) mg/l = ppm
(3) ug/l = ppb
* concentration was input as 1/2 the minimum detection limit or (PQL).

This calc is linked to CT-PM.

Water TDS

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

File #:74548
Report Date: 04/11/16
Submitted: 04/05/16
PLS Report No.: 1604025

Attn: Kyle McCormack Phone: (323) 476-3626 FAX:(323) 476-3640

Project: Malburg Generating Station Quarterly

Sample ID: Inlet Reclaimed Water Water (1604025-01) Sampled:04/05/16 09:55 Received:04/05/16 09:55

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method	Prepared	Analyzed	By	Batch
Total Dissolved Solids	**1020**		1	mg/L	5.0	- SM 2540C	04/07/16	04/08/16	am	BD60829

Quality Control Data

Analyte	Result	PQL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch BD60829 - -										
Blank Prepared: 04/07/16 Analyzed: 04/08/16										
Total Dissolved Solids	ND	5.0	mg/L							
LCS Prepared: 04/07/16 Analyzed: 04/08/16										
Total Dissolved Solids	340	5.0	mg/L	356.0		95.5	80-120			
Duplicate Source: 1604037-03 Prepared: 04/07/16 Analyzed: 04/08/16										
Total Dissolved Solids	3650	5.0	mg/L		3740			2.44	5	
Duplicate Source: 1604026-01 Prepared: 04/07/16 Analyzed: 04/08/16										
Total Dissolved Solids	4580	5.0	mg/L		4780			4.27	5	

Notes and Definitions

NA	Not Applicable
ND	Analyte NOT DETECTED at or above the detection limit
NR	Not Reported
MDL	Method Detection Limit
PQL	Practical Quantitation Limit

Environmental Laboratory Accreditation Program Certificate No. 1131, Mobile Lab No. 2534, LACSD No. 10138

Authorized Signature(s)

POSITIVE LAB SERVICE

781 East Washington Blvd., Los Angeles, CA 90021
(213) 745-5312 FAX (213) 745-6372

Certificate of Analysis

Colorado Energy Management
4963 Soto St.
Vernon, CA 90058

Attn: Tom Barnhart Phone: (323) 476-3626 FAX:(323) 476-3640

File #:74548
Report Date: 10/20/17
Submitted: 10/18/17
PLS Report No.: 1710138

Project: Malburg Generating Station - Wastewater Grab Sample

Sample ID: Wastewater Grab Sample Water (1710138-01) Sampled:10/18/17 08:25 Received:10/18/17 08:25

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method		Prepared	Analyzed	By	Batch
Arsenic	ND		1	mg/L	0.020	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Beryllium	ND		1	mg/L	0.005	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Cadmium	ND		1	mg/L	0.005	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Chromium	ND		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Copper	**0.031**		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Lead	ND		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Nickel	**0.015**		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Selenium	**0.025**		1	mg/L	0.020	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Vanadium	**0.012**		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Manganese	**0.116**		1	mg/L	0.010	EPA 200.7	EPA 200.7	10/19/17	10/19/17	CG	BJ71936
Silica (SiO2)	**106**		5	mg/L	0.250	EPA 200.7	EPA 200.7	10/19/17	10/20/17	CG	BJ71936

Analyte	Results	Flag	D.F.	Units	PQL	Prep/Test Method		Prepared	Analyzed	By	Batch
Mercury	ND		1	mg/L	0.001	EPA 245.1	EPA 245.1	10/19/17	10/19/17	pj	BJ71934

Attachment 6

Malburg Generating Station Emission Rates and Stack Parameters for Refined Modeling

	Stack Height meters	Temp, Kelvins	Exhaust Velocity, m/s	Stack Diam, m	Emission Rates, g/s				Emission Rates, lb/hr			
					NOx	SO2	CO	PM10/ PM2.5	NOx	SO2	CO	PM10/ PM2.5
Averaging Period: One hour for Normal Operations												
Each Turbine - Case 14	33.53	377.59	13.844	3.6576	0.5185	0.0198	0.3154	-	4.115	0.157	2.503	-
Fire Pump (a)	3.51	738.15	69.458	0.1143	0.1877	2.394E-4	0.0189	-	1.49	0.0019	0.15	0.03
Averaging Period: Three hours for Normal Operations												
Each Turbine - Case 14	33.53	377.59	13.844	3.6576	-	0.0198	-	-	-	0.157	-	-
Fire Pump	3.51	738.15	69.458	0.1143	-	7.980E-5	-	-	-	6.333E-4	-	-
Averaging Period: Eight hours for Normal Operations												
Each Turbine - Case 14	33.53	377.59	13.844	3.6576	-	-	0.3154	-	-	-	2.503	-
Fire Pump	3.51	738.15	69.458	0.1143	-	-	2.363E-3	-	-	-	1.875E-2	-
Averaging Period: 24 hours for Normal Operations												
Each Turbine - Case 14	33.53	377.59	13.844	3.6576	-	0.0198	-	0.4266	-	0.157	-	3.386(b)
Cooling Tower - Each Cell	13.73	316.00	10.028	6.7056	-	-	-	0.0127	-	-	-	0.101
Fire Pump	3.51	738.15	69.458	0.1143	-	9.975E-6	-	1.575E-4	-	7.917E-5	-	1.250E-3
Averaging Period: Annual Periods (includes all Startups/Shutdowns)												
Each Turbine - Case 15	33.53	378.15	13.743	3.6576	0.5921	0.0201	-	0.4207	4.699	0.160	-	3.339(b)
Cooling Tower - Each Cell	13.73	316.00	10.028	6.7056	-	-	-	0.0127	-	-	-	0.101
Fire Pump = 200 hours/year (a)	3.51	738.15	69.458	0.1143	4.286E-3	5.466E-6	-	8.630E-5	3.402E-2	4.338E-5	-	6.849E-4
Averaging Period: One hour for Startup Periods - Scenario 1: Cold Startup for NOx Emissions												
1st Turbine/Hour 1 - Case 1	33.53	375.37	9.556	3.6576	12.8696	-	-	-	102.14	-	-	-
2nd Turbine/Hour 2 - Case 1	33.53	375.37	9.556	3.6576	2.6032	-	-	-	20.66	-	-	-
Averaging Period: One hour for Startup Periods - Scenario 1: Cold Startup for CO Emissions												
1st Turbine/Hour 1 - Case 1	33.53	375.37	9.556	3.6576	-	-	25.5944	-	-	-	203.13	-
2nd Turbine/Baseload - Case 14	33.53	377.59	13.844	3.6576	-	-	0.3154	-	-	-	2.503	-
Averaging Period: One hour for Startup Periods - Scenario 2: Two Turbines in Hot Startup												
Each Turbine - Case 1	33.53	375.37	9.556	3.6576	6.4638	-	7.5474	-	51.30	-	59.90	-
Averaging Period: Eight hours for Startup Periods												
Each Turbine - Case 1	33.53	375.37	9.556	3.6576	-	-	4.6683	-	-	-	37.052	-
Fire Pump	3.51	738.15	69.458	0.1143	-	-	2.363E-3	-	-	-	1.875E-2	-

Assumptions:

Turbine operates 24 hours per day for all cases and pollutants

Fire pump not tested during 1-hr startups (Cold or Hot)

(a) Due to intermittent use of firepump, annual average emissions used for 1-hour NO2 and SO2 NAAQS assessment per USEPA guidance.

(b) 24-hour PM10/PM2.5 turbine emissions are proposed limit of 3.386 lb/hr. Annual PM10/PM2.5 turbine emissions are permit limit of 29.25 tons/year for both turbines.