Appendix F
Dispersion Modeling Analysis for Lake County, Ohio
2010 SO2 NAAQS Nonattainment Area

Introduction

The United States Environmental Protection Agency (U.S. EPA) established a new National Ambient Air Quality Standard (NAAQS) for SO2 on June 22, 2010, of 75 ppb, as the 99th percentile of maximum daily values, averaged over three years. In addition, U.S. EPA revoked the primary annual and 24-hour standards.

On August 5, 2013 (75 FR 47191), effective October 4, 2013, U.S. EPA promulgated the initial SO2 nonattainment areas for the newly established SO2 standard across the country. The CAA requires states with SO2 nonattainment areas to submit a plan within eighteen months of the effective date of the designations October 4, 2013 detailing how the SO2 standard will be attained by April 4, 2015.

This document supports the SO2 State Implementation Plan (SIP) for the Lake County nonattainment area in the State of Ohio. This nonattainment area encompasses emissions from the Eastlake Power Plant, Painesville Municipal Power Plant, and Carmeuse Lime Grand River Operations. Eastlake Power Plant (Ohio EPA facility identification # 0243160009) is located at 10 Erie Road, Eastlake, Ohio. Painesville Municipal Power Plant (Ohio EPA facility identification # 0243110008) is located at 325 Richmond Street, Painesville, Ohio. Carmeuse Lime Grand River Operations (Ohio EPA facility identification # 0243030257) is located at 15 Williams Street, Grand River, Ohio. There are no other significant sources of SO2 emissions in the nonattainment area that warrant inclusion in the modeling analysis. As can be seen from the inventory included in Ohio's SO2 Nonattainment Area SIP, the emissions from the facilities comprise 99.95% of the 2011 SO2 emissions in the entire nonattainment area.

Per U.S. EPA's guidance (April 23, 2014 Guidance for 1-Hour SO2 Nonattainment Area SIP Submissions (herein referred to as "Nonattainment SIP Guidance")), "An approvable attainment demonstration would be an air quality modeling analysis that demonstrates that the emission limits in the plan will suffice to provide for timely attainment of the affected standard".

Multiple dispersion modeling analyses were performed for this SIP analysis. The first was an analysis of the 2010-2012 period, using actual variable emissions from each facility included in the modeling domain. This portion of Ohio EPA's analysis demonstrates the contribution of each facility to the violating monitor 39-085-0007 in Lake County, Ohio, which is located near Painesville, OH, and was used to assess model performance. This specific modeling analysis is herein referred to as the "base case," and all modeling analyses not associated with monitor-only specific impacts are herein referred to as "future case" scenarios. The second analysis demonstrates the impact of each individual facility on the nonattainment area when operating at permitted or potential SO2 emission rates. This portion of the analysis was used to establish emission rates that eliminate facility-specific hotspots exceeding the standard (herein

referred to as “ceiling rates”). The third analysis demonstrates the interactive impact of all facilities in the nonattainment area when operating at previously identified ceiling rates. This portion of the analysis was used to establish emission rates at all facilities required to model attainment of the standard over the nonattainment area (herein referred to as “attainment rates”). The final analysis demonstrates attainment of the standard. These analyses are discussed in greater detail below.

The base case analysis evaluated a three-year time period, 2010-2012 using actual, temporally varying emissions to determine the contribution of emissions from each source in the modeling domain to the monitored design value concentrations and to assess model performance. Ohio EPA attempted to use variable emissions at the finest temporal scale available for each facility. For this analysis, Ohio EPA utilized hourly emissions from the Eastlake Power Plant (“Eastlake”) for the 2010-2012 period collected from U.S. EPA’s Clean Air Markets Database. Monthly variable actual emissions were utilized for the 2010-2012 period for the Painesville Municipal Power Plant (“Painesville”). Daily variable emissions were utilized for the 2010-2012 period at the Carmeuse Lime Grand River Operations facility (“Carmeuse Lime”). Variable emissions data for the 2010-2012 period was submitted to Ohio EPA by both companies based on coal usage and sulfur content during outreach to all sources included in the modeling domain.

The various future case analyses evaluated the impact of each facility individually on the modeling domain when operated at their permitted limits, as well as any attainment strategies and/or emission reductions necessary. Dispersion modeling was used to validate that the control strategies and permit limits will provide for attainment of the standard using five years of meteorological data.

Modeling Approach

Per U.S. EPA’s Nonattainment SIP Guidance,

> “Appendix A of this document contains modeling guidance supplemental to that provided in the preamble to the final rulemaking promulgating the 2010 S02 NAAQS and in 40 CFR part 51, Appendix W. Appendix A of this document has also been updated to respond to issues raised during the comment period related to the September 2011 draft S02 Guidance Document. This guidance clarifies the EPA's recommendations on how to conduct refined dispersion modeling under Appendix W to support the implementation of the 2010 S02 NAAQS.”

Modeling input data, including emission rates, are addressed in Section 8.0 of Appendix W and specifically for SO2, in Appendix A of the Nonattainment SIP Guidance. The averaging period for the 2010 SO2 NAAQS is the 99th percentile of maximum monitored daily values, averaged over three years. Per the Nonattainment SIP Guidance, five years of National Weather Service data is sufficient to represent attainment of the standard. Thus, the modeled form of the standard is expressed as the 99th percentile of maximum daily values averaged over five years (herein referred to as “design value”). Five years of meteorological data was used for all future case modeling scenarios.

The recommended dispersion model for SIP modeling for SO2 is the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) modeling system. There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET, a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data preprocessor that incorporates complex terrain using United States Geological Survey (USGS) Digital Elevation Data. Additionally, Ohio EPA utilized the AERMINUTE module to incorporate 1-minute ASOS meteorological data into the hourly surface input file. Ohio EPA utilized the most up-to-date versions of AERMOD and the associated preprocessors available at the time of the attainment modeling analyses. These are as follows: AERMOD version 14134, AERMET version 14134, AERMINUTE version 14237, and AERMAP version 11103.

Meteorological Data

In order to generate meteorological input data for use with AERMOD, AERMET, along with AERMINUTE and AERSURFACE preprocessing for the modeling domain was conducted to generate the surface (.sfc) and profile (.pfl). Ohio EPA used the AERMINUTE pre-processing module. This module accepts as input 1-minute ASOS meteorological surface observations, calculates an hourly average for each hour in the modeled time period, and substitutes any missing values from the co-located ISHD surface data. Use of AERMINUTE reduces the number of calm hours present in the input files, and these enhanced hourly files are therefore considered more representative of local meteorological conditions.

Meteorological data from 2008 through 2012 from the Cleveland, OH surface station (Station # 14820) located at the Cleveland Hopkins International Airport and the Buffalo, NY upper air station (Station # 14733) located at the Buffalo Niagara International Airport were used in these analyses. These sites were determined to be representative of Lake County, OH. AERSURFACE was run using twelve sectors and four seasons.

As stated above, Ohio EPA modeled multiple scenarios for the Lake County nonattainment area. The base case modeling demonstrates the source specific impacts at the monitor location, while the future case modeling scenarios demonstrate the methodology to establish control measures that ensure modeled attainment of 2010 SO2 standard.

Background

Ohio EPA applied background concentrations of SO2 to all modeled results under all scenarios. Given the complex meteorology of the area and the known shutdowns of several large SO2 sources impacting, but not included in, the modeling domain, Ohio EPA established two background concentrations. The first, 27 ppb, was established for the base case modeling scenario. A future case background concentration of 10.3 ppb was established from the base case background, accounting for known shutdowns of large SO2 sources impacting the nonattainment area. A detailed description of the

background determination for both the base and future case scenarios is provided in the protocol discussion of Ohio's SIP submittal.

Base Case Analysis

The base case analysis compared model predicted three-year SO2 design values to actual monitored design values during the same 2010-2012 period. The modeled base case was a reasonable attempt to replicate the actual monitored design values. The purpose of modeling actual conditions was to determine the contribution to the modeled exceedance by each source. Further, the base case provides a means to assess model performance, input data quality, and the accuracy of the background concentration. To assess source-specific impacts at the monitor location, Ohio EPA generated a MAXDCONT file for the 4th – 50th maximum daily values, averaged over three years.

Emission Sources

Ten emission sources from the three facilities were included in the base case modeling analysis. Variable emissions for all ten sources were included in the model via the HOUREMIS input pathway, years 2010-2012. Ohio EPA utilized the 1-hour SO2 design value output option internal to the AERMOD code to simplify post processing and eliminate the need to generate large hourly output files. Additionally, Ohio EPA included the base case background concentration of 27 ppb via the SO pathway in the AERMOD input file. The relevant release point parameters for the ten emission units included in the base case analysis are presented in Table 1, below. All emissions sources included in the modeling were treated as point sources.

	Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	SO2
			(m)	(m)	(m)	(m)	(K)	(m/s)	(m)	(lb/hr)
Eastlake Power Plant	B001_EL	Coal Fired EGU- Stack	463125	4613288	186.36	164.592	399.82	11.552	3.6576	Variable
	B002_EL	Coal Fired EGU- Stack	463125	4613288	186.36	164.592	399.82	11.552	3.6576	Variable
	B003_EL	Coal Fired EGU- Stack	463125	4613288	186.36	164.592	399.82	11.552	3.6576	Variable
	B004_EL	Coal Fired EGU- Stack	463125	4613288	186.36	164.592	399.82	11.552	4.8768	Variable
	B005_EL	Coal Fired EGU- Stack	462979	4613348	185.08	182.880	386.48	9.906	7.3152	Variable
Painesville Municipal	B001_PV	Boiler No. 5 Stack	478879.3	4619419.7	195.68	47.854	439.26	11.467	2.4384	Variable
	B003_PV	Boiler No. 3 Stack	478858.9	4619428.82	195.65	52.121	449.82	7.907	3.4534	Variable
	B004_PV	Boiler No.4 Stack	478858.9	4619428.82	195.65	52.121	449.82	7.907	3.4534	Variable
Carmeuse Lime	P001_CL	Klin #4 Stack	476497.02	4622159.11	176.5	44.501	495.37	16.459	3.2842	Variable
	P002_CL	Klin #5 Stack	476497.02	4622159.11	176.5	44.501	495.37	16.459	3.2842	Variable

Table 1: Base Case modeled source parameters, Lake County nonattainment area, 2010-2012.

Receptors

It was only necessary for a single receptor, at the location of the monitor, to be modeled for the base case as the purpose of this scenario was to duplicate the monitored design value for the 2010-2012 period. The modeled results were then compared to the monitored design value for the same period.

Meteorology

In order to replicate actual conditions during the 2010-2012 period, the base case was modeled using only 2010-2012 meteorological data, processed as described previously.

Results

As stated previously, the intent of the base case was to assess model performance and to determine the contribution of each source to modeled exceedances of the standard. Table 2 was created from the MAXDCONT output file for the base case. With regards to model performance, the 2010-2012 design value at monitor 39-085-0007 was 149 ppb. The modeled design value for the base case is 122 ppb. Thus, the modeled design value captures 82% of the monitored design value. Ohio EPA considers this excellent agreement. It is likely that more refined emissions data from Painesville Municipal and Carmeuse Lime would improve the agreement between the modeled and monitor design values, but such data is not available.

RANK	Eastlake Contribution (ppb)	Painesville Contribution (ppb)	Carmeuse Contribution (ppb)	Modeled DV (with 27 ppb background)
4TH	62.68	31.98	0.02	121.68
5TH	67.31	24.57	0.01	118.89
6TH	72.10	17.58	0.01	116.69
7TH	60.36	26.88	0.02	114.26
8TH	15.56	67.70	0.00	110.26
9TH	34.73	45.42	0.01	107.15
10TH	24.24	54.27	0.06	105.56
11TH	12.31	63.94	0.02	103.27
12TH	63.94	10.22	0.04	101.20
13TH	0.81	71.68	0.00	99.49
14TH	35.09	34.84	0.03	96.96
15TH	39.73	29.15	0.01	95.89
16TH	57.53	8.05	0.01	92.59
17TH	24.53	40.40	0.03	91.96
18TH	15.64	48.90	0.00	91.54
19TH	55.06	8.71	0.05	90.82
20TH	46.97	15.72	0.02	89.70
21ST	40.12	21.65	0.01	88.78

22ND	39.94	20.97	0.01	87.93
23RD	31.02	27.43	0.00	85.45
24TH	45.51	12.41	0.01	84.92
25TH	54.84	2.35	0.02	84.21
26TH	20.09	36.08	0.01	83.17
27TH	46.80	7.56	0.00	81.35
28TH	12.60	41.14	0.01	80.74
29TH	30.75	21.39	0.02	79.15
30TH	28.37	23.61	0.02	78.99
31ST	30.93	20.83	0.01	78.77
32ND	29.27	21.79	0.03	78.08
33RD	20.21	30.64	0.01	77.86
34TH	18.83	31.61	0.01	77.45
35TH	21.97	27.98	0.01	76.95
36TH	22.97	25.77	0.00	75.74
Average Contribution	**Eastlake 54.73%**	**Painesville 45.25%**	**Carmeuse 0.02%**	

Table 2: Base Case modeled source group contributions to exceedances, 2010-2012.

In addition to model performance, the base case analysis allowed for the assessment of facility specific impacts at the monitor location. As shown in Table 2, the average contribution of Eastlake to modeled exceedances was 54.73%, the average contribution of Painesville to modeled exceedances was 45.25%, and the average contribution of Carmeuse was 0.02%. These results are used, in part, to determine the final attainment strategy for the nonattainment area. Figure 1 shows the location of the facilities in the modeling domain, the background monitor (39-085-0003), and monitor 39-085-0007, which was represented as a receptor in the modeling domain.

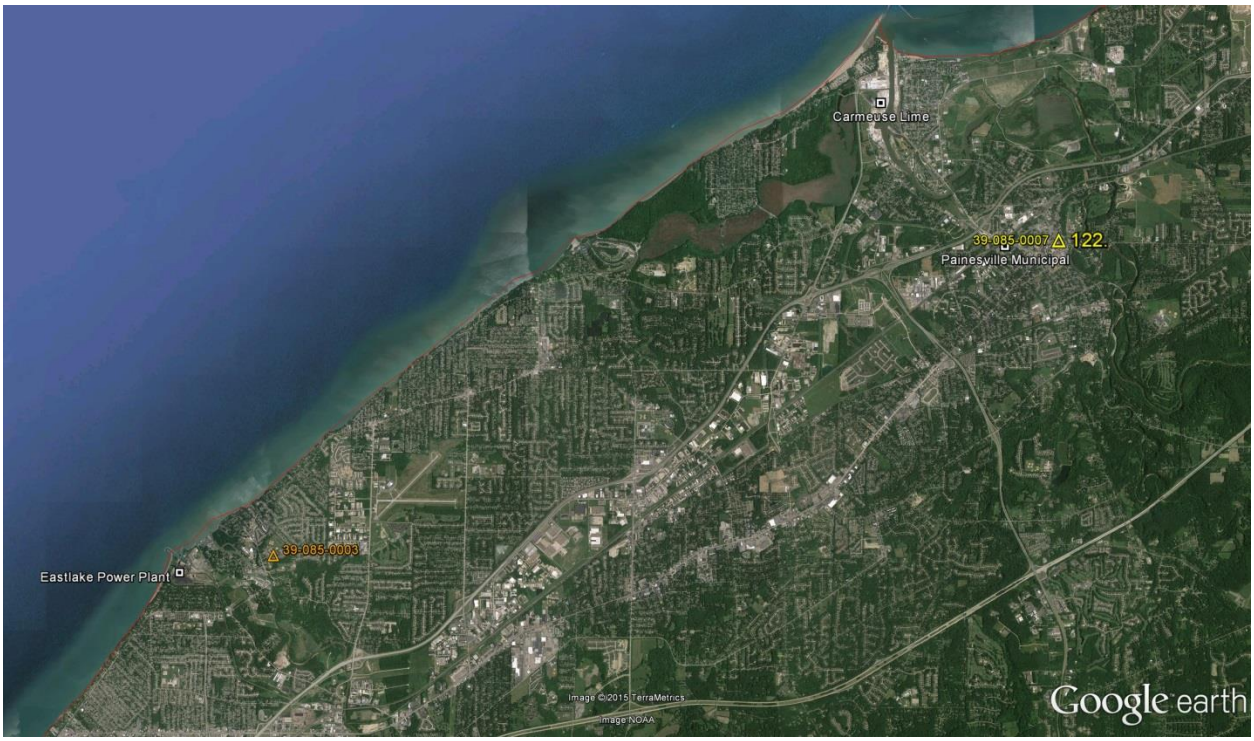

Figure 1: Map of base case scenario with three-year modeled design value at monitor 39-085-0007.

Future Case Analysis

As described previously, the future case analysis consists of three separate modeling scenarios. The first assessed the impact of each facility when modeled individually for the 2008-2012 period at permitted emission rates. The results of this analysis informed the second analysis, which established a "ceiling rate" for each facility that is sufficient to eliminate any facility specific exceedances in the modeling domain. The second analysis modeled each facility interactively to determine the combined impact of the emission units when modeled at their previously established ceiling rates. The final modeling analysis for the future case represents the final attainment strategy for all facilities, and demonstrates modeled attainment of the standard at all receptors in the modeling domain.

Emission Sources

All future case modeling scenarios utilized fixed emission rates at all sources included in the modeling domain. Table 3 shows the relevant stack parameters and rates modeled for each step of the future attainment demonstration. The results of each step are discussed in the "Results" section below. Ohio EPA is excluding the locations and base elevations for sources shown in Table 3, as they are identical to those given in Table 1 for the base case modeling scenario. Further, no emissions from Eastlake Units B004

and B005 were included in the future case as these units are no longer operating and will be accounted for in Ohio's SO2 nonattainment SIP as permanently shut down.

	Source ID	Stack Height	Temperature	Exit Velocity	Stack Diameter	Permitted SO2 Rate	Ceiling SO2 Rate	Attainment SO2 Rate
		(m)	(K)	(m/s)	(m)	(lb/hr)	(lb/hr)	(lb/hr)
Eastlake Power Plant	B001_EL	164.592	399.82	11.552	3.6576	7473	1160.79	1158.89
	B002_EL	164.592	399.82	11.552	3.6576	7473	1160.79	1158.89
	B003_EL	164.592	399.82	11.552	3.6576	7473	1160.79	1158.89
	B004_EL	164.592	399.82	11.552	4.8768	0 (Shutdown)	0 (Shutdown)	0 (Shutdown)
	B005_EL	182.880	386.48	9.906	7.3152	0 (Shutdown)	0 (Shutdown)	0 (Shutdown)
Painesville Municipal	B001_PV	47.854	439.26	11.467	2.4384	1126.7	386.92 or	362.997 or
	B003_PV	52.121	449.82	7.907	3.4534	1126.7	441.66	430.499
	B004_PV	52.121	449.82	7.907	3.4534	1126.7		
Carmeuse Lime	P001_CL	44.501	495.37	16.459	3.2842	230	230	230
	P002_CL	44.501	495.37	16.459	3.2842	260	260	260

Table 3: Stack parameters and future case emission rates for all modeled scenarios, 2008-2012.

Receptors

A total of 14,680 receptors were included in the modeling domain. 50 meters spacing within a 1 km radius of each facility was used. 100 meters spacing was used within 2.5 km of each facility, 250 meters spacing was used within a radius of 5 km from each facility, and a 500 meters spacing was used within a 10 km radius of each facility. Beyond 10 km, 1000 meters spacing was used. A discrete receptor was also included at the location of the monitor, as was done in the base case scenario. Figure 1 shows the location of each facility as well as the receptor grid used for all future case modeling scenarios.

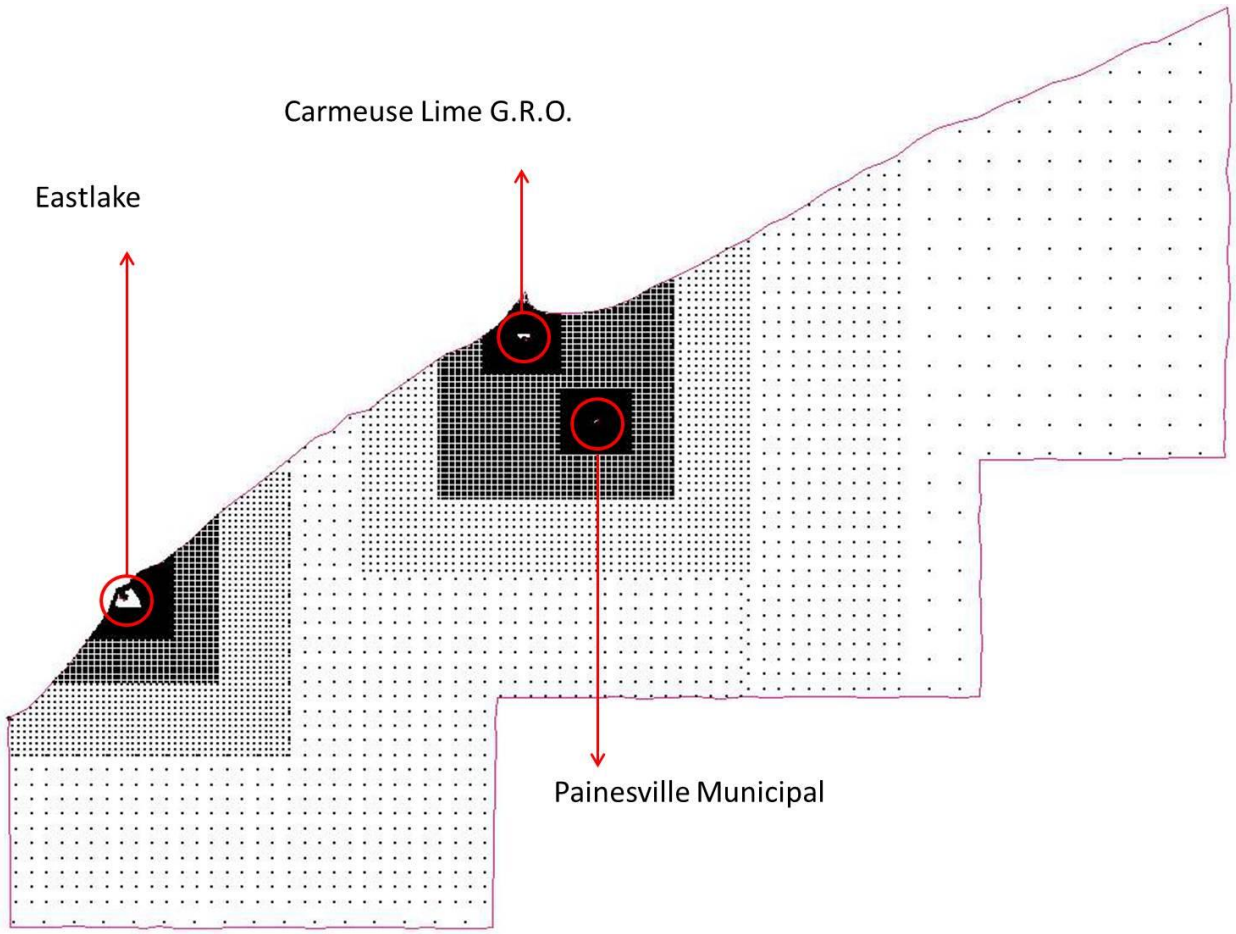

Figure 2: Receptor grid and modeled facilities, Lake County nonattainment area.

Meteorology

All future case analyses were based on 5-years of meteorological data (2008-2012) as described in the general meteorology section at the beginning of this document and following U.S. EPA guidance with respect to the determination of SO2 design values.

Results

The first future case analysis evaluated the individual impact of each facility as a design value when modeled at their permitted SO2 emission rate. The maximum modeled impact of each facility is shown in Table 4. Any maximum impact over 169.20290 ug/m3 represents a modeled exceedance if background is not considered. Modeled design values above 196.2 ug/m3 represent exceedances when the background is considered.

	Source ID	Stack Height	Temperature	Exit Velocity	Stack Diameter	Permitted SO2 Rate	Max Design Value, with background
		(m)	(K)	(m/s)	(m)	(lb/hr)	(ug/m3)
Eastlake Power Plant	B001_EL	164.592	399.82	11.552	3.6576	7473	1116.28198
	B002_EL	164.592	399.82	11.552	3.6576	7473	
	B003_EL	164.592	399.82	11.552	3.6576	7473	
	B004_EL	164.592	399.82	11.552	4.8768	0 (Shutdown)	
	B005_EL	182.880	386.48	9.906	7.3152	0 (Shutdown)	
Painesville Municipal	B001_PV	47.854	439.26	11.467	2.4384	1126.7	1372.59878
	B003_PV	52.121	449.82	7.907	3.4534	1126.7	
	B004_PV	52.121	449.82	7.907	3.4534	1126.7	
Carmeuse Lime	P001_CL	44.501	495.37	16.459	3.2842	230	190.85692
	P002_CL	44.501	495.37	16.459	3.2842	260	

Table 4: Maximum design value individual facility impacts at permitted SO2 rates, 2008-2012.

The results in Table 4 clearly demonstrate that reductions in SO2 emission rates were required for both the Eastlake and Painesville facilities. The maximum five-year design value for Carmeuse Lime did not model any exceedances of the standard.

Using these results and the results generated by the MAXDCONT file, Ohio EPA determined unit-specific ceiling emission rates that would eliminate individual facility exceedances. Ohio EPA then modeled each facility individually at these ceiling rates, and subsequently modeled all facilities interactively/combined at those same ceiling rates. Based on outreach, Painesville Municipal indicated to Ohio EPA that a portion of their compliance plan would be a permit modification allowing only one unit at a time to operate (B003 and B004 share a common stack). Thus, Ohio EPA considered this restriction in both the individual ceiling rate analysis and in the interactive/combined modeling scenarios. Table 5 shows the results of both the individual and interactive modeling analysis performed using ceiling rates. Results for Painesville Municipal in Table 5 indicate the operational restrictions noted above.

<table>
<tr><th></th><th>Source ID</th><th>Ceiling SO2 Rate</th><th>Individual Max Design Value(Ceiling Rate, with background)</th><th>Combined Design Value from Interactive Analysis (Ceiling Rates, with background)</th></tr>
<tr><td></td><td></td><td>(lb/hr)</td><td>(ug/m3)</td><td>(ug/m3)</td></tr>
<tr><td rowspan="5">Eastlake Power Plant</td><td>B001_EL</td><td>1160.79</td><td rowspan="5">196.2</td><td rowspan="9">203.41612 (B001_PV only) or 199.06598 (B003_PV and B004_PV only)</td></tr>
<tr><td>B002_EL</td><td>1160.79</td></tr>
<tr><td>B003_EL</td><td>1160.79</td></tr>
<tr><td>B004_EL</td><td>0 (Shutdown)</td></tr>
<tr><td>B005_EL</td><td>0 (Shutdown)</td></tr>
<tr><td rowspan="3">Painesville Municipal</td><td>B001_PV</td><td>386.92 or</td><td>196.2 or</td></tr>
<tr><td>B003_PV</td><td rowspan="2">441.66</td><td rowspan="2">196.2</td></tr>
<tr><td>B004_PV</td></tr>
<tr><td rowspan="2">Carmeuse Lime</td><td>P001_CL</td><td>230</td><td rowspan="2">190.85692</td></tr>
<tr><td>P002_CL</td><td>260</td></tr>
</table>

Table 5: Maximum design value impacts at ceiling rates, individual and combined impacts, 2008-2012.

The results shown in Table 5 indicate that the ceiling rates determined by Ohio EPA eliminate all facility specific hotspots when modeled alone (compared to 196.2 ug/m3). However, the combined impacts of all facilities in the interactive analysis and under both operating scenarios at Painesville Municipal demonstrate exceedances of the standard, necessitating further reductions to demonstrate area-wide attainment of the standard.

To allocate the final reductions necessary to demonstrate modeled attainment of the standard, Ohio EPA considered several factors. Firstly, the results of the base case indicate that Carmeuse Lime contributed very little to modeled exceedances at the monitor location, while Eastlake and Painesville Municipal contributed significantly to modeled exceedances. Further, modeling of Carmeuse Lime at permitted rates did not demonstrate any exceedances of the standard. Therefore, further reductions necessary to model area-wide attainment of the standard will be limited to Eastlake and Painesville Municipal. Table 6 shows the MAXDCONT output for all exceedances of the standard generated from the interactive ceiling rate analysis. For clarity with respect to facility specific contributions, Ohio EPA is not including background concentration in Table 6. Thus, all modeled values exceeding 169.2029 ug/m3 are considered exceedances here.

Lake County 2008-2012 Ceiling Rate MAXDCONT Results: B001 Only Scenario at Painesville Municipal																
* X	Y	AVERAGE CONC	ZELEV	ZHILL	ZFLAG	AVE	GRP	RANK	NET ID	CONT ALL	CONT B001_EL	CONT B002_EL	CONT B003_EL	CONT B001_PV	CONT P001_CL	CONT P002_CL
480122.1	4613005	176.419	277.81	277.81	0	1-HR	ALL	4TH		176.419	0.00001	0.00001	0.00001	116.70567	28.0287	31.68462
480622.1	4612505	174.70981	291.21	291.21	0	1-HR	ALL	4TH		174.70981	0.00004	0.00004	0.00004	174.50775	0.09479	0.10715
480122.1	4612505	174.5207	285.41	285.41	0	1-HR	ALL	4TH		174.5207	0.00002	0.00002	0.00002	108.9019	30.80064	34.81811
465427.1	4614405	169.47385	187.28	187.28	0	1-HR	ALL	4TH		169.47385	56.39997	56.39997	56.39997	0.13088	0.06715	0.07591
465027.1	4614405	169.34594	186.69	186.69	0	1-HR	ALL	4TH		169.34594	56.3693	56.3693	56.3693	0.11464	0.05793	0.06548
465327.1	4614405	169.32641	187.4	187.4	0	1-HR	ALL	4TH		169.32641	56.35035	56.35035	56.35035	0.13162	0.06747	0.07627

Lake County 2008-2012 Ceiling Rate MAXDCONT Results: B003 and B004 Only Scenario at Painesville Municipal																	
* X	Y	AVERAGE CONC	ZELEV	ZHILL	ZFLAG	AVE	GRP	RANK	NET ID	CONT ALL	CONT B001_EL	CONT B002_EL	CONT B003_EL	CONT B003_PV	CONT B004_PV	CONT P001_CL	CONT P002_CL
480122.1	4612005	172.06886	296.13	296.13	0	1-HR	ALL	4TH		172.06886	0.00005	0.00005	0.00005	56.72541	56.72541	27.51453	31.10338
476122.1	4610505	171.37464	299.04	310.78	0	1-HR	ALL	4TH		171.37464	0.00004	0.00004	0.00004	71.24347	71.24347	13.55948	15.32811
480622.1	4612005	169.56082	295.56	295.56	0	1-HR	ALL	4TH		169.56082	0.00005	0.00005	0.00005	84.45512	84.45512	0.30531	0.34513
465427.1	4614405	169.48372	187.28	187.28	0	1-HR	ALL	4TH		169.48372	56.39997	56.39997	56.39997	0.07037	0.07037	0.06715	0.07591
465027.1	4614405	169.35366	186.69	186.69	0	1-HR	ALL	4TH		169.35366	56.3693	56.3693	56.3693	0.06118	0.06118	0.05793	0.06548
465327.1	4614405	169.33634	187.4	187.4	0	1-HR	ALL	4TH		169.33634	56.35035	56.35035	56.35035	0.07077	0.07077	0.06747	0.07627

Table 6: 2008-2012 MAXDCONT results for interactive ceiling rate analyses.

As shown in Table 6, both operating scenarios at Painesville Municipal, with all facilities modeled at previously established ceiling rates, result in 6 receptors exceeding the standard. Under both scenarios, three exceedances demonstrate that the major contributor is emissions from Painesville Municipal, and three exceedances demonstrate that the major contributor is emissions from Eastlake. Emissions from Carmeuse Lime contribute significantly at some receptors. However, Ohio EPA has previously established that the minimal modeled impact of emissions from Carmeuse Lime at the monitor location, and thus no emission rate reductions at the Carmeuse Lime facility are required. Further, examination of the impacts of both the Eastlake and Painesville facilities to the exceedances shown in Table 6 indicate that reductions at only a single facility will not yield modeled attainment at all monitors in the modeling domain. Thus, Ohio EPA applied further reductions to both the Eastlake and Painesville Municipal facilities that will demonstrate modeled attainment of the standard at all receptors.

The above results and subsequent reductions yielded final emission rates necessary to model attainment at all receptors in the modeling domain. These final attainment rates are given in the last column of Table 3, above and are replicated in Table 7, below. Both operating scenarios were analyzed, and the results of these final modeling analyses are shown in Table 7.

	Source ID	Final Attainment SO2 Rate	Combined Design Value Impacts (Attainment Rates, with background)
		(lb/hr)	(ug/m3)
Eastlake Power Plant	B001_EL	1158.89	196.2 (B001_PV only) or 196.2 (B003_PV and B004_PV only)
	B002_EL	1158.89	
	B003_EL	1158.89	
	B004_EL	0 (Shutdown)	
	B005_EL	0 (Shutdown)	
Painesville Municipal	B001_PV	362.997 **or**	
	B003_PV	430.499	
	B004_PV		
Carmeuse Lime	P001_CL	230	
	P002_CL	260	

Table 7: Maximum design value impacts at attainment rates, 2008-2012.

Figure 3, below, shows the full modeling domain used in the attainment demonstration for the operation of only boiler B001 at Painesville Municipal and all other facilities at the rates shown in Table 7. The highest modeled five-year design value is highlighted, exclusive of background. Figure 4 shows the same modeling domain, and represents

the operation of boilers B003 and B004 only at Painesville Municipal and all other facilities at the rates shown in Table 7.

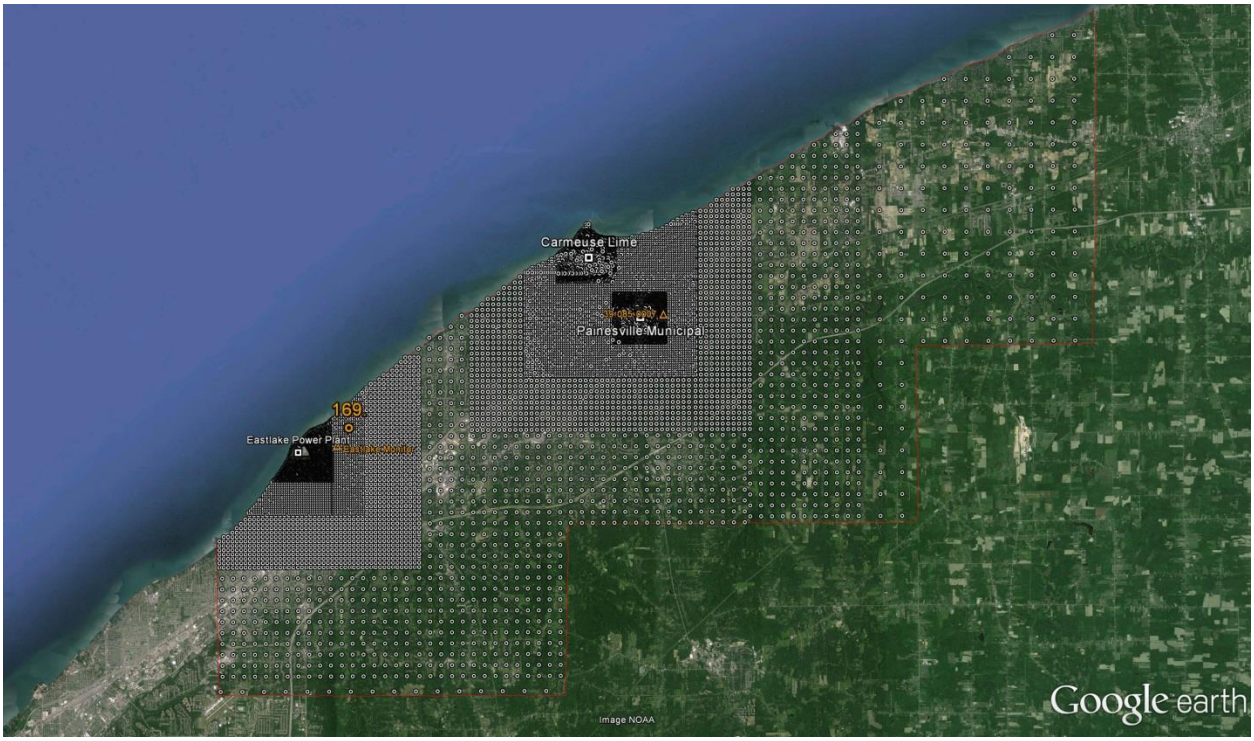

Figure 3: Attainment demonstration, interactive modeling with only B001 at Painesville operating.

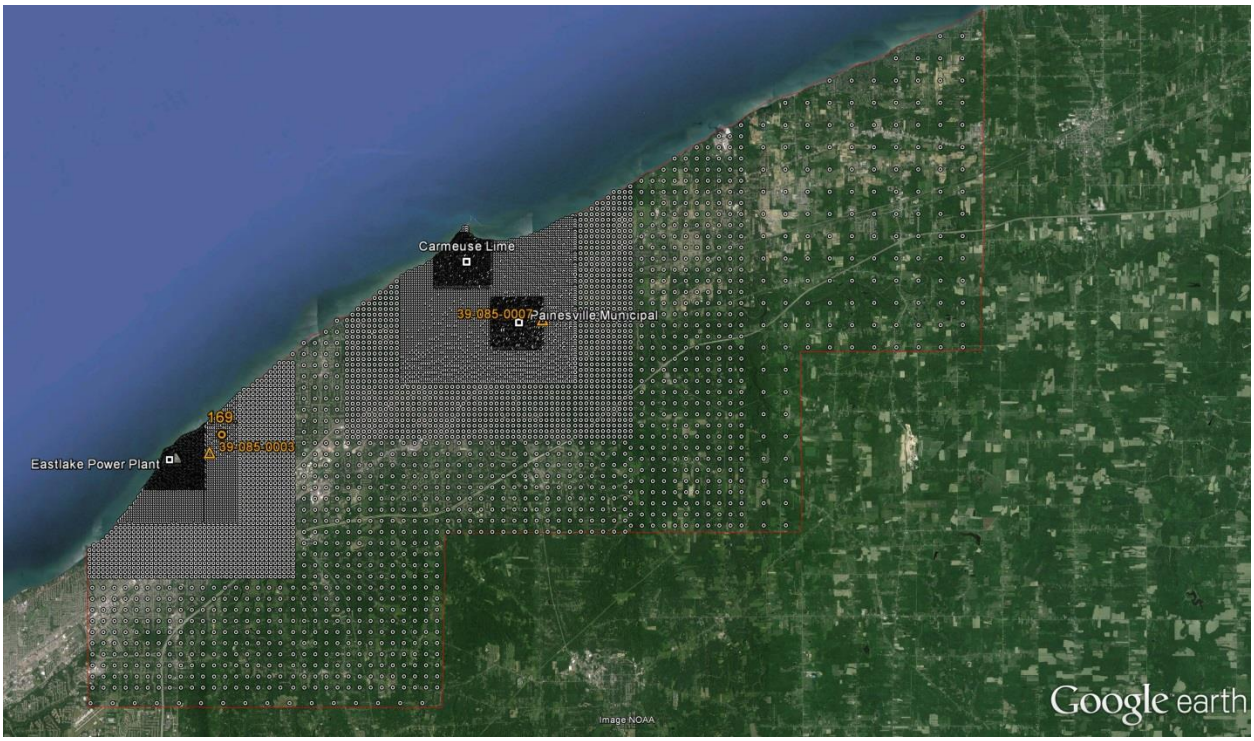

Figure 4: Attainment demonstration, interactive modeling with only B003 and B004 at Painesville operating.