January 6, 2017

Administrator Gina McCarthy
U.S. Environmental Protection Agency
Room 3000
William Jefferson Clinton Building – Mail Code 1101A
1200 Pennsylvania Avenue NW
Washington, DC 20460

Via e-mail: McCarthy.Gina@epa.gov and Federal Express

Re: Petition for Reconsideration of Air Quality Designation for Gallia County, Ohio for the 2010 Sulfur Dioxide (SO2) Primary National Ambient Air Quality Standard – Round 2; Final Rule, EPA-HQ-OAR-2014-0464, FRL-9948-87-OAR

Dear Administrator McCarthy:

Pursuant to Section 307(d)(7)(B) of the Clean Air Act ("CAA" or "Act"), Sierra Club hereby petitions the Administrator of the Environmental Protection Agency ("EPA" or "Agency") to reconsider her decision to designate the Gallia County, Ohio area surrounding the Gavin and Kyger coal-burning plants as unclassifiable for the 2010 sulfur dioxide ("SO2") National Ambient Air Quality Standard ("NAAQS") in the final rule, Air Quality Designations for the 2010 Sulfur Dioxide (SO2) Primary National Ambient Air Quality Standard – Round 2, 81 Fed. Reg. 45,039, 45,053 (July 12, 2016) ("SO2 Designation Rule").

In the Ohio Technical Support Document for the SO2 Designation Rule, EPA determined that it could not designate Gallia County as nonattainment based on Sierra Club's air dispersion modeling showing SO2 NAAQS exceedances.[1] After the close of the comment period for the proposed SO2 designations, however, EPA issued designations for the SO2 NAAQS for four areas in Texas, along with accompanying technical support and response to comment documents, that are inconsistent with EPA's rejection of Sierra Club's modeling for Gallia County. *See* 81 Fed. Reg. 89,870 (Dec. 13, 2016) (the "Texas Four Areas Rule.").[2] In the Texas Four Areas

[1] EPA, Final Technical Support Document, Ohio, Area Designations for the 2010 SO2 Primary National Ambient Air Quality Standard (undated, posted June 30, 2016) ("Final Ohio TSD") at 21, *available at* https://www.epa.gov/sites/production/files/2016-07/documents/r5_oh_final_designation_tsd_06302016.pdf.

[2] EPA, Technical Support Document for the Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standards (NAAQS) – Supplement for Four Areas in Texas Not Addressed in June 30, 2016, Version (Nov. 29, 2016) ("TSD for Texas Four Areas Rule"), *available at* https://www.regulations.gov/document?D=EPA-HQ-OAR-2014-0464-0434; Responses to Significant Comments on the Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standards (NAAQS)

Rule, EPA relied on Sierra Club's modeling as a basis for nonattainment designations for three counties. Most notably, in the Texas Four Areas Rule, EPA relied on the rationale that Sierra Club's modeling would demonstrate nonattainment even if some input adjustments were made because the modeling showed significant exceedances of the SO2 NAAQS standard. In contrast, in its Gallia County designation, EPA did not consider that Sierra Club's modeling showed significant exceedances of the NAAQS, and EPA did not consider whether the modeling would still show exceedances even if EPA's concerns about the modeling were addressed. Additionally, in its Gallia County designation, EPA rejected the same missing data substitution procedures that it recognized as consistent with EPA guidance in the Texas Four Areas Rule. If EPA were to employ the same rationale it used in the Texas Four Areas Rule in the Gallia County Designation Rule, then EPA likely would designate Gallia County as nonattainment.

Thus, the Texas Four Areas Rule provides a strong basis for EPA to reconsider its decision designating Gallia County as unclassifiable that arose after the period for public comment (and/or it was impracticable to raise these objections during the comment period) and is of central relevance to the outcome of the rule. The Administrator must therefore convene a proceeding for reconsideration in accordance with § 307(d)(7)(B) of the Act, 42 U.S.C. § 7607(d)(7)(B). Sierra Club urges EPA to issue a final nonattainment designation for Gallia County based on the overwhelming evidence that demonstrates that the Gavin and Kyger Creek coal-burning plants will continue to cause exceedances of the SO2 NAAQS absent federally enforceable emissions reductions, and to adopt the rationale EPA employed in the Texas Four Areas Rule.

I. The Grounds For These Objections Arose After The Close Of The Public Comment Period.

In its February 16, 2016 letter and accompanying Technical Support Document (Ohio Draft TSD),[3] EPA proposed an unclassifiable designation for Gallia County and a portion of Meigs County because it found that there was no reliable evidence of the area's attainment status. EPA rejected Sierra Club's September 2015 air dispersion modeling that showed actual emissions from the Gavin plant by itself, without inclusion of background SO2 levels, has 99th percentile 1-hour daily maximum impacts of 262.7 µg/m3, vastly exceeding the 2010 NAAQS of 196.2 µg/m3.[4] With background, and with the inclusion of emissions from the Kyger Creek and Mountaineer coal plants, Sierra Club's modeling showed 99th percentile 1-hour daily maximum SO2 concentrations are 289.7 µg/m3.[5] EPA also rejected Ohio EPA's modeling that showed a

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– Supplement for Four Areas in Texas Not Addressed in June 30, 2016, Version (Nov. 29, 2016), *available at* https://www.regulations.gov/document?D=EPA-HQ-OAR-2014-0464-0438.

[3] Ltr. from Robert A. Kaplan, Acting Regional Administrator, EPA Region 5, to Honorable John Kasich, Governor of Ohio (Feb. 16, 2016) (proposing an unclassifiable designation for Gallia and parts of Meigs Counties under 2010 1-hour sulfur dioxide National Ambient Air Quality Standard), *available at* https://www.epa.gov/sites/production/files/2016-03/documents/oh-epa-resp-r2.pdf; Draft Technical Support Document: Ohio Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard (hereinafter "Draft Ohio TSD"), *available at* https://www.epa.gov/sites/production/files/2016-03/documents/oh-epa-tsd-r2.pdf.

[4] Gavin Power Plant, Cheshire, Ohio, Evaluation of Compliance with the 1-hour NAAQS for SO2, Wingra Engineering, S.C., Sept. 16, 2015, at 4, Table 1, attached as Appendix D Exhibit 1 to Sierra Club's March 31, 2016 Comments on EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standard, Docket ID No. EPA–HQ–OAR–2014–0464 (attached as Exhibit 1).

[5] *Id*.

peak impact of 188.3 µg/m3, just below the 196.2 µg/m3 NAAQS, because the state used two low-wind-speed beta options that are not approved for regulatory use.[6]

After EPA issued its proposed unclassifiable designation in 2016, in further support of a nonattainment designation for Gallia County, Sierra Club submitted supplemental modeling that incorporated more-recent data and responded to concerns raised by Ohio EPA about Sierra Club's 2015 modeling. Specifically, Sierra Club's supplemental 2016 modeling: (i) uses emission data from EPA's Emissions Modeling Clearinghouse[7] and includes variable hourly exit velocities; (ii) does not include Mountaineer as an explicitly modeled source; (iii) adopts the State of Ohio's background concentration; and (iv) relies on the actual stack configuration for Kyger Creek.[8]

For the year 2015, for which Emissions Modeling Clearinghouse data were not then available, Sierra Club's modeling utilized Clean Air Markets Database and calculated hourly exit velocities based on facility-reported hourly heat input. Sierra Club used actual emissions over 2012-2014 and found peak impacts from Gavin alone with no background of 207.8 µg/m3 and peak impacts with Kyger Creek and Ohio EPA's background included of 240.8 µg/m3. Sierra Club also used actual emissions over 2013-2015 and found peak impacts from Gavin alone with no background of 193.5 µg/m3 (just below the standard), and peak impacts with Kyger Creek and Ohio EPA's background include of 239.0 µg/m3. Sierra Club's supplemental modeling also analyzed what Ohio EPA's September 2015 results would have been had Ohio EPA not selected the unapproved beta options. To do this analysis, Sierra Club obtained Ohio EPA's modeled inputs and then used those inputs (i.e., Ohio EPA's emissions inventory) in the model without selecting the beta options. This analysis resulted in a peak impact of 217.3 µg/m3 from both plants with no background and of 243.5 µg/m3 when Ohio EPA's fixed background was included.

Ohio EPA also submitted new modeling in April 2016 that resulted in peak impacts of 195.4 µg/m^3, conspicuously just under the SO2 NAAQS standard of 196.2 µg/m^3. Instead of using a fixed background concentration as before, Ohio EPA used a temporarily varying background analysis, which was derived from readings from the nearest air monitor during hours when winds blew in directions other than from Gavin and Kyger Creek. This analysis resulted in background concentrations varying between 4.22 µg/m^3 and 36.55 µg/m^3, which Ohio EPA then further reduced by 38% to 2.62 µg/m^3 and 22.66 µg/m^3. Ohio EPA's April 2016 modeling Ohio did not provide an assessment of peak impacts without the 38% adjustment to background concentrations.

In July 2016, EPA finalized an unclassifiable designation for Gallia County. EPA found the 38% reduction in background in Ohio EPA's April 2016 modeling was not reasonable and

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[6] Draft Ohio TSD at 28.

[7] EPA Emissions Modeling Clearinghouse, *available at* https://www.epa.gov/chief.

[8] Gavin Power Plant, Cheshire, Ohio, Evaluation of Compliance with the 1-hour NAAQS for SO2, Wingra Engineering, S.C., Mar. 29, 2016, at 3-4, attached as Appendix D Exhibit 3 to Sierra Club's March 31, 2016 Comments on EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standard, Docket ID No. EPA–HQ–OAR–2014–0464 (attached as Exhibit 2).

rendered its analysis unreliable.[9] Although EPA acknowledged that Ohio EPA's analysis showed peak impacts just under the standard (195.4 µg/m3 against a standard of 196.2 µg/m3), it did not ask Ohio EPA to provide a modeling analysis without the 38% reduction in background or attempt a correction itself. Importantly, such a correction could have been easily accomplished. If EPA had simply added the lowest recorded background level (before the 38% reduction was applied) to the maximum modeled impact (a conservative adjustment because the chance that maximum modeled impact would happen to occur at the same time as the lowest background value is low) the resulting value would have been above the SO2 standard: 195.4 $\mu g/m^3$ + 1.6 $\mu g/m^3$ = 197 $\mu g/m^3$. EPA did not address Sierra Club's modeling results that relied on Ohio EPA's emissions inputs that excluded use of the low-wind-speed beta options. EPA also rejected Sierra Club's supplemental 2016 modeling because of purportedly unexplained issues with emission data substitution. EPA did not seek clarification about how Sierra Club had performed such data substitution despite the fact that Sierra Club's modeling showed massive exceedances of the SO2 NAAQS. In fact, as Sierra Club explained in its comments to EPA, the Sierra Club used the accepted method of substituting data from EPA's clearinghouse for periods where there was no CAMD data available.[10]

On November 29, 2016, EPA issued a technical support document and response to comments for four areas in Texas, and the Texas Four Areas Rule was published on December 13, 2016. *See* 81 Fed. Reg. 89,870.[11] The Texas Four Areas Final Rule designates three areas as nonattainment based on modeling submitted by the Sierra Club that is based on substantially similar protocols by the same air dispersion modelers as the Sierra Club's Ohio modeling. However, EPA's evaluation of Sierra Club's modeling for Texas differed significantly from its approach in Ohio.

EPA acknowledged that Sierra Club's modeling data for Freestone County, Texas "was performed in accordance with appropriate EPA modeling guidance and using generally conservative assumptions."[12] Moreover, EPA concluded that "the Sierra Club's modeling results are likely underestimating the maximum impacts," and considered that because Sierra Club's modeled concentrations were much higher than the standard, potential adjustments would not change the nonattainment result.[13] Similarly, for Camp County, Texas, EPA considered that the modeled concentrations are 8% above the standard and found that "The Sierra Club modeling was deliberately conservative in many respects, *i.e.*, included several techniques which generally would tend to underestimate design value concentrations from the model."[14] Again for Rusk County, Texas, EPA gave significant weight to the fact that Sierra Club's modeled concentrations were 14-22% above the standard, signifying that the standard would still be violated even if changes suggested by industry were made to the modeling.[15]

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[9] Final Ohio TSD at 21.
[10] *See* Gavin Power Plant, Cheshire, Ohio, Evaluation of Compliance with the 1-hour NAAQS for SO2, Wingra Engineering, S.C., Mar. 29, 2016, at 3-4, attached as Appendix D Exhibit 3 to Sierra Club's March 31, 2016 Comments on EPA Responses to Certain State Designation Recommendations for the 2010 Sulfur Dioxide National Ambient Air Quality Standard, Docket ID No. EPA–HQ–OAR–2014–0464 (attached as Exhibit 2).
[11] *See* supra note 2.
[12] TSD for Texas Four Areas Rule at 8.
[13] TSD for Texas Four Areas Rule at 28.
[14] TSD for Texas Four Areas Rule at 48-50.
[15] TSD for Texas Four Areas Rule at 76-77.

Additionally, in the Final Texas Four Areas Rule, EPA acknowledged that the missing data substitution protocol employed by Sierra Club's modeler was consistent with EPA guidance.

> Sierra Club's modeling did follow accepted practices. Exit velocities were derived from the hourly flow rates and heat input in the USEPA Clearinghouse and CAMD databases. The Clearinghouse emissions and exit velocities for 2013-2014 were supplemented with CAMD emissions for 2015. Sierra Club derived the velocities for 2015 were derived from the hourly heat input reported in CAMD. Our assessment of the modeling data indicates it was performed mostly in accordance with appropriate EPA modeling and SO2 TAD guidance and using generally conservative assumptions.[16]

II. The Objections Raised Are Of Central Relevance To The Outcome Of The Rule.

EPA's rationale in the Texas Four Areas Rule was not available until November 29, 2016, well after the close of the comment period. If EPA were to take a consistent approach to consideration of Sierra Club's modeling in the Texas Four Areas Rule and Gallia County, Ohio designation, then EPA should consider whether any potential adjustments to Sierra Club's Ohio modeling would impact the ultimate findings of such large concentrations over the standard. Given its approach in the Texas Four Areas Rule, EPA should also reconsider whether Sierra Club's missing data substitution procedures were consistent with EPA guidance. EPA should also confirm that adjustments to Ohio EPA's modeling would show NAAQS violations, given that Ohio's modeling predicted impacts only a very small amount below the standard (with no background) and that simply adding the lowest actual background reading to the modeled impacts results in a value above the standard.

III. Conclusion

Sierra Club therefore urges EPA to grant this Petition and convene a proceeding for reconsideration in accordance with § 307(d)(7)(B) of the Act, 42 U.S.C. § 7607(d)(7)(B).

Respectfully submitted,

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[16] TSD for Texas Four Areas Rule at 27; see also *id*. at 39.

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Exhibit 1

Gavin Power Plant

Cheshire, Ohio

Evaluation of Compliance with the 1-hour NAAQS for SO_2

September 16, 2015

Conducted by:

Steven Klafka, P.E., BCEE

Wingra Engineering, S.C.

Madison, Wisconsin

1. Introduction

Wingra Engineering, S.C. was hired by Sierra Club to conduct an air modeling impact analysis to help the U.S. Environmental Protection Agency (USEPA), state and local air agencies identify facilities that are likely causing exceedances of the 1-hour sulfur dioxide (SO_2) national ambient air quality standard (NAAQS). This document describes the results and procedures for an evaluation conducted for the Gavin Power Plant located in Cheshire, Ohio.

To ensure the modeling analysis reflected the cumulative concentration of SO_2 emissions, it included emissions from the following additional sources of SO_2 emissions located within 50 kilometers of the Gavin Power Plant:

- Kyger Creek Station – Cheshire, Ohio
- Mountaineer Plant – New Haven, West Virginia

The dispersion modeling analysis predicted ambient air concentrations for comparison with the 1-hour SO_2 NAAQS. The modeling was performed using the most recent version of AERMOD, AERMET, and AERMINUTE, with data provided to Sierra Club by regulatory air agencies or obtained through other publicly-available sources as documented below. The analysis was conducted in adherence to all available USEPA guidance for evaluating source impacts on attainment of the 1-hour SO_2 NAAQS via aerial dispersion modeling, including the AERMOD Implementation Guide; USEPA's Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010; modeling guidance promulgated by USEPA in Appendix W to 40 CFR Part 51; USEPA's March 2011 Modeling Guidance for SO_2 NAAQS Designations;[1] and, USEPA's December 2013 SO_2 NAAQS Designations Technical Assistance Document.[2]

2. Compliance with the 1-hour SO_2 NAAQS

2.1 1-hour SO_2 NAAQS

The 1-hour SO_2 NAAQS takes the form of a three-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations, which cannot exceed 75 parts per billion (ppb).[3] Compliance with this standard was verified using USEPA's AERMOD air dispersion model, which produces air concentrations in units of $\mu g/m^3$. The 1-hour SO_2 NAAQS of 75 ppb equals 196.2 $\mu g/m^3$, and this is the value used for determining whether modeled impacts exceed the

[1] http://www.epa.gov/scram001/so2_modeling_guidance.htm
[2] http://www.epa.gov/oaqps001/sulfurdioxide/pdfs/SO2ModelingTAD.pdf
[3] USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010.

NAAQS.[4] The 99th-percentile of the annual distribution of daily maximum 1-hour concentrations corresponds to the fourth-highest value at each receptor for a given year.

2.2 Modeling Results

Modeling results for Gavin Power Plant and the other two power plants are summarized in Table 1. Results are provided for each source alone, and for all sources combined.It was determined that based on either current allowable emissions or measured actual emissions, the Gavin Power Plant is estimated to create downwind SO_2 concentrations which exceed the 1-hour NAAQS.

More specifically, the modeling results presented in Table 1, show exceedances of the NAAQS by the plant's allowable and actual emissions. "Allowable" is the peak emission rate from each unit as approved by the current air quality operation permit for the facility. "Actual" are the measured emissions for each hour between January 1, 2012 and December 31, 2014 as taken from USEPA *Air Markets Program Data*.[5]

In addition, the emissions from the other two power plants significantly contribute to the ambient SO_2 concentration in the area impacted by Gavin Power Plant.

Air quality impacts in Ohio are based on a background concentration of 28.8 $\mu g/m^3$. This is the 2011-13 design value for Allen County, Ohio - the lowest measured background concentration in the state. This is the most recently available design value. See Section 5 for further discussion of the background concentrations used for this analysis.

[4] The ppb to $\mu g/m^3$ conversion is found in the source code to AERMOD v. 14134, subroutine Modules. The conversion calculation is 75/0.3823 = 196.2 $\mu g/m^3$.
[5] http://ampd.epa.gov/ampd/

Table 1 - SO_2 Modeling Results for Gavin Power Plant Modeling Analysis

Emission Rates	Facility	99th Percentile 1-hour Daily Maximum (µg/m³)				Complies with NAAQS?
		Impact	Background	Total	NAAQS	
Allowable	Gavin	4,356.2	28.8	4,385.0	196.2	No
Actual		262.7	28.8	291.5	196.2	No
Allowable	Kyger Creek	1,448.5	28.8	1,477.3	196.2	No
Actual		72.3	28.8	101.1	196.2	Yes
Allowable	Mountaineer	186.6	28.8	215.4	196.2	No
Actual		24.3	28.8	53.1	196.2	Yes
Allowable	All Plants	5,600.5	28.8	5,629.3	196.2	No
Actual		289.7	28.8	318.5	196.2	No

The emissions used for the modeling analysis are summarized in Table 2.

Table 2 - Modeled SO_2 Emissions [6]

Stack ID	Unit ID	Allowable Emissions 30-day Average (lbs/hr)
G01 (Gavin)	Unit 1	88,446
G02 (Gavin)	Unit 2	88,446
K01 (Kyger)	Units 1 to 5	75,850
M01 (Mountaineer)	Unit 1	11,960
All Facilties	All Units	264,701.5

Based on the modeling results, Table 3 provides the emission reductions from current allowable rates necessary to achieve compliance with the 1-hour NAAQS. This assumes a one-hour averaging period for the emission rate and that the emission rate is binding at all times. However, given the conservative aspects of this modeling protocol, it is extremely likely that this limit is too high to protect the NAAQS. For example, startup or shutdown periods were not evaluated. During these periods, decreased gas velocities and temperatures may lead to greater ambient impacts at ground level. Further, the hypothetical emission limitation in Table 3 would allow Gavin Power Plant to consume the entire NAAQS, leaving little to no room for any other source of SO_2 in the area. No

[6] Gavin allowable emissions are taken from Ohio EPA, Final Title V Chapter 3745-77 Permit, Facility ID: 06-27-01-0056, January 30, 2015. Kyger Creek allowable emissions are taken from Ohio EPA, Final Title V Chapter 3745-77 Permit, Facility ID: 06-27-0003, February 2, 1998. Mountaineer Plant allowable emissions are taken from West Virginia DEP, Permit to Operate, No. R30-05300009-2009, April 17, 2009.

margin of safety has been included in the hypothetical emission limitation.

Table 3 - Required Emission Reductions from Gavin Power Plant for Compliance with the 1-hour NAAQS for SO_2

Acceptable Impact (NAAQS - Background) 99th Percentile 1-hour Daily Max ($\mu g/m^3$)	Required Total Facility Reduction Based on Allowable Emissions (%)	Required Total Facility Emission Rate (lbs/hr)	Required Total Facility 1-hour Average Emission Rate (lbs/mmbtu)
167.4	97%	5,285.6	0.22

Predicted exceedances of the 1-hour NAAQS for SO_2 based on allowable emissions extend throughout the region to a maximum distance of 50 kilometers.

Figure 1 shows the extent of NAAQS violations based on allowable emissions from all sources.

Figure 2 shows the extent of NAAQS violations based on actual hourly emissions from all sources.

2.3 Conservative Modeling Assumptions

A dispersion modeling analysis requires the selection of numerous parameters which affect the predicted concentrations. For the enclosed analysis, several parameters were selected which under-predict facility impacts.

Assumptions used in this modeling analysis which likely under-estimate concentrations include the following:

- Allowable emissions are based on a limitation with an averaging period which is greater than the 1-hour average used for the SO_2 air quality standard. Emissions and impacts during any 1-hour period may be higher than assumed for the modeling analysis.
- No consideration of facility operation at less than 100% load. Stack parameters such as exit flow rate and temperature are typically lower at less than full load, reducing pollutant dispersion and increasing predicted air quality impacts.
- No consideration of building or structure downwash. These downwash effects typically increase predicted concentrations near the facility.
- Except for the Kyger Creek and Mountaineer power plants, no consideration of off-site sources. These other sources of SO_2 will increase the predicted impacts.

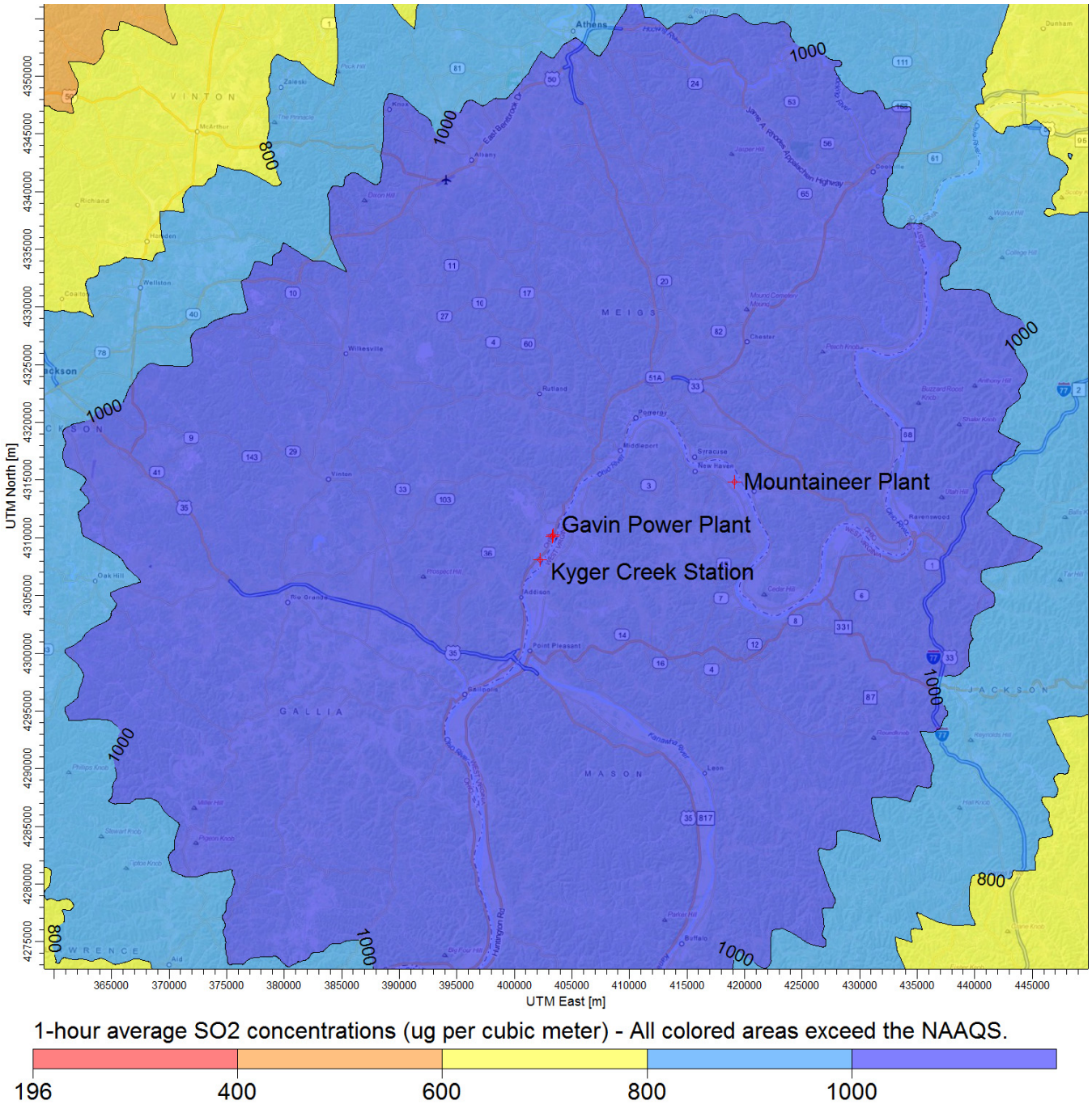

Figure 1 – Region View of Impacts Due to Allowable Emissions from All Facilities

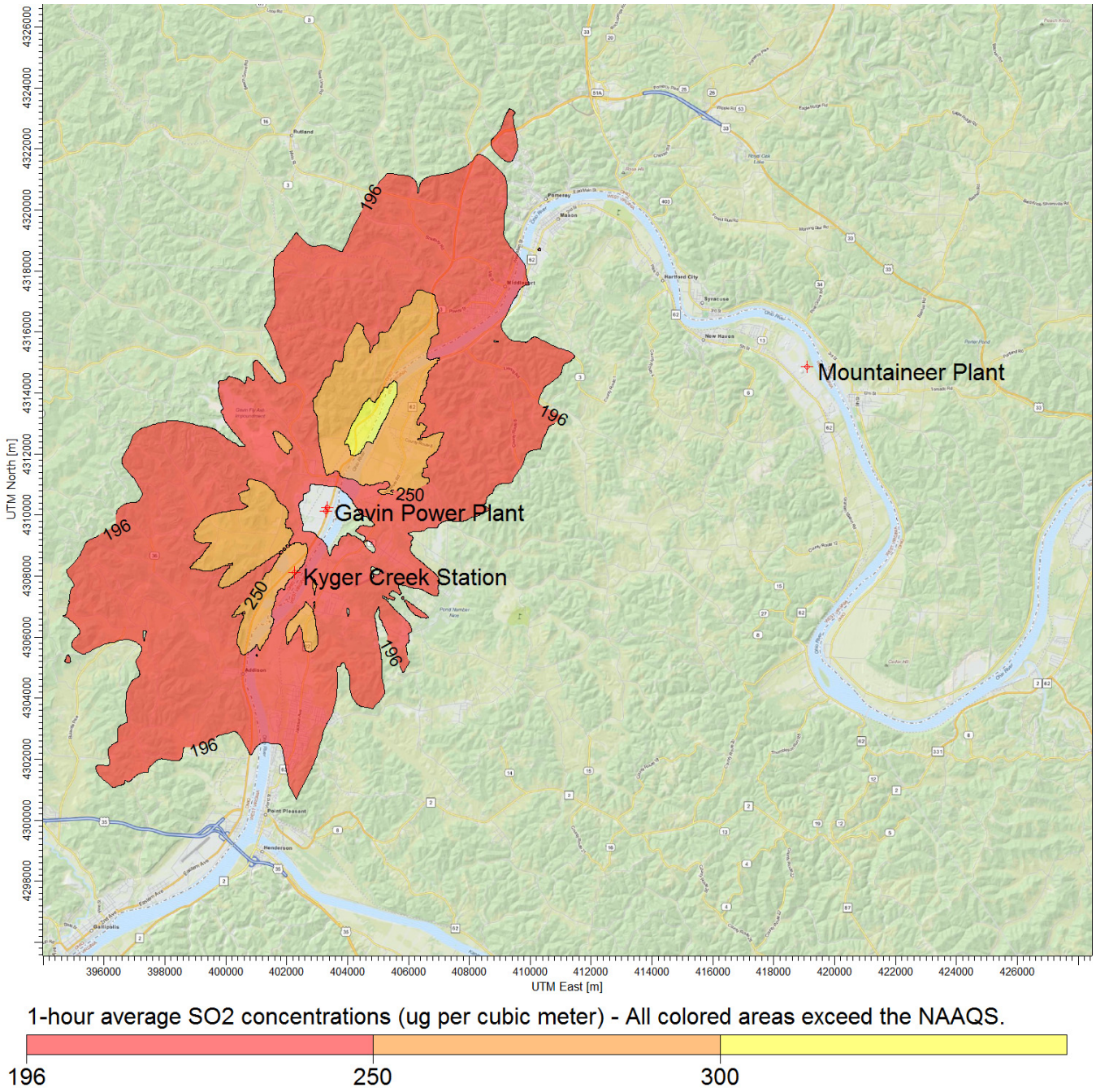

Figure 2 - Regional View of Impacts Due to Actual Emissions for 2012-14 Period from All Facilities

3. Modeling Methodology

3.1 Air Dispersion Model

The modeling analysis used USEPA's AERMOD program, v. 14134. AERMOD, as available from the Support Center for Regulatory Atmospheric Modeling (SCRAM) website, was used in conjunction with a third-party modeling software program, *AERMOD View*, sold by Lakes Environmental Software.

3.2 Control Options

The AERMOD model was run with the following control options:

- 1-hour average air concentrations
- Regulatory defaults
- Flagpole receptors

To reflect a representative inhalation level, a flagpole height of 1.5 meters was used for all modeled receptors. This parameter was added to the receptor file when running AERMAP, as described in Section 4.4.

An evaluation was conducted to determine if the modeled facility was located in a rural or urban setting using USEPA's methodology outlined in Section 7.2.3 of the Guideline on Air Quality Models.[7] For urban sources, the URBANOPT option is used in conjunction with the urban population from an appropriate nearby city and a default surface roughness of 1.0 meter. Methods described in Section 4.1 were used to determine whether rural or urban dispersion coefficients were appropriate for the modeling analysis.

3.3 Output Options

The AERMOD analysis was based on three years of recent meteorological data. The modeling analyses used one run with three years of sequential meteorological data from 2012-2014. Consistent with USEPA's Modeling Guidance for SO_2 NAAQS Designations, AERMOD provided a table of fourth-high 1-hour SO_2 impacts concentrations consistent with the form of the 1-hour SO_2 NAAQS.[8]

Please refer to Table 1 for the modeling results.

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[7] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005.
[8] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 24-26.

4. Model Inputs

4.1 Geographical Inputs

The "ground floor" of all air dispersion modeling analyses is establishing a coordinate system for identifying the geographical location of emission sources and receptors. These geographical locations are used to determine local characteristics (such as land use and elevation), and also to ascertain source to receptor distances and relationships.

The Universal Transverse Mercator (UTM) NAD83 coordinate system was used for identifying the easting (x) and northing (y) coordinates of the modeled sources and receptors. Stack locations were obtained from facility permits and prior modeling files provided by the state regulatory agency. The stack locations were then verified using aerial photographs.

The facility was evaluated to determine if it should be modeled using the rural or urban dispersion coefficient option in AERMOD. A Geographic Information System (GIS) was used to determine whether rural or urban dispersion coefficients apply to a site. Land use within a three-kilometer radius circle surrounding the facility was considered. USEPA guidance states that urban dispersion coefficients are used if more than 50% of the area within 3 kilometers has urban land uses. Otherwise, rural dispersion coefficients are appropriate.[9]

USEPA's AERSURFACE v. 13016 was used to develop the meteorological data for the modeling analysis. This model was also used to evaluate surrounding land use within 3 kilometers. Based on the output from the AERSURFACE, approximately 7.6% of surrounding land use around the modeled facility was of urban land use types including Type 21 – Low Intensity Residential, Type 22 – High Intensity Residential and Type 23 – Commercial / Industrial / Transportation.

This is less than the 50% value considered appropriate for the use of urban dispersion coefficients. Based on the AERSURFACE analysis, it was concluded that the rural option would be used for the modeling summarized in this report. Please refer to Section 4.5.3 for a discussion of the AERSURFACE analysis.

[9] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005, Section 7.2.3.

4.2 Emission Rates and Source Parameters

The modeling analysis considered SO_2 emissions from the Kyger Creek and Mountaineer power plants. Other off-site sources were not considered. Concentrations were predicted for the scenarios shown in Tables 1 and 2:

1) allowable emissions based on the current permit issued by the regulatory agency, and

2) actual hourly emissions measured each hour between January 1, 2012 and December 31, 2014 as taken from USEPA *Air Markets Program Data*.[10]

Stack parameters and emissions used for the modeling analysis are summarized in Table 4.

Table 4 – Facility Stack Parameters and Emissions [11]

Facility	Gavin		Kyger Creek	Mountaineer
Stack	G01	G02	K01	M01
Description	Unit 1	Unit 2	Units 1-5	Unit 1
X Coord. [m]	403338	403295	402253	419097
Y Coord. [m]	4310252	4310124	4308114	4314859
Base Elevation [m]	174.29	174.3	172.36	178.8
Release Height [m]	252.98	252.98	255.42	304.8
Gas Exit Temperature [°K]	323.15	323.15	327.594	327.039
Gas Exit Velocity [m/s]	8.058	8.058	15.512	15.119
Inside Diameter [m]	12.802	12.802	11.887	12.954
Allowable Emission Rate [g/s]	11,140	11,140	9,557	1,507
Actual Emission Rate [g/s]	-	-	-	-

The above stack parameters and emissions were obtained from regulatory agency documents and databases identified in Section 2.2. The analysis was conducted based on 100% operating load using maximum exhaust flow rates and temperatures. Operation at less than full capacity loads was not considered. This assumption tends to under-predict impacts since stack parameters such as exit flow rate and temperature are typically lower at less than full load, reducing pollutant dispersion and increasing predicted air quality impacts. Stack location, height and diameter were verified using aerial photographs, and flue gas flow rate and temperature were verified using combustion calculations.

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[10] http://ampd.epa.gov/ampd/

[11] Gavin stack parameters taken from Ohio EPA, Stars2 Facility Profile, October 1, 2013. Kyger Creek and Mountainer stack parameters were obtained from the annual survey compiled by the U.S. Energy Information Administration. http://www.eia.gov/electricity/data/eia860/

4.3 Building Dimensions

No building dimensions or prior downwash evaluations were available. Therefore this modeling analysis did not address the effects of downwash and this may under-predict impacts.

4.4 Receptors

For Gavin Power Plant, three receptor grids were employed:

1. A 100-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 5 kilometers.
2. A 500-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 10 kilometers.
3. A 1,000-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 50 kilometers. 50 kilometers is the maximum distance accepted by USEPA for the use of the AERMOD dispersion model.[12]

A flagpole height of 1.5 meters was used for all these receptors.

Elevations from stacks and receptors were obtained from National Elevation Dataset (NED) GeoTiff data. GeoTiff is a binary file that includes data descriptors and geo-referencing information necessary for extracting terrain elevations. These elevations were extracted from 1 arc-second (30 meter) resolution NED files. The USEPA software program AERMAP v. 11103 is used for these tasks.

4.5 Meteorological Data

To improve the accuracy of the modeling analysis, recent meteorological data for the 2012-2014 period were prepared using the USEPA's program AERMET which creates the model-ready surface and profile data files required by AERMOD. Required data inputs to AERMET included surface meteorological measurements, twice-daily soundings of upper air measurements, and the micrometeorological parameters surface roughness, albedo, and Bowen ratio. One-minute ASOS data were available so USEPA methods were used to reduce calm and missing hours.[13] The USEPA software program AERMINUTE v. 14237 is used for these tasks.

This section discusses how the meteorological data was prepared for use in the 1-hour SO_2 NAAQS

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[12] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, Section A.1.(1), November 9, 2005.
[13] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, p. 19.

modeling analyses. The USEPA software program AERMET v. 14134 is used for these tasks.

4.5.1 Surface Meteorology

Surface meteorology was obtained for Huntington Tri-State Airport, West Virginia located near the Gavin Power Plant. Integrated Surface Hourly (ISH) data for the 2012-2014 period were obtained from the National Climatic Data Center (NCDC). The ISH surface data was processed through AERMET Stage 1, which performs data extraction and quality control checks.

4.5.2 Upper Air Data

Upper-air data are collected by a "weather balloon" that is released twice per day at selected locations. As the balloon is released, it rises through the atmosphere, and radios the data back to the surface. The measuring and transmitting device is known as either a radiosonde, or rawindsonde. Data collected and radioed back include: air pressure, height, temperature, dew point, wind speed, and wind direction. The upper air data were processed through AERMET Stage 1, which performs data extraction and quality control checks.

For Gavin Power Plant, the concurrent 2012-2014 upper air data from twice-daily radiosonde measurements obtained at the most representative location were used. This location was the Pittsburgh, Pennsylvania measurement station. These data are in Forecast Systems Laboratory (FSL) format and were downloaded in ASCII text format from NOAA's FSL website.[14] All reporting levels were downloaded and processed with AERMET.

4.5.3 AERSURFACE

AERSURFACE is a program that extracts surface roughness, albedo, and daytime Bowen ratio for an area surrounding a given location. AERSURFACE uses land use and land cover (LULC) data in the U.S. Geological Survey's 1992 National Land Cover Dataset to extract the necessary micrometeorological data. LULC data was used for processing meteorological data sets used as input to AERMOD.

AERSURFACE v. 13016 was used to develop surface roughness, albedo, and daytime Bowen ratio values in a region surrounding the meteorological data collection site. AERSURFACE was used to develop surface roughness in a one kilometer radius surrounding the data collection site. Bowen ratio and albedo was developed for a 10 kilometer by 10 kilometer area centered on the meteorological data collection site. These micrometeorological data were processed for seasonal periods using 30-degree sectors. Seasonal moisture conditions were considered average with winter

[14] Available at: http://esrl.noaa.gov/raobs/

months having continuous snow cover.

4.5.4 Data Review

Missing meteorological data were not filled as the data file met USEPA's 90% data completeness requirement.[15] The AERMOD output file shows there were 0.9% missing data.

To confirm the representativeness of the airport meteorological data, the surface characteristics of the airport data collection site and the modeled source location were compared. Since the Huntington Tri-State Airport, West Virginia is located close to Gavin Power Plant, this meteorological data set was considered appropriate for this modeling analysis. [16] This weather station provided high quality surface measurements for the most recent 3-year time, and had similar land use, surface characteristics, terrain features and climate. Finally, the use of meteorological data from the selected surface and upper air stations were recommended by the Ohio Environmental Protection Agency for modeling facilities located in Gallia County.[17]

5. Background SO_2 Concentrations

Background concentrations were determined consistent with USEPA's Modeling Guidance for SO_2 NAAQS Designations.[18, 19] To preserve the form of the 1-hour SO_2 standard, based on the 99th percentile of the annual distribution of daily maximum 1-hour concentrations averaged across the number of years modeled, the background fourth-highest daily maximum 1-hour SO_2 concentration was added to the modeled fourth-highest daily maximum 1-hour SO_2 concentration.[20] Background concentrations were based on the 2011-13 design value measured by the ambient monitors located in Ohio.[21]

6. Reporting

All files from the programs used for this modeling analysis are available to regulatory agencies. These include analyses prepared with AERSURFACE, AERMET, AERMAP, and AERMOD.

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[15] USEPA, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-05, February 2000, Section 5.3.2, pp. 5-4 to 5-5.
[16] USEPA, AERMOD Implementation Guide, March 19, 2009, pp. 3-4.
[17] Ohio EPA, AERMET Output Files for AERMOD Model Input,http://epa.ohio.gov/dapc/model/modeling/metfiles.aspx
[18] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 20-23.
[19] USEPA, SO_2 NAAQS Designations Modeling Technical Assistance Document, Dec. 2013, section 8.1, pp 27-28.
[20] USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010, p. 3.
[21] http://www.epa.gov/airtrends/values.html

Exhibit 2

Gavin Power Plant

Cheshire, Ohio

Evaluation of Compliance with the 1-hour NAAQS for SO_2

March 29, 2016

Conducted by:

Steven Klafka, P.E., BCEE

Wingra Engineering, S.C.

Madison, Wisconsin

1. Introduction

Wingra Engineering, S.C. was hired by Sierra Club to conduct an air modeling impact analysis to help the U.S. Environmental Protection Agency (USEPA), state, and local air agencies identify facilities that are likely causing exceedances of the 2010 1-hour sulfur dioxide (SO_2) national ambient air quality standard (NAAQS). This document describes the results and procedures for an evaluation conducted for the Gavin Power Plant located in Cheshire, Ohio.

To ensure the modeling analysis reflected the cumulative concentration of SO_2 emissions, this analysis included emissions from the Kyger Creek Station in Cheshire, Ohio, which is located within 50 kilometers of the Gavin Power Plant.

This analysis supplements the evaluation described in my September 16, 2015 report prepared on behalf of Sierra Club. This analysis addresses comments on the 2015 analysis provided by the Ohio Environmental Protection Agency (Ohio EPA) in its *Review and Analysis of Sierra Club Submitted Gavin Power Plant Evaluation of Compliance with the 1-hour NAAQS for SO_2*. In particular, this evaluation responds to the Ohio EPA comments by: i) using variable stack parameter inputs; ii) relying on actual configuration for the two stacks at the Kyger Creek plant; iii) not incorporating emissions from the Mountaineer Power Plant; and, iv) using the background SO_2 concentration determined by Ohio EPA, among other changes from the 2015 analysis.

The dispersion modeling analysis predicted ambient air concentrations for comparison with the 1-hour SO_2 NAAQS. The modeling was performed using the most-recent version of AERMOD, AERMET, and AERMINUTE, with data provided to Sierra Club by regulatory air agencies or obtained through other publicly-available sources as documented below. The analysis was conducted in adherence with all available USEPA guidance for evaluating source impacts on attainment of the 1-hour SO_2 NAAQS via air dispersion modeling, including the AERMOD Implementation Guide; USEPA's Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010; modeling guidance promulgated by USEPA in Appendix W to 40 CFR Part 51; USEPA's March 2011 Modeling Guidance for SO_2 NAAQS Designations;[1] and, USEPA's December 2013 SO_2 NAAQS Designations Technical Assistance Document.[2]

[1] http://www.epa.gov/scram001/so2_modeling_guidance.htm
[2] http://www.epa.gov/oaqps001/sulfurdioxide/pdfs/SO2ModelingTAD.pdf

2. Compliance with the 1-hour SO_2 NAAQS

2.1 1-hour SO_2 NAAQS

The 1-hour SO_2 NAAQS takes the form of a three-year average of the 99th-percentile of the annual distribution of daily maximum 1-hour concentrations, which cannot exceed 75 parts per billion (ppb).[3] Compliance with this standard was assessed using USEPA's AERMOD air dispersion model, which produces air concentrations in units of µg/m^3. The 1-hour SO_2 NAAQS of 75 ppb equals 196.2 µg/m^3, and this is the value used for determining whether modeled impacts exceed the NAAQS.[4] The 99th-percentile of the annual distribution of daily maximum 1-hour concentrations corresponds to the fourth-highest value at each receptor for a given year.

2.2 Modeling Results

Modeling results for Gavin Power Plant and Kyger Creek Station are summarized in Table 1. Two scenarios were evaluated:

1. Actual hourly emissions and variable stack exit velocities for the 2012-14 period
2. Actual hourly emissions and variable stack exit velocities for the 2013-15 period

Results are provided for each source alone, and for both plants combined. It was determined that based on measured actual emissions for both of the three-year periods examined, the Gavin Power Plant is estimated to create downwind SO_2 concentrations that exceed the 1-hour NAAQS.

"Actual" represents the emissions which occurred during each hour of two 3-year periods: 2012-14 and 2013-15. Actual emission measurements were taken from two databases, USEPA *Clean Air Markets Program Data (CAMD)*[5] and the Emissions Modeling Clearinghouse State-Level Hourly Sulfur Dioxide (SO_2) Data. [6]

To more accurately predict the dispersion of emissions, hourly exit velocities were used for both power plants. Continuous emissions monitor measurements were not publicly available for this analysis so exit velocities were derived from the hourly flow rates and heat input in the USEPA Clearinghouse and CAMD databases. For the 2012-14 period, velocities were derived from the hourly flow rates reported in the Clearinghouse. For the 2013-15 period, the Clearinghouse

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[3] 40 C.F.R. § 50.17; *see also* USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010.
[4] The ppb to µg/m^3 conversion is found in the source code to AERMOD v. 15181, subroutine Modules. The conversion calculation is 75/0.3823 = 196.2 µg/m^3.
[5] http://ampd.epa.gov/ampd/
[6] https://www3.epa.gov/ttn/chief/emch/so2naaqs/index.html

emissions and exit velocities for 2013-14 were supplemented with CAMD emissions for 2015. The velocities for 2015 were derived from the hourly heat input reported in CAMD.

Further, a third scenario was used to evaluate AERMOD files provided by Ohio EPA for their modeling analysis of the Gavin and Kyger plants.[7] Ohio EPA had used proposed options for AERMET and AERMOD: ADJ_U* and LOWWIND3. In its comments on the Ohio EPA modeling analysis of Gavin, EPA stated: "EPA does not believe that the air quality modeling results obtained from the use of this beta option can be used at this time as a reliable indicator of attainment status in Gallia County." The Ohio EPA analysis was re-run for the 2012-14 period without the ADJ_U* and LOWWIND3 options using the meteorological data prepared for the Sierra Club modeling analyses. Without these two beta options, the results significantly increased and more closely matched the updated modeling results presented in this report. This analysis demonstrates that if Ohio EPA had not selected these two beta options, its air modeling analysis for Gavin and Kyger Creek very likely would have predicted nonattainment of the NAAQS.

In this evaluation, air quality impacts in Ohio are based on a background concentration of 26.16 $\mu g/m^3$. This is the 2012-14 design value used by the Ohio EPA in its own modeling evaluation of the same power plants.[8]

Table 1 - SO_2 Modeling Results using Actual Hourly Emissions and Exit Velocities

Period	Facility	99th Percentile 1-hour Daily Maximum ($\mu g/m^3$)				Complies with NAAQS?
		Impact	Background	Total	NAAQS	
2012-14	Gavin	207.8	26.2	234.0	196.2	No
	Kyger Creek	98.7	26.2	124.9	196.2	Yes
	Both Plants	240.8	26.2	267.0	196.2	No
2013-15	Gavin	193.5	26.2	219.7	196.2	No
	Kyger Creek	95.4	26.2	121.6	196.2	Yes
	Both Plants	239.0	26.2	265.2	196.2	No
Ohio EPA Results without ADJ_U* and LOWWIND3 Options						
2012-14	Both Plants	217.3	26.2	243.5	196.2	No

[7] This AERMOD file for the Ohio EPA modeling analysis was Gavin_Kyger_12_14_v5.DTA.
8 *See* USEPA's Technical Support Document, Ohio, Area Designations for the 2010 SO2 Primary National Ambient Air Quality Standard, p. 30.

Figure 1 shows the geographic extent of NAAQS violations based on actual emissions from all sources for the 2012-14 period.

Figure 2 shows the geographic extent of NAAQS violations based on actual emissions from all sources for the 2013-15 period.

2.3 Conservative Modeling Assumptions

A dispersion modeling analysis requires the selection of numerous parameters which affect the predicted concentrations. For the enclosed analysis, several parameters were selected which under-predict facility impacts.

Assumptions used in this modeling analysis which likely under-estimate concentrations include the following:

- No consideration of building or structure downwash. These downwash effects typically increase predicted concentrations near the facility.
- Except for the Kyger Creek plant, no consideration of off-site sources. These other sources of SO_2 will increase the predicted impacts, and as USEPA notes, there are many significant sources of SO_2 emissions within 50 km of the Gavin Plant.[9]

[9] USEPA's Technical Support Document, Ohio, Area Designations for the 2010 SO_2 Primary National Ambient Air Quality Standard, pp. 25, 32.

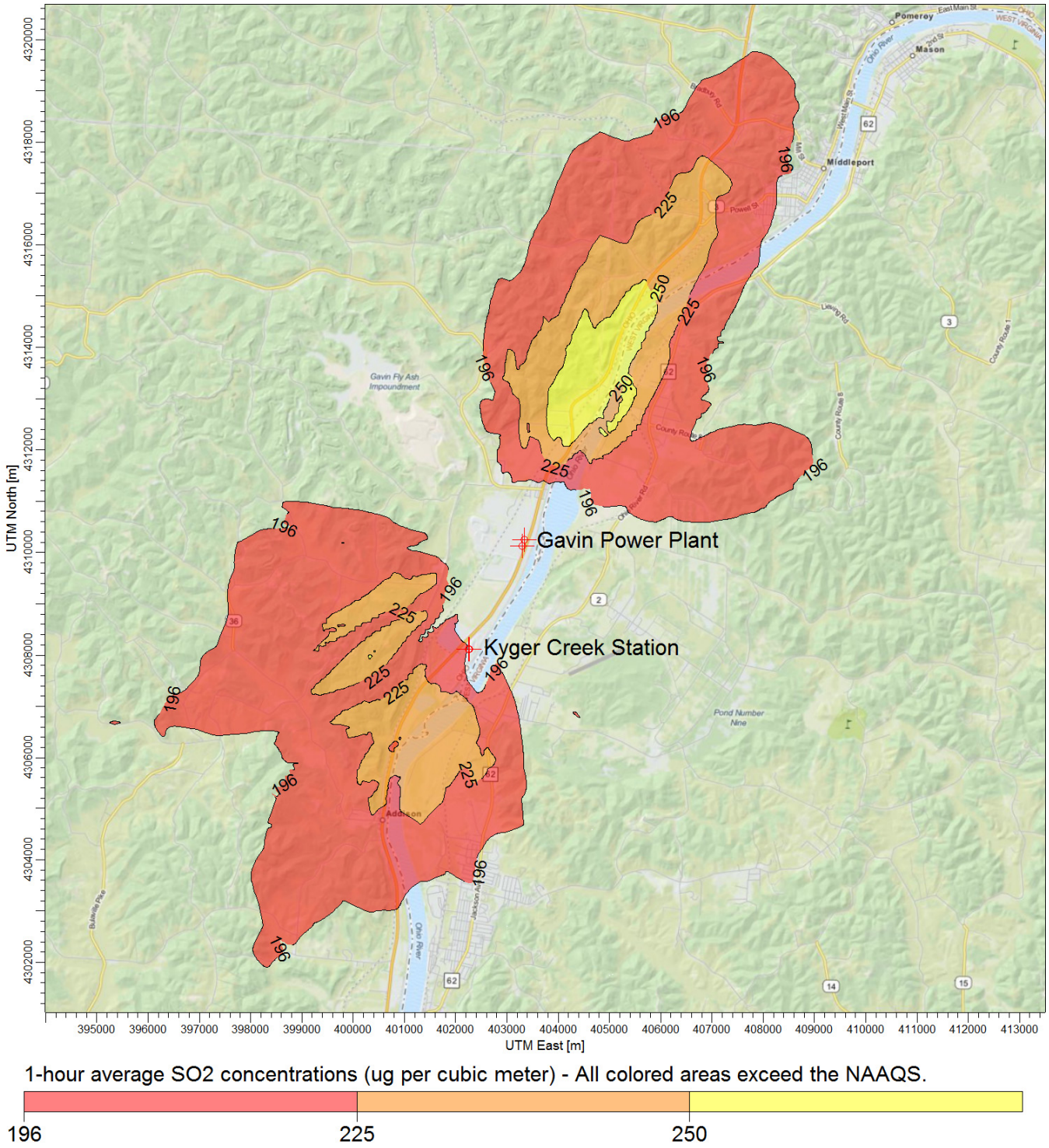

Figure 1 – Regional View of Impacts Due to Actual Emissions from Both Plants for the 2012-14 Period

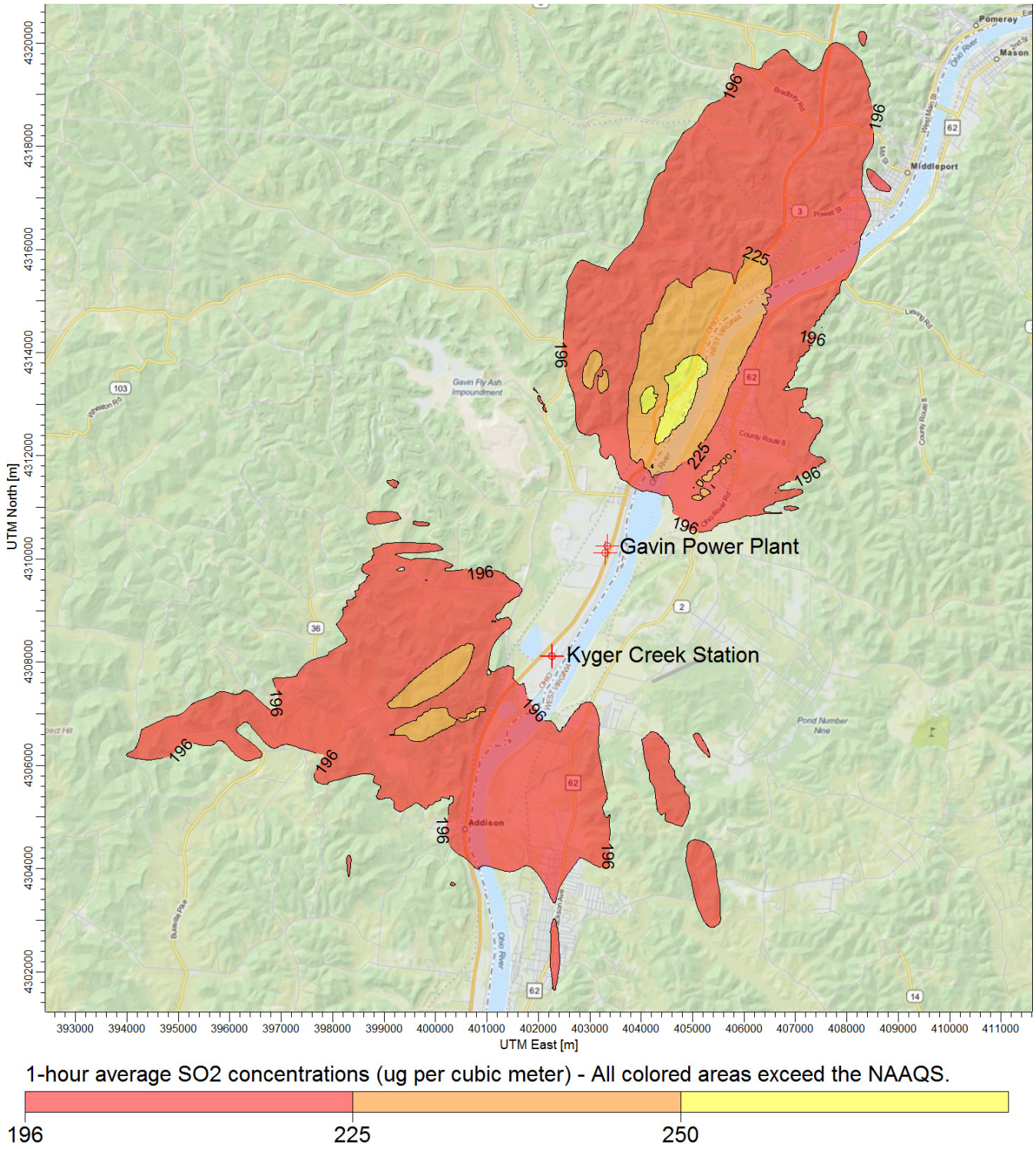

Figure 2 - Regional View of Impacts Due to Actual Emissions from Both Plants for the 2013-15 Period

3. Modeling Methodology

3.1 Air Dispersion Model

The modeling analysis used USEPA's AERMOD program, v. 15181. AERMOD, as available from the Support Center for Regulatory Atmospheric Modeling (SCRAM) website, was used in conjunction with a third-party modeling software program, *AERMOD View*, sold by Lakes Environmental Software.

3.2 Control Options

The AERMOD model was run with the following control options:

- 1-hour average air concentrations
- Regulatory defaults
- Flagpole receptors

To reflect a representative inhalation level, a flagpole height of 1.5 meters was used for all modeled receptors. This parameter was added to the receptor file when running AERMAP, as described in Section 4.4.

An evaluation was conducted to determine if the modeled facility was located in a rural or urban setting using USEPA's methodology outlined in Section 7.2.3 of the Guideline on Air Quality Models.[10] For urban sources, the URBANOPT option is used in conjunction with the urban population from an appropriate nearby city and a default surface roughness of 1.0 meter. Methods described in Section 4.1 were used to determine whether rural or urban dispersion coefficients were appropriate for the modeling analysis.

3.3 Output Options

The AERMOD analysis was based on three years of recent meteorological data. The modeling analyses used two runs with three years of sequential meteorological data from the 2012-2014 and 2013-15 periods. Consistent with USEPA's Modeling Guidance for SO_2 NAAQS Designations, AERMOD provided a table of fourth-high 1-hour SO_2 impacts concentrations consistent with the form of the 1-hour SO_2 NAAQS.[11]

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[10] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005.
[11] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 24-26.

Please refer to Table 1 for the modeling results.

4. Model Inputs

4.1 Geographical Inputs

The "ground floor" of all air dispersion modeling analyses is establishing a coordinate system for identifying the geographical location of emission sources and receptors. These geographical locations are used to determine local characteristics (such as land use and elevation), and also to ascertain source to receptor distances and relationships.

The Universal Transverse Mercator (UTM) NAD83 coordinate system was used for identifying the easting (x) and northing (y) coordinates of the modeled sources and receptors. Stack locations were obtained from facility permits and prior modeling files provided by the state regulatory agency. The stack locations were then verified using aerial photographs.

The facility was evaluated to determine if it should be modeled using the rural or urban dispersion coefficient option in AERMOD. A Geographic Information System (GIS) was used to determine whether rural or urban dispersion coefficients apply to a site. Land use within a three-kilometer radius circle surrounding the facility was considered. USEPA guidance states that urban dispersion coefficients are used if more than 50% of the area within 3 kilometers has urban land uses. Otherwise, rural dispersion coefficients are appropriate.[12]

USEPA's AERSURFACE v. 13016 was used to develop the meteorological data for the modeling analysis. This model was also used to evaluate surrounding land use within 3 kilometers. Based on the output from the AERSURFACE, approximately 7.6% of surrounding land use around the modeled facility was of urban land use types including Type 21 – Low Intensity Residential, Type 22 – High Intensity Residential and Type 23 – Commercial / Industrial / Transportation.

This is less than the 50% value considered appropriate for the use of urban dispersion coefficients. Based on the AERSURFACE analysis, it was concluded that the rural option would be used for the modeling summarized in this report. Please refer to Section 4.5.3 for a discussion of the AERSURFACE analysis.

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[12] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005, Section 7.2.3.

4.2 Emission Rates and Source Parameters

The modeling analysis considered SO_2 emissions from the Kyger Creek power plant. Other off-site sources were not considered. Stack parameters used for the modeling analysis are summarized in Table 2. The exit temperature was held constant but the hourly exit velocity varied based on flow rate and heat input information provided by USEPA Clearinghouse and CAMD databases.

Table 2 – Facility Stack Parameters[13]

Facility	Gavin		Kyger Creek	
Stack	G01	G02	K12	K35
Description	Unit 1	Unit 2	Units 1-2	Units 3-5
X Coord. [m]	403338	403295	402264.53	402253.99
Y Coord. [m]	4310252	4310124	4308112.02	4308119.27
Base Elevation [m]	172.82	172.82	176.17	176.17
Release Height [m]	252.98	252.98	255.42	255.42
Gas Exit Temperature [°K]	323.15	323.15	327.594	327.594
Gas Exit Velocity [m/s]	-	-	-	-
Inside Diameter [m]	12.802	12.802	7.53	9.2

The above stack parameters and emissions were obtained from regulatory agency documents and databases identified in Section 2.2. Stack location, height and diameter were verified using aerial photographs, and flue gas flow rate and temperature were verified using combustion calculations.

4.3 Building Dimensions

No building dimensions or prior downwash evaluations were available. Therefore this modeling analysis did not address the effects of downwash and this may under-predict impacts.

4.4 Receptors

For Gavin Power Plant, three receptor grids were employed:

1. A 100-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 5 kilometers.
2. A 500-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 10 kilometers.
3. A 1,000-meter Cartesian receptor grid centered on Gavin Power Plant and extending out 50

[13] Stack elevation, height and exit area were obtained from the USEPA Emissions Modeling Clearinghouse State-Level Hourly Sulfur Dioxide (SO_2) Data. The exit area matched the diameters provided by Ohio EPA in their review of the 2015 modeling analysis. Stack temperatures were obtained from Ohio EPA.

kilometers. 50 kilometers is the maximum distance accepted by USEPA for the use of the AERMOD dispersion model.[14]

A flagpole height of 1.5 meters was used for all these receptors.

Elevations from stacks and receptors were obtained from National Elevation Dataset (NED) GeoTiff data. GeoTiff is a binary file that includes data descriptors and geo-referencing information necessary for extracting terrain elevations. These elevations were extracted from 1 arc-second (30 meter) resolution NED files. The USEPA software program AERMAP v. 11103 is used for these tasks.

4.5 Meteorological Data

To improve the accuracy of the modeling analysis, recent meteorological data for the 2012-2014 and 2013-15 periods were prepared using the USEPA's program AERMET which creates the model-ready surface and profile data files required by AERMOD. Required data inputs to AERMET included surface meteorological measurements, twice-daily soundings of upper air measurements, and the micrometeorological parameters surface roughness, albedo, and Bowen ratio. One-minute ASOS data were available so USEPA methods were used to reduce calm and missing hours.[15] The USEPA software program AERMINUTE v. 15272 is used for these tasks.

This section discusses how the meteorological data was prepared for use in the 1-hour SO_2 NAAQS modeling analyses. The USEPA software program AERMET v. 15181 is used for these tasks.

4.5.1 Surface Meteorology

Surface meteorology was obtained for Huntington Tri-State Airport, West Virginia located near the Gavin Power Plant. Integrated Surface Hourly (ISH) data for the 2012-2014 and 2013-2015 periods were obtained from the National Climatic Data Center (NCDC). The ISH surface data was processed through AERMET Stage 1, which performs data extraction and quality control checks.

4.5.2 Upper Air Data

Upper-air data are collected by a "weather balloon" that is released twice per day at selected locations. As the balloon is released, it rises through the atmosphere, and radios the data back to the surface. The measuring and transmitting device is known as either a radiosonde, or rawindsonde.

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[15] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, p. 19.

Data collected and radioed back include: air pressure, height, temperature, dew point, wind speed, and wind direction. The upper air data were processed through AERMET Stage 1, which performs data extraction and quality control checks.

For Gavin Power Plant, the concurrent upper air data from twice-daily radiosonde measurements obtained at the most representative location were used. This location was the Pittsburgh, Pennsylvania measurement station. These data are in Forecast Systems Laboratory (FSL) format and were downloaded in ASCII text format from NOAA's FSL website.[16] All reporting levels were downloaded and processed with AERMET.

4.5.3 AERSURFACE

AERSURFACE is a program that extracts surface roughness, albedo, and daytime Bowen ratio for an area surrounding a given location. AERSURFACE uses land use and land cover (LULC) data in the U.S. Geological Survey's 1992 National Land Cover Dataset to extract the necessary micrometeorological data. LULC data was used for processing meteorological data sets used as input to AERMOD.

AERSURFACE v. 13016 was used to develop surface roughness, albedo, and daytime Bowen ratio values in a region surrounding the meteorological data collection site. AERSURFACE was used to develop surface roughness in a one kilometer radius surrounding the data collection site. Bowen ratio and albedo was developed for a 10 kilometer by 10 kilometer area centered on the meteorological data collection site. These micrometeorological data were processed for seasonal periods using 30-degree sectors. Seasonal moisture conditions were considered average with winter months having continuous snow cover.

4.5.4 Data Review

Missing meteorological data were not filled as the data file met USEPA's 90% data completeness requirement.[17] The AERMOD output file shows there were 0.87% and 1.09% missing data for the 2012-14 and 2013-15 periods, respectively.

To confirm the representativeness of the airport meteorological data, the surface characteristics of the airport data collection site and the modeled source location were compared. Since the Huntington Tri-State Airport, West Virginia is located close to Gavin Power Plant, this meteorological data set was considered appropriate for this modeling analysis.[18] This weather station provided high quality

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[16] Available at: http://esrl.noaa.gov/raobs/
[17] USEPA, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-05, February 2000, Section 5.3.2, pp. 5-4 to 5-5.
[18] USEPA, AERMOD Implementation Guide, March 19, 2009, pp. 3-4.

surface measurements for the 2012-14 and 2013-15 periods, and had similar land use, surface characteristics, terrain features and climate. Finally, the use of meteorological data from the selected surface and upper air stations were recommended by the Ohio Environmental Protection Agency for modeling facilities located in Gallia County.[19]

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6. Reporting

All files from the programs used for this modeling analysis are available to regulatory agencies. These include analyses prepared with AERSURFACE, AERMET, AERMAP, and AERMOD.

[19] Ohio EPA, AERMET Output Files for AERMOD Model Input,http://epa.ohio.gov/dapc/model/modeling/metfiles.aspx
[20] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 20-23.
[21] USEPA, SO_2 NAAQS Designations Modeling Technical Assistance Document, Dec. 2013, section 8.1, pp 27-28.
[22] USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010, p. 3.

CERTIFICATE OF SERVICE

I hereby certify that on January 6th, 2017, I filed Sierra Club's Petition for Reconsideration of Air Quality Designation for Gallia County, Ohio for the 2010 Sulfur Dioxide (SO2) Primary National Ambient Air Quality Standard – Round 2; Final Rule, EPA-HQ-OAR-2014-0464, FRL-9948-87-OAR, via email and Federal Express, to:

Administrator Gina McCarthy
U.S. Environmental Protection Agency
Room 3000
William Jefferson Clinton Building – Mail Code 1101A
1200 Pennsylvania Avenue NW
Washington, DC 20460
McCarthy.Gina@epa.gov

January 6th, 2017

/s/ Harry Libarle
Harry Libarle