GA EPD Dispersion Modeling for the 2010 1-Hour SO_2 NAAQS: Georgia Power - Plant Wansley December 28, 2016

Georgia Power's Plant Wansley is an affected source under EPA's Data Requirements Rule (DRR) because Plant Wansley emitted greater than 2,000 tons of SO_2 in 2014. To satisfy the requirements of the DRR, Georgia Power notified Georgia EPD that they will characterize air quality through the modeling option and submitted a dispersion modeling report and related modeling files on November 18, 2016. Dispersion modeling was conducted by Georgia Power. Georgia EPD reviewed the modeling report and files to ensure that the dispersion modeling was conducted in accordance with the final DRR and Modeling Technical Assistance Document (TAD).

This report discusses the procedures used to review the supporting dispersion modeling and the modeling results.

INPUT DATA

Meteorological Data – Since no on-site meteorological data was available, the hourly meteorological data of surface and upper air observations from the Peachtree City Airport, GA NWS station (KFFC) for the period of 2012-2014 was used in this modeling.

The meteorological data was compiled and provided by Georgia EPD. The AERMET processor (15181) was used to convert the NWS data into AERMOD model-ready meteorological data files using the AERSURFACE surface characteristics evaluation utility (13016). Values of the surface characteristics (albedo, Bowen ratio, and surface roughness) surrounding the Peachtree City Airport NWS surface station and the project site were derived for each of twelve 30-degree sectors over four seasons in accordance with the AERMOD Implementation Guide (09078). Georgia EPD compared the above AERSURFACE generated surface characteristics and found no significant differences in the albedo, Bowen ratio, and surface roughness for the two sites. Therefore, a meteorological dataset with the Peachtree City Airport NWS surface characteristics was used in the modeling. According to the 3-year wind rose for the Peachtree City Airport (Figure 1), the winds are predominantly from the northwest.

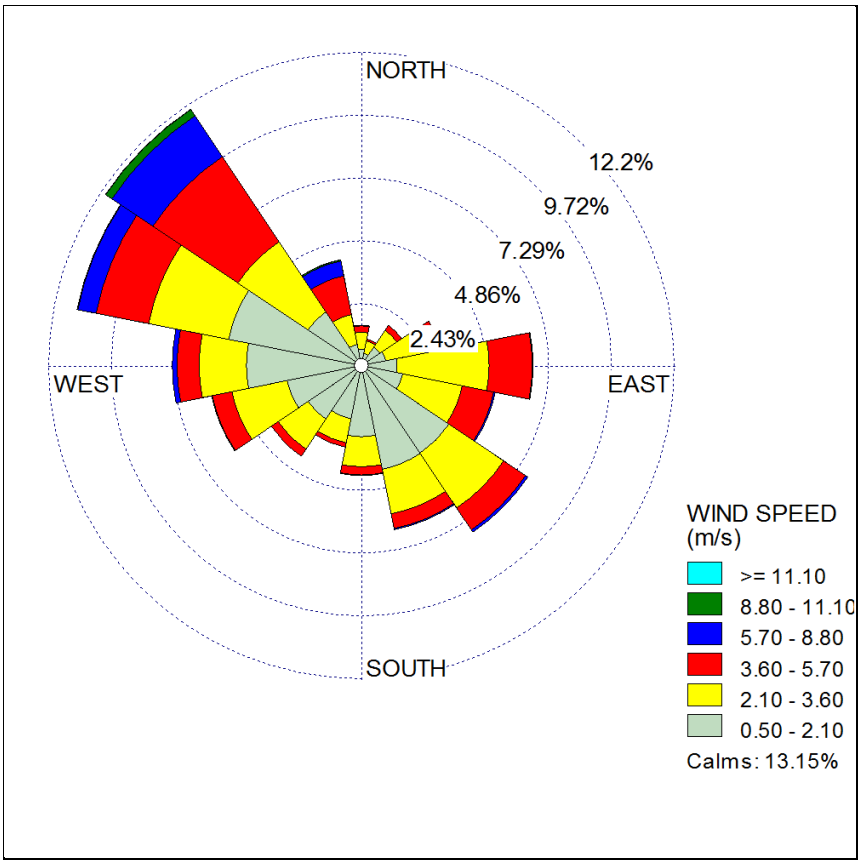

Figure 1. Three-year wind rose (2012-2014) for the Peachtree City Airport.

Source Data – Plant Wansley is an electric power generation plant operating two supercritical pulverized coal-fired boilers (Units 1 and 2). Each unit is equipped with a wet flue gas desulfurization (FGD) system for control of SO_2 emissions. During normal operations, the units exhausts through a 675-foot scrubber stack (Wan12FGD) which serves Units 1 and 2 (each with its own flue). However, there may be some periods of time during which a scrubber is not in operation. In these cases, the unit will exhaust through a 1000-foot bypass stack (Wan12BYP) which serves Units 1 and 2 (each with its own flue).

Actual hourly emissions, temperatures, and flow rates for the most recent three calendar years (2012-2014) were modeled for both units. This information was reported to EPA's Clean Air Markets Division (CAMD) under the Acid Rain Program using continuous emission monitoring systems (CEMS) certified according to 40 CFR Part 75. Figures 2-4 show the hourly SO_2 emission rates (g/s) that were modeled through each stack for Wan12FGD and Wan12BYP in 2012, 2013, and 2014.

Receptor Locations – A comprehensive Cartesian receptor grid extending to approximately 20 km from the Plant Wansley in all directions was used in the AERMOD modeling analysis to assess ground-level SO_2 concentrations. The Cartesian receptors were placed according to the following configuration based on the center of the Plant Wansley:

- 0 km – 2km ➔ 100 meters apart
- 2 km – 5 km ➔ 250 meters apart
- 5 km – 10 km ➔ 500 meters apart
- 10 km – 20 km ➔ 1,000 meters apart

This domain is sufficient to capture the maximum impact. Receptors were also placed at 100-m intervals within Plant Wansley's ambient air boundary. Although the SO_2 Modeling TAD specifies that receptors need not be placed at locations where it is not feasible to place a monitor (e.g., water bodies and within facility property lines), the receptor grid conservatively simulates all areas including within the facility's ambient air boundary that is not generally accessible to the public. This receptor grid represents a very conservative approach to the modeling analysis. All receptor locations are represented in the Universal Transverse Mercator projections, Zone 16, North American Datum 1983.

Terrain Elevation – Terrain data from USGS 1-sec National Elevation Dataset (NED) CONUS were extracted to obtain the elevations of receptors by AERMAP terrain processor (version 11103). The resulting elevation data were verified by comparing contoured receptor elevations with USGS 7.5-minute topographic map contours.

Building Downwash – The effects of building downwash were incorporated into the AERMOD analysis. Direction-specific building parameters required by AERMOD were developed using the BPIP PRIME utility (version 04274). Actual heights for the scrubber stacks and the bypass stacks were used in the modeling analysis.

Offsite Emission Inventory and Background – The following offsite SO_2 sources were included in the NAAQS modeling analysis in accordance with the previously submitted June 17, 2016 modeling protocol addendum and the September 27, 2016 modeling protocol update.

- Natural gas-fired Units 6 and 7 at Plant Yates
- Natural gas-fired combined-cycle Blocks 6 and 7 owned by Southern Power Company ("SPC") at the Wansley Combined-Cycle Generating Plant
- Natural gas-fired combined-cycle Block 8 owned by Oglethorpe Power Corporation ("OPC") at the Chattahoochee Energy Facility
- Natural gas-fired combined-cycle Block 9 owned by Municipal Electric Authority of Georgia ("MEAG Power")

Allowable/PTE SO_2 emissions and Good Engineering Practice (GEP) stack heights were used to model these sources. Information for the SPC, OPC, and MEAG Power combined-cycle units was obtained from the Georgia PSD Modeling Inventory (https://psd.georgiaair.org/inventory).

Plant Yates Units 1- 5 were not included in the model since these units were retired on April 15, 2015. Also, Units 6-7 were converted from coal to natural gas on April 15, 2015. Permit condition 3.2.1 limits the fuel fired in the electric generating units (Units 6 and 7) to natural gas only. This limits the PTE of SO_2 for SG06 and SG07 to 18.34 tpy using AP-42 emission factors as follows:

AP-42, Fifth Edition, Volume I Chapter 1: External Combustion Sources, Section 1.4 Natural Gas Combustion, Table 1.4-2 lists an SO_2 emission factor of 0.6 lb/MMscf:

$$SO_2 emissions\ per\ EGU = \left(\frac{3{,}489{,}216\ scf}{hr}\right)\left(\frac{8760\ hr}{yr}\right)\left(\frac{1\ MMSCF}{10^6\ scf}\right)\left(\frac{0.6\ lb}{MMscf}\right)\left(\frac{ton}{2{,}000\ lb}\right)$$

$$SO_2 emissions\ per\ EGU = 9.17\ tons\ per\ year$$

$$SO_2 emissions\ from\ SG06\ and\ SG07 = 18.34\ tons\ per\ year$$

Therefore, the maximum hourly SO_2 emission rate that will be modeled for Yates Unit 6-7 will be 18.34 tons SO_2 x 2000 lbs/ton ÷ 8760 hrs/year = 4.2 lb/hr SO_2. Units 6 and 7 at Plant Yates exhaust to single stack equipped with two flues. Dual-flue stacks have distinct emission points close enough together resulting in a merged plume.

All offsite sources not modeled are adequately represented by the background concentration included in the modeling analysis. The background SO_2 concentration is based on the 2013-2015 design value at the South DeKalb monitor (13-089-002) of 5 ppb (13.1 µg/m^3). Detailed information can be found in the previously submitted June 17, 2016 modeling protocol addendum and the September 27, 2016 modeling protocol update.

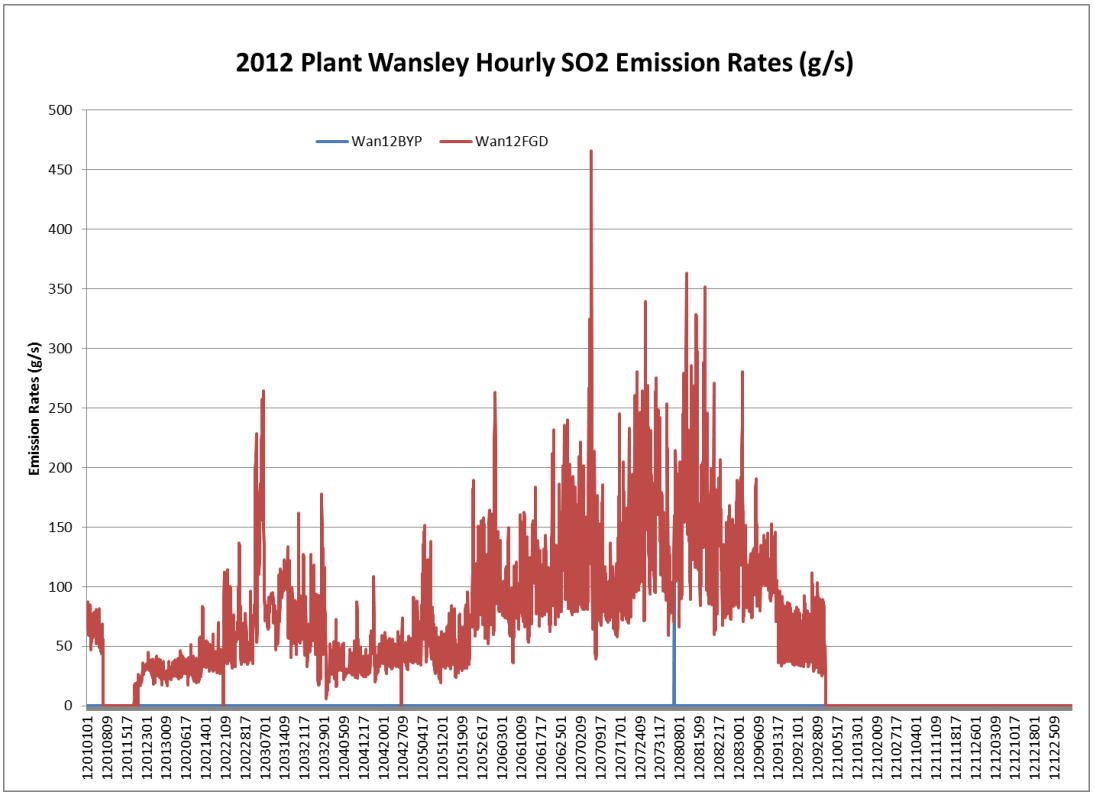

Figure 2. Hourly (2012) SO_2 emission rates (g/s) modeled through each stack for Plant Wansley.

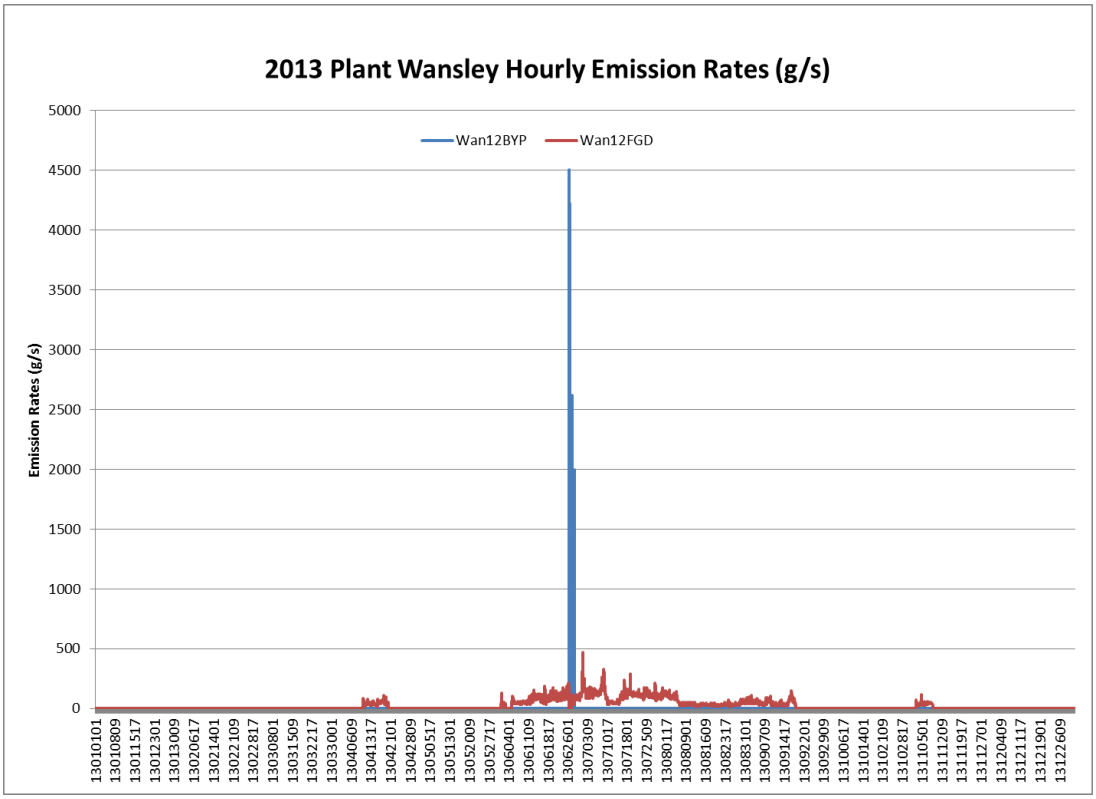

Figure 3. Hourly (2013) SO_2 emission rates (g/s) modeled through each stack for Plant Wansley.

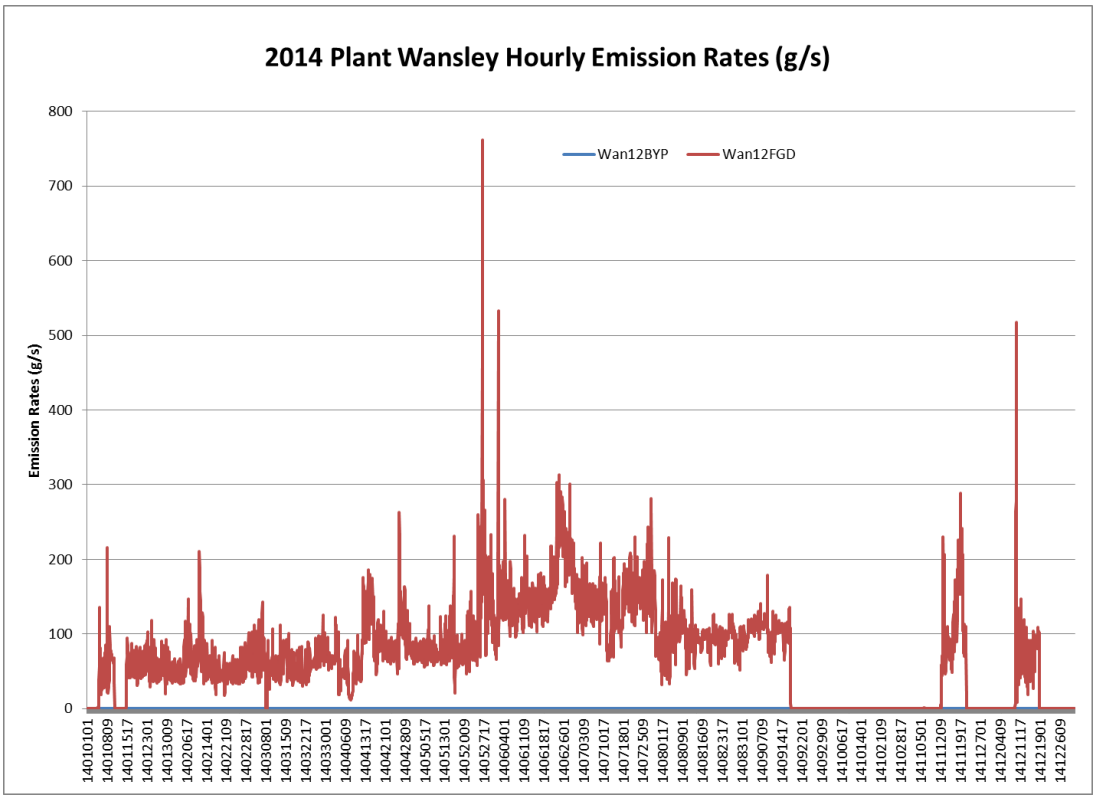

Figure 4. Hourly (2014) SO_2 emission rates (g/s) modeled through each stack for Plant Wansley.

1-HOUR SO_2 NAAQS ASSESSMENT

The total SO_2 concentrations were calculated as the sum of the modeled concentrations due to SO_2 emissions from Plant Wansley, SO_2 emissions from the offsite sources, and the 2012-2014 background SO_2 concentration of 5 ppb (13.1µg/m^3). AERMOD (version 15181) was used to model the 1st, 2nd, 3rd, and 4th highest three-year average of 1-hour SO_2 concentrations (Table 1). Figure 5 shows a Google Earth map for Plant Wansley. As seen in Figure 6, the 4th high daily maximum 1-hour SO_2 concentration averaged over 3-years was located at approximately 2.62 kilometers northeast of Plant Wansley.

The highest 4th high 1-hour SO_2 concentration averaged over three years including the modeled SO_2 impacts from Plant Wansley and the offsite sources (10 ppb = 25.2 µg/m^3) and the background SO_2 concentration (5 ppb = 13.1 µg/m^3) is 15 ppb (38.3 µg/m^3). As shown in Table 2, this value is well below the NAAQS level of 75 ppb (196 µg/m^3).

Table 1. Summary of highest 1-hour SO_2 modeled impacts averaged over 3 model years.

Rank	**3-year Average (ppb)**	2012 (ppb)	2013 (ppb)	2014 (ppb)	Receptor (lat, log)	Distance from Plant Wansley (km)
1st High	28	16	52	17	33.4218, -84.9940	3.71
2nd High	23	17	38	13	33.4183, -85.0027	2.83
3rd High	17	14	21	16	33.4283, -85.0090	2.83
4th High	**15**	13	18	13	33.4238, -85.0080	2.62

Table 2. Summary of 1-hour SO2 NAAQS (µg/m^3) analysis

Pollutant	Averaged Period	Model Design Concentration excluding background	Annual Background Concentration	Total Concentration	NAAQS	Below NAAQS (Y/N)
SO_2	1-hour	10 ppb	5 ppb	**15 ppb**	75 ppb	Yes
SO_2	1-hour	25.2 µg/m^3	13.1 µg/m^3	38.3 µg/m^3	196 µg/m^3	Yes

Figure 5. Google Earth map for Plant Wansley.

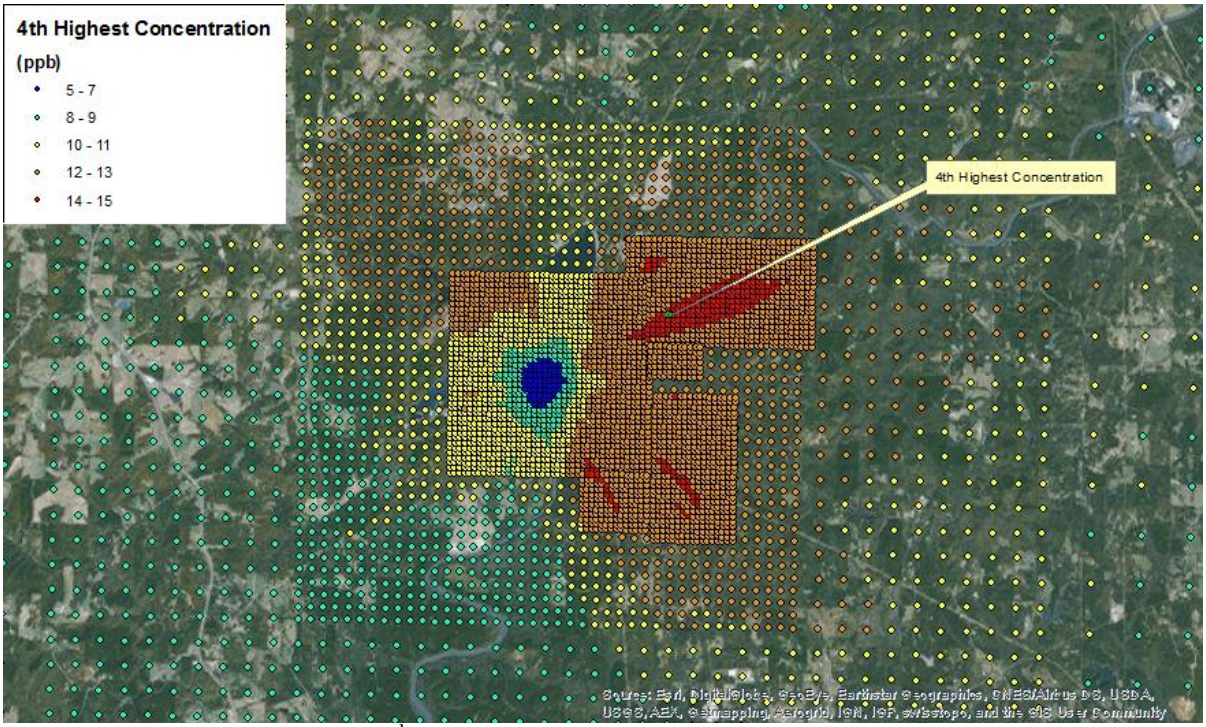

Figure 6. Spatial plot of the 4th highest daily maximum 1-hour SO_2 concentration averaged over 3 years (2012-2014).

CONCLUSIONS

The Georgia Power Plant Wansley dispersion modeling for the 1-hour SO_2 NAAQS designations was conducted in accordance with the final Data Requirements Rule (DRR) and Modeling Technical Assistance Document (TAD) using the most recently available information. As seen in Table 2, SO_2 emissions from Plant Wansley do not cause or contribute to any violations of the 1-hour SO_2 NAAQS in the vicinity of Georgia Power Plant Wansley. This result demonstrates attainment of the 1-hour SO_2 NAAQS in the area surrounding the Plant Wansley.