Mirant Potomac River, LLC
Alexandria, VA

Update 3 to:

A Dispersion Modeling Analysis of Downwash from Mirant's Potomac River Power Plant

Modeling Units 1 and 4 Together

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1.0 INTRODUCTION

This report describes dispersion modeling performed for Units 1 and 4 at Mirant's Potomac River Generating Station. The modeling was performed according to the Protocol approved by the Virginia Department of Environmental Quality. The purpose of the modeling was to demonstrate that Units 1 and 4, operating together under specified loads and during certain periods in a calendar day will not cause or contribute to exceedances of the National Ambient Air Quality Standards (NAAQS).

Section 2 of this report presents the stack and emission parameters included in the modeling. Section 3 presents modeling results and conclusions.

2.0 MODEL INPUTS

Modeling was performed using the same version of AERMOD/AERMET and the same meteorological data and receptor grid used in the August, 2005 report prepared by ENSR.

Mirant is proposing to operate Unit 1 in cycling mode in which the unit would operate up to 16 hours in a day. The unit would be shut down for the remaining 8 hours. The unit would typically operate at maximum load (88MW) for up to 8 hours in a day and minimum load (35 MW) for up to 8 hours in a day. Unit 4 would operate at maximum load for the entire day.

We have conducted dispersion modeling for a typical Unit 1 operating scenario within this cycling frame work in order to demonstrate that NAAQS are met. The Unit 1 operating hours consist of:

- Midnight - 5:00am Not Operating
- 5:00am - 6:00am 35 MW
- 6:00am - 10:00am 88 MW
- 10:00am - 4:00pm 35 MW
- 4:00pm - 8:00pm 88 MW
- 8:00pm - 9:00pm 35 MW
- 9:00 pm – Midnight Not Operating

Unit 4 would operate continuously for the entire 24-hour period.

Stack gas flow rate and exit temperature for Unit 1 at 35 MW were derived from continuous emission monitoring data for 2004. Hourly flow rates were plotted versus load and a best fit curve was derived. Similarly, hourly temperature measured at the stack breeching was plotted versus load and a best fit curve derived. The values of ACFM and temperature on the best fit curves corresponding to 35 MW were selected and used in the modeling. Exit velocity was calculated from ACFM using the stack diameter.

Power plant personnel provided the historical heat rate versus load for Unit 1. The heat rate at 35 MW for Unit 1 is 14 MMBtu/MWhr. The heat rate was used to calculate SO_2 and PM_{10} emissions at 35 MW using the following equations:

- SO_2 (lb/hr) = Unit 1 heat rate x 35 MW x 0.30 lb SO_2/MMBtu
- PM_{10} (lb/hr) = Unit 1 heat rate x 35 MW x 0.06 lb PM_{10}/MMBtu
- NOx (lb/hr) = Unit 1 heat rate x 35 MW x 0.45 lb NOx/MMBtu

SO_2 emissions for Unit 1 at 88 MW (maximum load) were calculated in exactly the same manner as the August 2005 modeling report except that an emission factor of 0.30 lb SO_2/MMBtu was used instead of the permit limit of 1.52 lb SO_2/MMBtu. Mirant plans to control SO_2 emissions from both units using Trona.

PM_{10} emissions for Unit 1 at 88 MW were calculated in the same manner as the August 2005 report except that an emission factor of 0.06 lb/MMBtu was used instead of the permit limit of 0.12 lb/MMBtu. Stack testing indicates that maximum PM/PM_{10} emissions are 0.06 lb/MMBtu. The NOx emission rate at 88 MW for Unit 1 is the same value used in the August 2005 modeling report, 473.9 lb/hr.

Emissions for Unit 4 at maximum load (107 MW) were taken from the August 2005 report with the following changes made:

- SO_2 emissions assumed 0.30 lb/MMBtu using Trona
- PM_{10} emissions assumed 0.06 lb/MMBtu based on stack test data
- NOx emissions assumed 0.24 lb/MMBtu based on CEMs data

Table 2-1 shows the stack and flue gas exit parameters used in modeling Units 1 and 4 stack emissions.

Sources of PM_{10} emissions include the Unit 1 and 4 combustion stack,s two fly ash silos and one bottom ash silo, plus material handling sources. Table 2-1 shows the Units 1 and 4 stack emissions plus the silos. In modeling PM_{10} emissions from PRGS when only Units 1 and 4 are operating, Mirant assumed that emissions from all the silos and from the material handling sources are 40% of what they are when all units are operating at maximum load. This is because Units 1 and 4 produces approximately 40% of the entire station's power output. The one exception to this is the coal pile wind erosion. We assumed that these emissions remain the same as they were in the August 2005 modeling.

The emissions shown in Tables 2-1 and 2-2 below for the non combustion sources represent 40% of the values listed in Tables 2-1 and 2-2 in the August 2005 modeling report, with the exception of the coal pile wind erosion.

Table 2-1 - Stack and Emission Parameters Used in the Modeling

Point Source	Height (m)	Diam (m)	Temp (K)		Exit Velocity (m/s)		Emissions (g/sec)					
							SO_2		PM_{10}		NOx	
			Min Load	*Max Load*	*Min Load*	*Max Load*	*Min Load*	*Max Load*	*Min Load*	*Max Load*	*Min Load*	*Max Load*
Boiler 1/Stack 1	48.2	2.6	442.6	444.3	19.0	35.7	18.52	39.80	3.7	8.0	27.8	59.7
Boiler 4/Stack 4	48.2	2.4	-	405.4	-	33.2	-	41.09	-	8.2	-	32.9
Fly Ash Silo	33.6	1.0	293.0		0.1		0.0		0.034		0.0	
Fly Ash Silo	33.6	1.0	293.0		0.1		0.0		0.034		0.0	
Bottom Ash Silo	31.0	1.0	293.0		0.1		0.0		0.047		0.0	

Table 2-2 - Stack and Emission Parameters Used in the Modeling

Area Sources	Size	Height	PM_{10} Existing Emissions			
	m^2	m	lb/hr	tpy	g/sec	g/sec-m^2
Ash Loader Upgrade	546	2.0	0.02	0.04	0.002	4.72E-06
Coal Pile Wind Erosion and Dust Suppression	17,679	4.6	0.93	1.12	0.118	6.66E-06
Coal Stackout Conveyor Dust Suppression	263	9.1	0.02	0.08	0.002	8.76E-06
Coal Railcar Unloading Dust Suppression	288	1.0	0.04	0.02	0.006	2.16E-05
Ash trucks on Paved Roads	5,886	1.0	0.24	0.48	0.030	5.15E-06

Notes:

Coal Pile = 4 acres = 17,679 m^2

Modeled height of coal pile = one half of average pile height = 30 feet x 0.5 = 15 feet (4.6 meters)

Modeled height stackout conveyor dust suppression = average height of coal pile (9.1 meters)

Resuspended roadway dust from paved roads: area = 2 x 0.3 miles x 20 feet wide = 5,886 m^2

3.0 MODELING RESULTS

3.1 Sulfur Dioxide (SO_2) Modeling Results

Table 3-1 presents results of modeling SO_2 emissions from Units 1 and 4 at PRGS. Highest second highest 3-hour and 24-hour impacts and highest annual average impacts for each year are presented in the tables. Modeled impacts are added to the highest monitored background concentrations for comparison with the NAAQS. The monitored background for the 24-hour average was 60.3 $\mu g/m^3$. This represented the highest, second highest concentration over the three year (2002-2004) period used in the August 2005 report. Mirant reviewed daily monitored concentrations for this 3-year period and determined that the highest monitored background concentrations do not occur on the days when highest 24-hour SO_2 impacts are predicted from Unit 1. . For this modeling of Units 1 and 4, Mirant identified all the days in years 2000-2004 during which the top twenty-five 24-hour SO_2 concentrations were predicted for each year. Mirant then recorded the 24-hour monitored SO_2 concentration on these days and ranked them. The highest monitored 24-hour SO_2 concentration during these five years was 53 $\mu g/m^3$. This value was used in the NAAQS compliance assessment shown in Table 3-1.

As shown in Table 3-1, the highest second highest 3-hour average SO_2 concentration is 830.2 $\mu g/m^3$. This concentration is below the 1,300 $\mu g/m^3$ 3-hour NAAQS. The highest, second highest 24–hour average concentration is 356.4 $\mu g/m^3$. This concentration is below the 365 $\mu g/m^3$ 24-hour NAAQS. Finally, the highest annual average concentration of 60 $\mu g/m^3$ is below the 80 $\mu g/m^3$ annual NAAQS.

3.2 PM_{10} Results

Table 3-2 presents results of modeling PM_{10} emissions from Unit 1 and Unit 4 plus all other non-combustion sources at PRGS. The highest, second highest 24-hour average concentration is 122.0 $\mu g/m^3$. This concentration is below the 150 $\mu g/m^3$ 24-hour NAAQS. The highest annual average concentration of 37.1 $\mu g/m^3$ is below the 50 $\mu g/m^3$ annual NAAQS.

3.3 Nitrogen Oxides (as NO_2) Results

Table 3-3 presents results of modeling Unit 1 and Unit 4 NOx emissions. Maximum total NO_2 concentrations are predicted to be 80.3 $\mu g/m^3$. This concentration is below 100 $\mu g/m^3$ annual NAAQS.

3.4 Conclusions

Modeling results indicate that Units 1 and 4 operating in the mode described above produce ambient air concentrations that are better than the NAAQS for SO_2, PM_{10} and NO_2.

Table 3-1 AERMOD Modeling Results for SO_2
Unit 1 Cycling between Max and Min Loads, Unit 4 at Max Load, SO_2 Emission Rate = 0.3 lb/MMBtu

Year	Pollutant	Averaging Period	AERMOD-PRIME	Monitored Background	AERMOD-PRIME + Background	NAAQS	Impact Location		Distance	Direction	Ground Elevation	Flagpole Elevation
			Concentrations ($\mu g/m^3$)				X (m)	Y (m)	m	deg	m	m
2000	SO_2	3-hour	534.3	238.4	772.7	1300	322787.7	4298786.0	174.8	354	4.6	39.6
		24-hour	303.4	53.0	356.4	365	322787.7	4298786.0	174.8	354	4.6	39.6
		Annual	39.0	15.7	54.7	80	322787.7	4298786.0	174.8	354	4.6	39.6
2001	SO_2	3-hour	591.8	238.4	830.2	1300	322787.7	4298786.0	174.8	354	4.6	39.6
		24-hour	282.4	53.0	335.4	365	322770.8	4298791.5	182.7	349	6.1	39.6
		Annual	43.9	15.7	59.6	80	322787.7	4298786.0	174.8	354	4.6	39.6
2002	SO_2	3-hour	577.1	238.4	815.5	1300	322755.8	4298806.0	200.1	346	6.5	39.6
		24-hour	296.9	53.0	349.9	365	322787.7	4298786.0	174.8	354	4.6	39.6
		Annual	37.7	15.7	53.4	80	322787.7	4298786.0	174.8	354	4.6	39.6
2003	SO_2	3-hour	508.6	238.4	747.0	1300	322787.7	4298786.0	174.8	354	4.6	39.6
		24-hour	198.7	53.0	251.7	365	322787.7	4298786.0	174.8	354	4.6	39.6
		Annual	20.0	15.7	35.7	80	322787.7	4298786.0	174.8	354	4.6	39.6
2004	SO_2	3-hour	487.9	238.4	726.3	1300	322787.7	4298786.0	174.8	354	4.6	39.6
		24-hour	178.4	53.0	231.4	365	322787.7	4298786.0	174.8	354	4.6	39.6
		Annual	27.4	15.7	43.1	80	322787.7	4298786.0	174.8	354	4.6	39.6

Table 3-2 AERMOD Modeling Results for PM_{10}

Unit 1 Cycling between Max and Min Loads, Unit 4 at Max Load, PM_{10} Emission Rate = 0.06 lb/MMBtu

Fugitive Dust Sources Reduced to 40% except Coal Pile

Year	Pollutant	Averaging Period	AERMOD-PRIME	Monitored Background	AERMOD-PRIME + Background	NAAQS	Impact Location		Distance	Direction	Ground Elevation	Flagpole Elevation
			Concentrations ($\mu g/m^3$)				X (m)	Y (m)	m	deg	m	m
2000	PM10	24-hour	68.5	45	113.5	150	322810.6	4298329.0	283.1	179	10.6	0.0
		Annual	13.4	21	34.4	50	322810.6	4298329.0	283.1	179	10.6	0.0
2001	PM10	24-hour	77.0	45	122.0	150	322810.6	4298329.0	283.1	179	10.6	0.0
		Annual	13.4	21	34.4	50	322810.6	4298329.0	283.1	179	10.6	0.0
2002	PM10	24-hour	63.9	45	108.9	150	322810.6	4298329.0	283.1	179	10.6	0.0
		Annual	14.0	21	35.0	50	322810.6	4298329.0	283.1	179	10.6	0.0
2003	PM10	24-hour	61.4	45	106.4	150	322810.6	4298329.0	283.1	179	10.6	0.0
		Annual	16.1	21	37.1	50	322810.6	4298329.0	283.1	179	10.6	0.0
2004	PM10	24-hour	54.8	45	99.8	150	322810.6	4298329.0	283.1	179	10.6	0.0
		Annual	14.7	21	35.7	50	322810.6	4298329.0	283.1	179	10.6	0.0