

Final Technical Support Document

For Final Action on Ohio Area Designations for the 2010 SO₂ Primary National Ambient Air Quality Standard

Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA, or the Agency) must designate areas as either “unclassifiable,” “attainment,” or “nonattainment” for the 2010 1-hour sulfur dioxide (SO₂) primary national ambient air quality standard (NAAQS). Section 107(d) of the CAA defines a nonattainment area as one that does not meet the NAAQS or that contributes to a NAAQS violation in a nearby area, an attainment area as any area other than a nonattainment area that meets the NAAQS, and an unclassifiable area as any area that cannot be classified on the basis of available information as meeting or not meeting the NAAQS.

July 2, 2016, is the deadline established by the U.S. District Court for the Northern District of California for the EPA to designate certain areas. This deadline is the first of three deadlines established by the court for the EPA to complete area designations for the 2010 SO₂ NAAQS. This deadline applies to two areas in Ohio because two emission sources meet the criteria for applicability of this deadline under the court’s order.

Ohio submitted updated recommendations on September 16, 2015. Table 1 below lists Ohio’s recommendations and identifies the counties in Ohio that the EPA is designating in order to meet the July 2, 2016, court-ordered deadline. These final designations are based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

Table 1 – Ohio’s Recommended and the EPA’s Final Designations

Area	Ohio’s Recommended Area Definition	Ohio’s Recommended Designation	EPA’s Area Definition	EPA’s Final Designation
Clermont County, Ohio	Clermont County, excluding Pierce Township	Attainment	Same as State’s Recommendation (Clermont County, OH)	Unclassifiable/Attainment
Gallia County, Ohio	Gallia County and In Meigs County: Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships	Attainment	Same as State’s Recommendation (Gallia County, OH)	Unclassifiable

Background

On June 3, 2010, the EPA revised the primary (health based) SO₂ NAAQS by establishing a new 1-hour standard, which is met at an ambient air quality monitoring site when the 3-year average of the 99th percentile of 1-hour daily maximum concentrations does not exceed 75 ppb. This NAAQS was published in the *Federal Register* on June 22, 2010 (75 FR 35520), and is codified at 40 CFR 50.17. The EPA determined this is the level necessary to protect public health with an adequate margin of safety, especially for children, the elderly, and those with asthma. These groups are particularly susceptible to the health effects associated with breathing SO₂. The two prior primary standards of 140 ppb evaluated over 24 hours, and 30 ppb evaluated over an entire year, codified at 40 CFR 50.4, remain applicable.¹ However, the EPA is not currently designating areas on the basis of either of these two primary standards. Similarly, the secondary standard for SO₂, set at 500 ppb evaluated over 3 hours, codified at 40 CFR 50.5, has not been revised, and the EPA is also not currently designating areas on the basis of the secondary standard.

General Approach and Schedule

Section 107(d) of the CAA requires that not later than 1 year after promulgation of a new or revised NAAQS, state governors must submit their recommendations for designations and boundaries to EPA. Section 107(d) also requires the EPA to provide notification to states no less than 120 days prior to promulgating an initial area designation that is a modification of a state's recommendation. If a state does not submit designation recommendations, the EPA may promulgate the designations that it deems appropriate without prior notification to the state, although it is our intention to provide such notification when possible. If a state or tribe disagrees with the EPA's intended designations, it is given an opportunity within the 120-day period to demonstrate why any proposed modification is inappropriate. The EPA is required to complete designations within 2 years after promulgation of a new or revised NAAQS, unless EPA determines that sufficient information is not available, in which case the deadline is extended to 3 years. The 3-year deadline for the revised SO₂ NAAQS was June 2, 2013.

On August 5, 2013, the EPA published a final rule establishing air quality designations for 29 areas in the United States for the 2010 SO₂ NAAQS, based on recorded air quality monitoring data from 2009 - 2011 showing violations of the NAAQS (78 FR 47191). In that rulemaking, the EPA committed to address, in separate future actions, the designations for all other areas for which the Agency was not yet prepared to issue designations.

Following the initial August 5, 2013, designations, three lawsuits were filed against the EPA in different U.S. District Courts, alleging the Agency had failed to perform a nondiscretionary duty

¹ 40 CFR 50.4(e) provides that the two prior primary NAAQS will no longer apply to an area 1 year after its designation under the 2010 NAAQS, except that for areas designated nonattainment under the prior NAAQS as of August 22, 2010, and areas not meeting the requirements of a SIP Call under the prior NAAQS, the prior NAAQS will apply until that area submits and EPA approves a SIP providing for attainment of the 2010 NAAQS. Clermont, Gallia, and Meigs Counties are not subject to these exceptions.

under the CAA by not designating all portions of the country by the June 2, 2013, deadline. In an effort intended to resolve the litigation in one of those cases, plaintiffs, Sierra Club and the Natural Resources Defense Council, and the EPA filed a proposed consent decree with the U.S. District Court for the Northern District of California. On March 2, 2015, the court entered the consent decree and issued an enforceable order for the EPA to complete the area designations according to the court-ordered schedule.

According to the court-ordered schedule, the EPA must complete the remaining designations by three specific deadlines. By no later than July 2, 2016 (16 months from the court's order), the EPA must designate two groups of areas: (1) areas that have newly monitored violations of the 2010 SO₂ NAAQS, and (2) areas that contain any stationary sources that had not been announced as of March 2, 2015, for retirement and that, according to the EPA's Air Markets Database, emitted in 2012 either (i) more than 16,000 tons of SO₂, or (ii) more than 2,600 tons of SO₂ with an annual average emission rate of at least 0.45 pounds of SO₂ per one million British thermal units (lbs SO₂/MMBTU). Specifically, a stationary source with a coal-fired unit that, as of January 1, 2010, had a capacity of over 5 megawatts and otherwise meets the emissions criteria, is excluded from the July 2, 2016, deadline if it had announced through a company public announcement, public utilities commission filing, consent decree, public legal settlement, final state or federal permit filing, or other similar means of communication, by March 2, 2015, that it will cease burning coal at that unit.

The last two deadlines for completing remaining designations are December 31, 2017, and December 31, 2020. The EPA has separately promulgated requirements for state and other air agencies to provide additional monitoring or modeling information on a timetable consistent with these designation deadlines. We expect this information to become available in time to help inform these subsequent designations. These requirements were promulgated on August 21, 2015 (80 FR 51052), in a rule known as the SO₂ Data Requirements Rule (DRR), codified at 40 CFR part 51 subpart BB.

Updated designations guidance was issued by the EPA through a March 20, 2015, memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions 1-10. This memorandum supersedes earlier designation guidance for the 2010 SO₂ NAAQS, issued on March 24, 2011, and it identifies factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO₂ NAAQS. The guidance also contains the factors the EPA intends to evaluate in determining the boundaries for all remaining areas in the country, consistent with the court's order and schedule. These factors include: 1) Air quality characterization via ambient monitoring or dispersion modeling results; 2) Emissions-related data; 3) Meteorology; 4) Geography and topography; and 5) Jurisdictional boundaries. This guidance was supplemented by two non-binding technical assistance documents intended to assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling or ambient air quality monitoring for sources that emit SO₂. Notably, the EPA's documents titled, "SO₂ NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and "SO₂ NAAQS Designations Source-Oriented Monitoring Technical Assistance Document" (Monitoring TAD), were available to states and other interested parties. Both of these TADs were most recently updated in February 2016.

Based on complete, quality assured and certified ambient air quality data collected between 2013 and 2015, no violations of the 2010 SO₂ NAAQS have been recorded at ambient air quality monitors in any undesignated part of Ohio. However, there are two sources in the State meeting the emissions criteria of the consent decree for which the EPA must complete designations by July 2, 2016. In this final technical support document, the EPA discusses its review and technical analysis of Ohio's updated recommendations for the areas that we must designate. The EPA also discusses any intended and final modifications from the State's recommendation based on all available data before us.

The following are definitions of important terms used in this document:

- 1) 2010 SO₂ NAAQS – the primary NAAQS for SO₂ promulgated in 2010. This NAAQS is 75 ppb, based on the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. See 40 CFR 50.17.
- 2) Attaining monitor – an ambient air monitor meeting all methods, quality assurance, and siting criteria and requirements whose valid design value is at or under 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.
- 3) Design Value – a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
- 4) Designated nonattainment area – an area which the EPA has determined has violated the 2010 SO₂ NAAQS or contributed to a violation in a nearby area. A nonattainment designation reflects considerations of the state's recommendations and all of the information discussed in this document. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analyses, and any other relevant information.
- 5) Designated unclassifiable area – an area for which the EPA cannot determine based on all available information whether or not it meets the 2010 SO₂ NAAQS.
- 6) Designated unclassifiable/attainment area – an area which the EPA has determined to have sufficient evidence to find either is attaining or is likely to be attaining the NAAQS. The EPA's decision is based on all available information including the most recent 3 years of air quality monitoring data, available modeling analyses, and any other relevant information.
- 7) Modeled violation – a violation based on air dispersion modeling.
- 8) Recommended attainment area – an area a state or tribe has recommended that the EPA designate as attainment.
- 9) Recommended nonattainment area – an area a state or tribe has recommended that the EPA designate as nonattainment.
- 10) Recommended unclassifiable area – an area a state or tribe has recommended that the EPA designate as unclassifiable.
- 11) Recommended unclassifiable/attainment area – an area a state or tribe has recommended that the EPA designate as unclassifiable/attainment.
- 12) Violating monitor – an ambient air monitor meeting all methods, quality assurance, and siting criteria and requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.

Technical Analysis for Clermont County, Ohio

Introduction

Clermont County, Ohio, contains a stationary source that, according to the EPA's Air Markets Database, emitted in 2012 either more than 16,000 tons of SO₂ or more than 2,600 tons of SO₂ and had an annual average emission rate of at least 0.45 lbs SO₂/MMBTU. Specifically, in 2012, the W.H. Zimmer Generating Station (Zimmer) emitted 11,975 tons of SO₂ and had an emissions rate of 0.53 lbs SO₂/MMBTU. As of March 2, 2015, this stationary source had not met the criteria for being "announced for retirement." Pursuant to the March 2, 2015, court-ordered schedule, the EPA must designate the area surrounding this facility by July 2, 2016.²

In its September 16, 2015, submission, Ohio recommended that the area surrounding Zimmer electric generating facility, specifically all townships in Clermont County with the exception of Pierce Township,³ be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO₂ are expected.

This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions from 2012 through 2014 for Zimmer. No other sources were included in the modeling. Ohio considered fifteen other SO₂ sources of varying size, located within 50 km of Zimmer and found that none of these sources were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. Ohio followed the EPA's Modeling TAD for the purposes of modeling to characterize air quality for use in designations, and used the most recent 3 years of actual emissions data and concurrent meteorological data. Surface meteorology and surface characteristics from the Cincinnati NWS site (43 km northwest of Zimmer), and coincident upper air observations from Wilmington, Ohio (74 km to the northeast of Zimmer) were selected as most representative of meteorological conditions within the area. Ohio chose to use a fixed background concentration which was determined by the state to be the 99th percentile of monitored values from the SO₂ monitor in northern Campbell County, Kentucky (21-037-3002). This monitor was considered to be impacted by emissions from Beckjord, until the facility permanently shut down its coal-fired boilers in October 2014. The background value was determined by examining the monitored values for which Beckjord had zero emission and the monitor value was nonzero. The background concentration for this area was determined by the state to be 11 ppb and was incorporated into the final AERMOD results. The state's modeling indicates that the predicted 99th percentile 1-hour average concentration within the chosen modeling domain is 147.0 µg/m³, or 56.1 ppb, occurring just north of Zimmer. The Sierra Club also submitted modeling showing violations of the standards from Zimmer. Ohio commented that the Sierra Club analysis used incomplete and incorrect hourly emissions and stack parameter information for Zimmer, and

² Clermont County also includes the Beckjord Generating Station, which emitted 67,069 tons in 2012, but which is not subject to a requirement for designation because the area around that plant has already been designated nonattainment.

³ Pierce Township, Clermont County, Ohio, was designated nonattainment for the 2010 SO₂ NAAQS on August 5, 2013 (78 FR 47191). This township included a major source (Beckjord Generating Stations) that subsequently shut down. Ohio has addressed this township separately, notably by submitting a redesignation request on August 11, 2015, for this township, and EPA will be addressing this township separately as well.

emissions data which was more conservative than the Modeling TAD requires for two additional modeled sources. The EPA did not find compelling information to designate Clermont County as nonattainment based on Sierra Club's unreliable modeling parameters.

On February 16, 2016, the EPA notified Ohio that we intended to designate the Clermont County, Ohio, area as unclassifiable/attainment, based on our view that the area was meeting the NAAQS. Additionally, we informed Ohio that our intended boundaries for the unclassifiable/attainment area consisted of Clermont County (excluding Pierce Township). Our intended designation and associated boundaries were based on, among other things, careful review of the state's assessment, supporting documentation, and all available data. Detailed rationale, analyses, and other information supporting our intended designation for this area can be found in the preliminary technical support document for Ohio, and this document along with all others related to this rulemaking can be found in Docket ID EPA-HQ-OAR-2014-0464.

Assessment of New Information

In our February 16, 2016, notification to Ohio regarding our intended unclassifiable/attainment designation for the Clermont County, Ohio, area, the EPA requested that any additional information that the Agency should consider prior to finalizing the designation should be submitted by April 19, 2016. On March 1, 2016, the EPA also published a notice of availability and public comment period in the *Federal Register*, inviting the public to review and provide input on our intended designations by March 31, 2016 (81 FR 10563).

The EPA is explicitly incorporating and relying upon the analyses and information presented in the preliminary technical support document for the purposes of our final designation for this area, except to the extent that any new information submitted to the EPA or conclusions presented in this final technical support document and our response to comments document (RTC), available in the docket, supersede those found in the preliminary document.

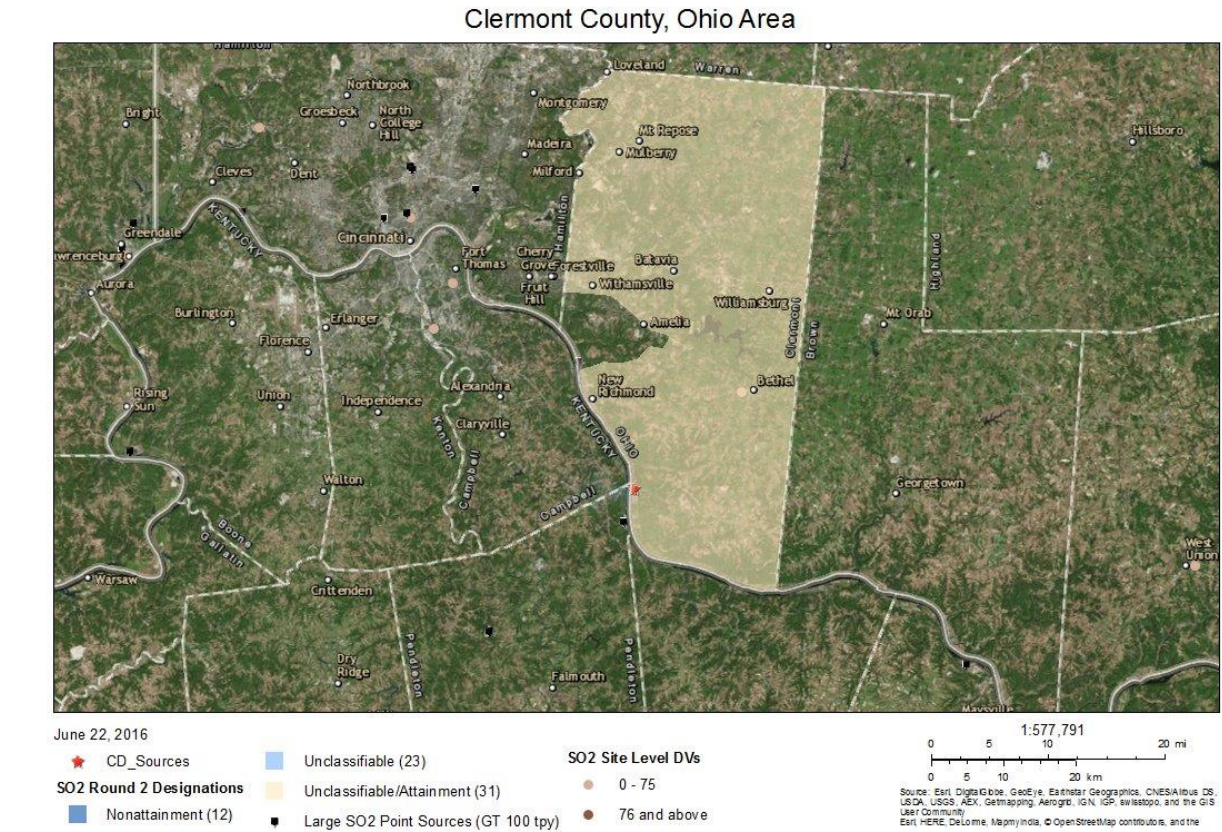
Subsequent to our February 16, 2016, notification, the EPA received comments from various groups, such as Ohio Utilities Group and FirstEnergy, supporting our intended designation for the area. No commenters objected to this proposed designation or objected to any portion of EPA's rationale for designating this area as unclassifiable/attainment.

Conclusion

Therefore, based on the information available to the EPA at this time, including the analyses performed for the purposes of the preliminary technical support document, and in the absence of any new information that would otherwise lead to a different conclusion regarding air quality in the area or any new information that would otherwise lead to a different conclusion regarding the area boundaries, the EPA concludes that the Clermont County, Ohio, area is meeting the 2010 primary SO₂ NAAQS, and therefore is designating the area as unclassifiable/attainment under the NAAQS. As previously noted, we are explicitly incorporating and relying upon the analyses and information presented in the technical support document for our intended designations as a portion of the support for the final designation for this area. The boundaries for this unclassifiable/attainment area consist of Clermont County (excluding Pierce Township), and are

shown in the figure below. Also included in the figure are nearby emitters of SO₂ and Ohio's recommended area.

Figure 1: The EPA's final unclassifiable/attainment area: Clermont County, Ohio



At this time, our final designations for the state only apply to this area and the others contained in this final technical support document. Consistent with the court-ordered schedule, the EPA will evaluate and designate all remaining undesignated areas in Ohio by either December 31, 2017, or December 31, 2020.

Technical Analysis for Gallia County, Ohio

Introduction

Gallia County, Ohio, contains a stationary source that, according to the EPA's Air Markets Database, emitted in 2012 either more than 16,000 tons of SO₂ or more than 2,600 tons of SO₂ and had an annual average emission rate of at least 0.45 lbs SO₂/MMBTU. Specifically, in 2012, the General James M. Gavin Power Plant (Gavin) emitted 31,269 tons of SO₂ and had an emissions rate of 0.36 lbs SO₂/MMBTU. As of March 2, 2015, this stationary source had not met the criteria for being "announced for retirement." Pursuant to the March 2, 2015 court-ordered schedule, the EPA must designate the area surrounding this facility by July 2, 2016.

In its September 16, 2015, submission, Ohio recommended that the area surrounding Gavin, specifically Gallia County and a portion of Meigs County which contains an SO₂ monitor, be designated as attainment based on an assessment and characterization of air quality from the facility and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO₂ are expected. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions.

On February 16, 2016, the EPA notified Ohio that we intended to designate the Gallia County, Ohio area as unclassifiable, due to our view that we could not determine based on available information whether the area was meeting the NAAQS. Additionally, we informed Ohio that our intended boundaries for the unclassifiable area consisted of Gallia County and a portion of Meigs County. Our intended designation and associated boundaries were based on, among other things, review of the state's assessment, supporting documentation, and all available data. Due to Ohio's unapproved use of the AERMOD beta option, LOWWIND3, the EPA did not find Ohio's modeling analysis to be a reliable assessment of whether the area is attaining the standard. Detailed rationale, analyses, and other information supporting our intended designation for this area can be found in the preliminary technical support document for Ohio, and this document along with all others related to this rulemaking can be found in Docket ID EPA-HQ-OAR-2014-0464.

Assessment of New Information

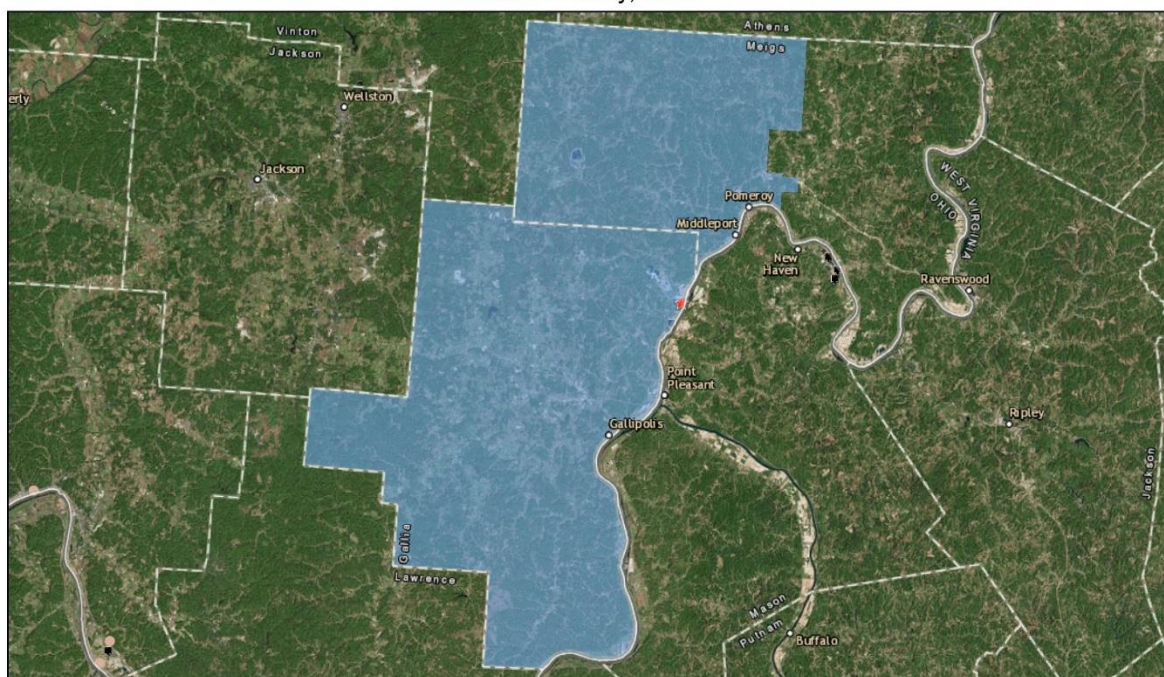
In our February 16, 2016, notification to Ohio regarding our intended unclassifiable designation for the Gallia County, Ohio area, the EPA requested that any additional information that the Agency should consider prior to finalizing the designation should be submitted by April 19, 2016. On March 1, 2016, the EPA also published a notice of availability and public comment period in the *Federal Register*, inviting the public to review and provide input on our intended designations by March 31, 2016 (81 FR 10563).

The EPA is explicitly incorporating and relying upon the analyses and information presented in the preliminary technical support document for the purposes of our final designation for this area, except to the extent that any new information submitted to the EPA or conclusions presented in this final technical support document and our response to comments document (RTC), available in the docket, supersede those found in the preliminary document.

As further detailed below, after carefully considering all available data and information, the EPA is unable to determine whether the Gallia County, OH, area is meeting the NAAQS, and therefore is designating the area as unclassifiable for the 2010 SO₂ NAAQS. The boundaries for this unclassifiable area consist of Gallia County and a portion of Meigs County, and are shown in the figure below. Also included in the figure are nearby emitters of SO₂ and Ohio's recommended area.

Figure 2: The EPA's final unclassifiable area: Gallia County, Ohio

Gallia County, Ohio



June 20, 2016

★ CD_Sources

SO2 Round 2 Designations

■ Nonattainment (12)

■ Unclassifiable (23)

■ Unclassifiable/Attainment (31)

■ Large SO2 Point Sources (GT 100 tpy)

SO2 Site Level DVs

● 0 - 75

● 76 and above

1:577,791
0 5 10 20 mi
0 5 10 20 km

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, GeoSwiss, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the

Web AppBuilder for ArcGIS

© Office of Environmental Information (OEI) | Data: U.S. Department of Commerce, U.S. Census Bureau, Geography Division | U.S. EPA Office of Air and Radiation (OAR) - Office of Air Quality Planning and Standards (OAQPS) | Source: U.S. Census Bureau | Earthstar Geographics | Esri, HERE, DeLorme |

Subsequent to our February 16, 2016, notification, the EPA received substantive comments from Sierra Club, Ohio Utility Group, Ohio Valley Electric Corporation, American Electric Power, and FirstEnergy regarding our intended unclassifiable designation for the Gallia County, Ohio area.

Also, additional information, specifically air dispersion modeling, was submitted to the EPA during the state and public comment period in order to characterize air quality in the Gallia County, Ohio, area. Notably, the state provided additional air dispersion modeling information during the comment period and asserted that the area surrounding Gavin has no modeled exceedances of the 2010 SO₂ standard based on the 2012-2014 period. Specifically, the state provided new background concentrations, revised meteorological data, and a new model run without the use of LOWWIND3. The Sierra Club also submitted additional air dispersion modeling information during the comment period and asserted that the Gallia County, Ohio, area should be designated as nonattainment. Specifically, Sierra Club provided new emissions data, omitted Mountaineer as an explicitly modeled source, adopted a new background concentration of 10 ppb, and utilized new stack configurations for Kyger Creek. The following discussion and analysis of this new information reference the Modeling TAD and the factors for evaluation contained in the EPA's March 20, 2015, guidance, as appropriate and applicable.

Additional Modeling by the State

Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO₂ NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. In some instances the recommended model may be a model other than AERMOD, such as the BLP model for buoyant line sources. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPIRIME: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The state used AERMOD version 15181, and a discussion of the individual components will be referenced in the corresponding discussion that follows, as appropriate.

Modeling Parameter: Rural or Urban Dispersion

The EPA's recommended procedure for characterizing an area by prevalent land use is based on evaluating the dispersion environment within 3 km of the facility. According to the EPA's modeling guidelines contained in documents such as the Modeling TAD, rural dispersion coefficients are to be used in the dispersion modeling analysis if more than 50% of the area within a 3 km radius of the facility is classified as rural. Conversely, if more than 50% of the area is urban, urban dispersion coefficients should be used in the modeling analysis. When performing the modeling for the area of analysis, Ohio determined that it was most appropriate to run the model in rural mode. Although Ohio did not conduct a formal Auer analysis of the area, less than 50% of the land use near the two large sources in Gallia County is industrial, commercial, or dense residential. The EPA is making a determination that rural dispersion coefficients are appropriate, based on aerial photographs in Google Maps, which confirm that more than 50% of the area within a 3 km radius of the facility is rural.

Modeling Parameter: Area of Analysis (Receptor Grid)

The EPA thinks that a reasonable first step towards characterization of air quality in the area surrounding Gavin is to determine the extent of the area of analysis, i.e., receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO₂ emission sources or facilities considered for modeling; the extent of significant concentration gradients of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO₂ concentrations.

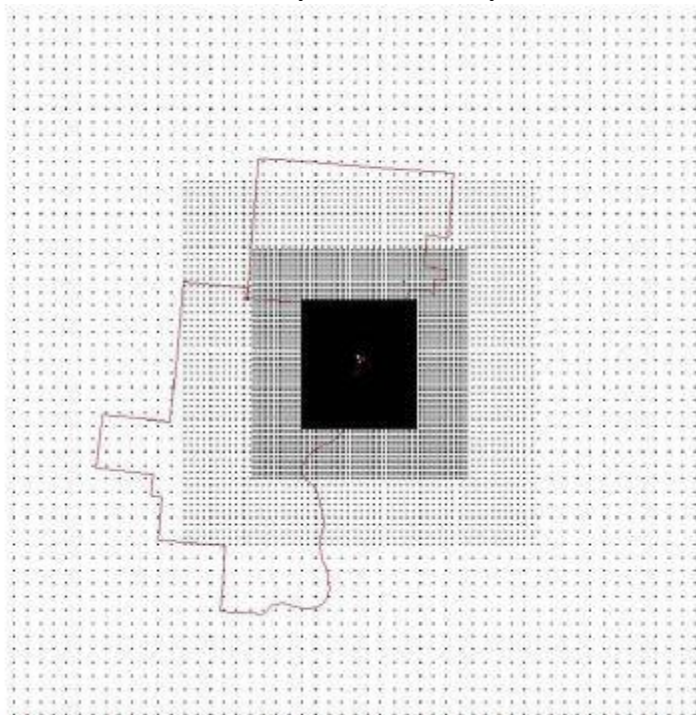
The grid receptor spacing for the area of analysis chosen by the state is as follows:

- 50 meter spacing along fenceline of both facilities and to 2 km from the fenceline

- 100 meter spacing to 3 km
- 250 meter spacing to 8 km
- 500 meter spacing to 15 km
- 1000 meter spacing beyond 10 km to 25 km
- 2000 meter spacing to 50 km
- Included discrete receptor at monitor location

The receptor network contained 34,255 receptors and covered the entirety of Gallia County and the western portion of Meigs County. Figure 3, which was included in Ohio’s submission during the comment period, shows the chosen area of analysis surrounding the Gavin and Kyger Creek facilities, as well as the receptor grid for the area of analysis. The Modeling TAD states that the receptor grid need not include receptors in areas where it would not be feasible to place a monitor and record ambient air impacts, such as bodies of water. Ohio did not seek to identify areas where it might be infeasible to place a monitor, and instead conservatively placed receptors according to the above array without respect to feasibility of monitoring. The impacts of the area’s geography and topography will be discussed later within this document.

Figure 3: Receptor Grid for the Gallia County Area of Analysis



For the Gallia County area, the state included one other emitter of SO₂ within 50 km of Gavin in any direction. The state determined that this was the appropriate distance in order to adequately characterize air quality from Gavin and other nearby sources which may have a potential impact in the area of analysis where maximum concentrations of SO₂ are expected. As discussed below, the state also evaluated whether to include two West Virginia sources in its analysis, but concluded that inclusion of these sources was not warranted. In addition to Gavin, the other modeled emitter of SO₂ included in the area of analysis is Kyger Creek. As AERMOD is recommended for use within 50 km of a given emission source, the state determined that 50 km

was an appropriate distance to adequately characterize air quality from the facility and other nearby sources which are expected to cause significant concentration gradients in the area. EPA agrees that 50 km is a conservative, acceptable distance to characterize the air quality around the primary source.

Modeling Parameter: Source Characterization

The state characterized the sources within the area of analysis in accordance with practices outlined as acceptable in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized the sources' building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRIME was used to assist in addressing building downwash.

Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purposes of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also provides for the flexibility of using allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate.

The EPA thinks that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information when it is available and that these data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA believes that detailed throughput, operating schedules, and emissions information from the impacted sources should be used.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. Specifically, a facility may have recently adopted a new federally enforceable emissions limit, been subject to a federally enforceable consent decree, or implemented other federally enforceable mechanisms and control technologies to limit SO₂ emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD. In these cases, the Modeling TAD notes that the existing SO₂ emissions inventories used for permitting or SIP planning demonstrations should contain the necessary emissions information for designations-related modeling. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state evaluated other SO₂ sources located within 50 km of the area of analysis. The Phillip Sporn power station and the Mountaineer power station in Mason County, WV, are located approximately 17 km from Gavin. The Sporn station closed in June 2015. The predominant winds from the southwest, as measured at Huntington, WV, would commonly

disperse the emissions of the Mountaineer plant toward the eastern portion of Meigs County (not included in Ohio’s designation recommendation). There are no other significant sources of SO₂ in or near Gallia and Meigs Counties. Only Gavin and Kyger Creek were determined by the state to have the potential to cause significant concentration gradient impacts within the area of analysis. The facilities in the area of analysis and their most recently available annual actual SO₂ are summarized below.

Table 2: Actual SO₂ Emissions in 2012 – 2014 from Facilities in the Gallia County, Ohio Area of Analysis

Facility Name	Distance from Gavin (km)	Actual SO ₂ Emissions (tons per year)			
		2012	2013	2014	2015
AEP General James M. Gavin Plant	--	31,269 ^A	27,852	36,872	26,473
AEP Kyger Creek Station	2.5	4,989	9,434	13,748	4,847
Appalachian Power Mountaineer Plant (Mason Co WV)	16.7	1,151	2,903	4,411	
Appalachian Power Phillip Sporn Plant (Mason Co WV) closed 6/2015	17.2	8,078	9,032	10,650	
Felman Productions-New Haven (Mason Co WV) ^B	17.2			534	
Total Emissions From All Facilities in the State’s Area of Analysis		46,021 ^C	49,755 ^C	66,215	

^A Emissions from EPA’s Air Markets Database. Other 2014 data from Ohio’s Fee Emission Reports.

^B Emissions from 2011 NEI.

^C Assumes 534 tons per year from Felman Productions

For Gavin and Kyger Creek, in the area of analysis, the state used actual emissions from the most recently available 3-year data set, i.e., 2012 - 2014. These emissions data were developed by the American Electric Power Service Corporation, incorporating sensor data to produce an hourly emission inventory that reflects actual emissions at the facilities. Ohio examined 2015 emissions data and concluded that 2013 to 2015 emissions were sufficiently similar to emissions in 2012 to 2014 that derivation of 2015 emissions data for modeling purposes was not warranted. Emissions data for 2015 are shown in Table 2 above. Since emissions in 2015 are lower than emissions in 2012 (especially at Gavin), total emissions in 2013 to 2015 are about 6 percent lower for Gavin and about 0.5 percent lower for Kyger Creek than those of 2012 to 2014. Modeling 2012 to 2014 emissions is consistent with the Modeling TAD, which recommends using the most recent three years of available data. The impact of the decline in emissions is discussed further below.

Table 5 below shows that Ohio used emission values that added up to less than the values reported to CAMD. The values in the CAMD database reflect data substitution, in which hours for which emissions monitoring equipment was not operating correctly are given emission values (for purposes of determining the number of trading program allowances to be debited) that are computed to provide a conservative estimate of the emissions. Gavin reportedly had significant periods when its emission monitoring equipment was malfunctioning, so that the values in the CAMD database for this plant were likely to overstate actual emissions. To account for potential

emission inflation caused by Part 75 substitutions within the CAMD database, Ohio consulted with AEP to derive accurate hourly emission rates, release point temperatures, and exit velocities when faults in the continuous emission monitors resulted in erroneous data. The substitution of erroneous data and derivation of refined emission parameters resulted in the lower total emissions shown in Table 5. The EPA has reviewed the details of Ohio's emission inventory development in Appendix B of Ohio's recommended designation submittal from September 15, 2015, and agrees that these refined emission parameters correct inflated emission values in the CAMD database.

Modeling Parameter: Meteorology and Surface Characteristics

The most recent 3 years of available meteorological data (concurrent with the most recent 3 years of emissions data) should be used in designations efforts. As noted in the Modeling TAD, the selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data are based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, the Federal Aviation Administration (FAA), and military stations.

For the Gallia County, Ohio, area of analysis, surface meteorology from the Huntington Tri-State Airport NWS station in West Virginia, approximately 65 km south-southeast of Gavin, and coincident upper air observations from the NWS station in Pittsburgh, Pennsylvania, approximately 235 km to the northeast, were selected as best representative of meteorological conditions within the area of analysis. The Huntington, West Virginia, NWS is the site recommended by Ohio for regulatory modeling work. Both locations are located near the Ohio River although it's unlikely the river valley area is influencing either the Huntington NWS data or the power plant plumes. The Ohio River is roughly 170 m above sea level. The NWS location is at an elevation of about 250 m above sea level. The location of the Gavin and Kyger Creek facilities are roughly 180 m above sea level, however, the power plant stacks are approximately 250 m tall. Consequently, the Huntington NWS data, should serve as an adequate meteorological database with which to model the large-scale winds impacting the tall stacks at Gavin and Kyger Creek.

The State used AERSURFACE version 13016 using data from the Huntington NWS station located at (38.365, -82.555) to estimate the surface characteristics of the area of analysis. The State developed surface characteristics for 12 spatial sectors at a monthly temporal resolution at the Huntington NWS station. These surface characteristics are the albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (representing the ratio of sensible heat flux to latent heat flux at the ground level), and the surface roughness (representing the influence of ground features such as buildings and vegetation on surface wind flow).

Meteorological data from the above surface and upper air stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD

modeling runs. The state used AERSURFACE to determine appropriate surface characteristics, and followed EPA guidance in the processing of the raw meteorological data into an AERMOD-ready format. Ohio processed the Huntington NWS surface meteorological data using the AERMINUTE preprocessor, which uses one-minute meteorological observations to provide the most complete and accurate hourly-averaged surface wind data. Then Ohio used AERMET to combine surface and upper air data into input files required by the AERMOD model.

Hourly surface meteorological data records are read by AERMET, and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1 minute duration was provided from the same instrument tower, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, Ohio set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. This approach is consistent with a March 2013 EPA memo titled, "Use of ASOS meteorological data in AERMOD dispersion Modeling." In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

In the revised modeling, the State decided to substitute cloud-cover data into the 2014 Huntington surface meteorological data, utilizing regional cloud-cover data from Mason County Airport and Charleston-Yeager Airport. The State performed these substitutions in order to create a surface file that would be more representative of realistic meteorological conditions at the Huntington station. The State believes that the revised .SFC input file generated demonstrated more realistic convective and mechanical mixing heights, compared to the previously generated .SFC input file without substituted cloud-cover data for 2014. Upon close examination of the revised .SFC input file, the EPA agrees that the substituted cloud-cover data for 2014 generates surface characteristics that better represent reality.

Modeling Parameter: Geography and Terrain

The terrain in the area of analysis is best described as hilly, along the Ohio River Valley. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model was the USGS National Elevation Database.

Modeling Parameter: Background Concentrations of SO₂

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO₂ that are ultimately added to the modeled design values: 1) a “first tier” approach, based on monitored design values, or 2) a temporally varying approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For the Gallia County, Ohio, area of analysis, the state chose to characterize background concentrations with a temporally varying approach and an additional bias adjustment. The background concentration for this area of analysis was determined by the state vary between 1 and 8.65 ppb,⁴ and these values were incorporated into the final AERMOD results. As a first step in determining background concentrations, Ohio relied on temporary varying (by hour and season) background data from the Pomeroy monitor, which is located north of Gavin and Kyger Creek. The initial background profile was based conservatively on the 99th percentile monitored concentrations, excluding occasions when the monitor may have been downwind of significant emissions. The EPA considers this first step appropriate, based on the Modeling TAD, and it is in accordance with the second mechanism described above. The state then conducted an adjustment intended to remove bias, reducing the temporally varying background concentrations by 38%. This 38% adjustment was derived by a mean error/bias calculation from a statistical comparison study between modeled and monitor concentrations.

EPA does not agree that a bias adjustment to the background concentrations is appropriate. The rationale for the adjustment is based on a comparison of model estimates to monitored concentrations at a monitor location, approximately 13 kilometers from the facilities. At this distance, well removed from the expected location of peak concentrations in the area, the comparison of model estimates and monitored concentrations does not provide a reliable indication of how well the model is performing. In any case, even if the monitor were located closer to the expected location of peak concentrations, EPA does not agree that adjustment of background concentrations (or adjustment of any other model input or output) is appropriate. EPA finds that the temporally varying approach was acceptable and consistent with the Modeling TAD, but EPA finds that the state’s 38% reduction of background concentrations is an inappropriate adjustment.

Summary of Modeling Results

The AERMOD modeling parameters, as supplied by additional information from the state during the comment period for the Gavin area of analysis are summarized below in Table 3.

Table 3: AERMOD Modeling Parameters for the Gallia County, Ohio Area of Analysis

Gallia County, Ohio Area of Analysis	
AERMOD Version	15181
Dispersion Characteristics	Rural

⁴ The conversion factor for SO₂ (at the standard conditions applied in the ambient SO₂ reference method) is 1 ppb = approximately 2.62 µg/m³.

Modeled Sources	2
Modeled Stacks	4
Modeled Structures	47
Modeled Fencelines	2
Total receptors	34,225
Emissions Type	Actual hourly
Emissions Years	2012-2014
Meteorology Years	2012-2014
Surface Meteorology Station	Huntington, WV
Upper Air Meteorology Station	Pittsburgh, PA
Methodology for Calculating Background SO ₂ Concentration	Temporally Varying
Calculated Background SO ₂ Concentration	1 to 8.65 ppb

The results presented below in Table 4 show the magnitude and geographic location of the highest predicted modeled concentration based on actual emissions.

Table 4: Maximum Predicted 99th Percentile 1-Hour SO₂ Concentration in the Gallia County, Ohio Area of Analysis Based on Actual Emissions

Averaging Period	Data Period	Receptor Location		SO ₂ Concentration (µg/m ³)	
		UTM/Latitude	UTM/Longitude	Modeled (including background)	NAAQS
99th Percentile 1-Hour Average	2012-2014	401500.00	4306200.00	195.4	196.4*

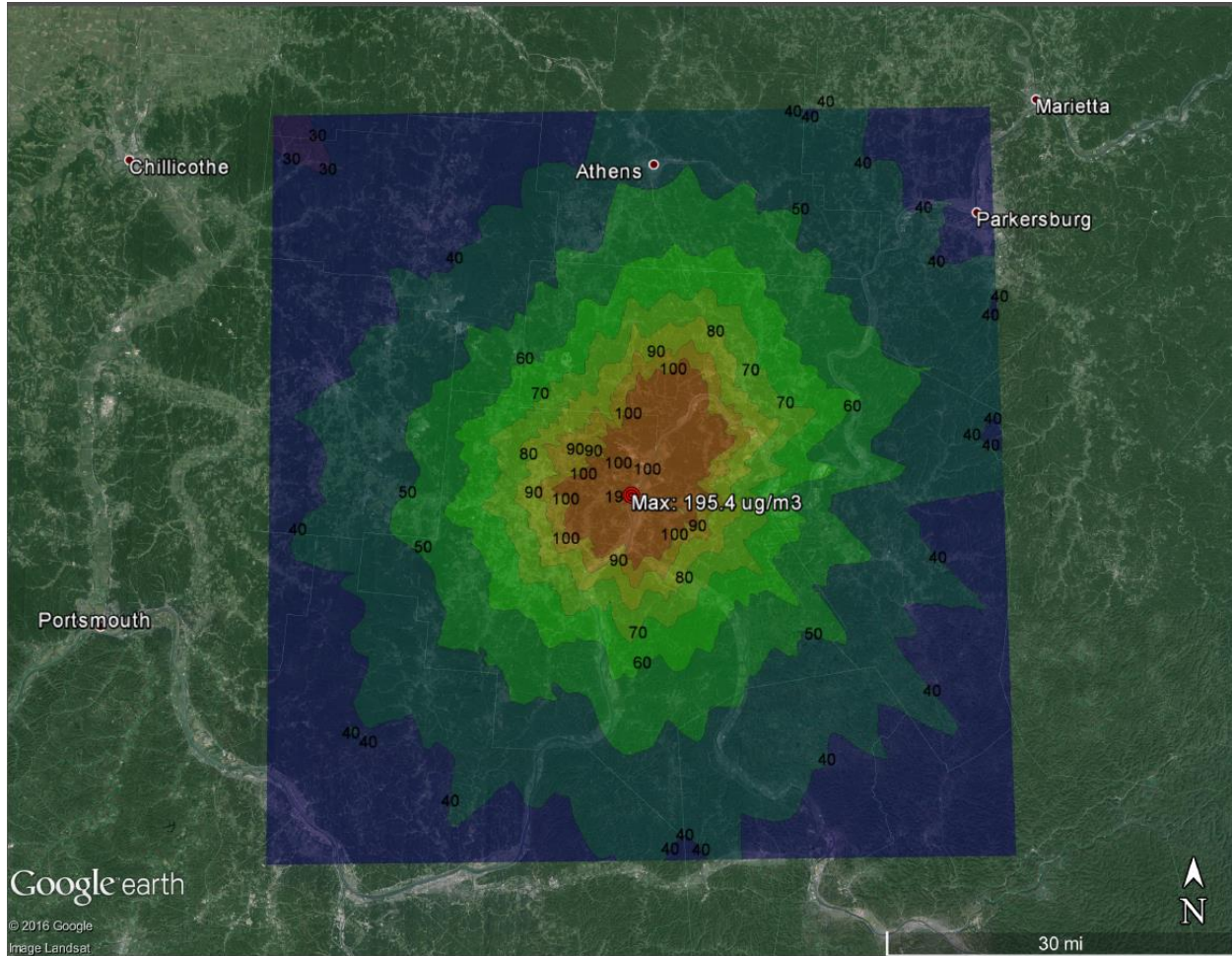
*Equivalent to the 2010 SO₂ NAAQS set at 75 ppb

The State's modeling indicates that the highest predicted 3-year average 99th percentile 1-hour average concentration within the chosen modeling domain is 195.4 µg/m³, or 74.6 ppb. This modeled concentration included the background concentration of SO₂, and is based on actual emissions from the facilities. Figure 4 below was included as part of Ohio's submission and indicates that the predicted value occurred about 2,000 meters south-southwest of the Kyger Creek stacks.

Ohio did not provide an assessment of concentrations without the 38% bias adjustment on background concentrations. Since Ohio applied variable background concentrations, the impact of the adjustment would depend on the background concentrations at the critical times for which the estimated concentrations factored into the determination of the 99th percentile maximum daily concentration. While Ohio's estimated concentration is only about 0.4 ppb below the standard, the information provided by Ohio does not clearly indicate whether use of an unadjusted set of background concentrations would have shown violations of the standard. Similarly, Ohio did not provide evidence as to the degree to which the lower emissions in 2013 to 2015 as compared to 2012 to 2014 affected concentrations. Therefore, EPA cannot fully

determine on the basis of its review of the modeling demonstration submitted by Ohio whether the Gallia County area is showing attainment of the 1-hour primary NAAQS.

Figure 4: Maximum Predicted 99th Percentile 1-Hour SO₂ Concentrations in the Gallia County, Ohio Area of Analysis Based on Actual Emissions



Additional Modeling by Sierra Club

On March 29, 2016, the Sierra Club submitted a new modeling analysis for the area surrounding Gavin. This analysis indicated a violation of the NAAQS. Upon closer examination of emissions data utilized by Sierra Club, the EPA finds that the emissions inventory overestimates actual emissions for both facilities. Table 5 shows a comparison among the emission values available on the CAMD web site, the emission values used by Sierra Club, and the emission values used by Ohio, showing annual average emission rates for the 2012 to 2014 period. This table shows that Sierra Club used emission values that added up to more than the values reported to CAMD.

Table 5. Emission rates modeled by Sierra Club and Ohio compared to emission data reported to CAMD (average tons/year for 2012 to 2014)

Facility	CAMD value	Sierra Club value	Ohio value
Gavin	31,998	32,012	28,048

Kyger Creek	9,390	9,442	9,133
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In addition, Sierra Club substituted questionable emission rates for 955 data points that were originally blank in the CAMD data set, and also inserted emission rates for 1,700 data points that were found to be zero in the CAMD data set. Given that Sierra Club claimed to use CAMD emissions data, these unexplained data insertions and discrepancies in the Sierra Club emissions input file make the data questionable. Since the modeled concentrations are a function of the particular emission rates during the hours that have meteorology conducive to high concentrations, errors in the emission values for particular hours can have significant effects on the estimated design value. The EPA finds that Sierra Club’s unexplained deviations from the original CAMD data make Sierra Club’s modeling analysis less reliable and transparent.

Sierra Club’s modeling used a fixed background concentration of 10 ppb, matching the value that Ohio used in the modeling Ohio did in support of its original recommendations for this area. As noted above, Ohio’s reassessment of background concentrations led to a conclusion the use of variable background concentrations would result in more refined modeled concentrations. Without the 38% bias adjustment, Ohio found background concentrations to range from 1.61 to 13.95 ppb. Given the wide range of background concentrations that vary by season and time of day, the background concentration used by Sierra Club appears to be unnecessarily conservative for most hours and less representative of realistic background conditions.

These concerns about the modeled emission rates, along with the conservatism of the background value, have the potential to cause significant misrepresentations of the impacts of these sources. As a result, EPA does not consider the Sierra Club’s modeling to provide a reliable assessment of whether the area is violating the NAAQS. As noted above, EPA also does not consider Ohio’s analysis to be a reliable assessment of concentrations in the area. Since the issues EPA identifies in the two analyses are different, the Sierra Club analysis does not provide a reliable indication, even in combination with the state’s analysis, as to whether the area is attaining the NAAQS.

Sierra Club modeled both 2012 to 2014 and 2013 to 2015, finding design values of 267 and 265 $\mu\text{g}/\text{m}^3$, respectively. This slight decline in design values from the 2012 to 2014 period to the 2013 to 2015 period is consistent with the slight decline in emissions from the one period to the other. This evidence reinforces the conclusion that EPA has insufficient evidence to determine the net effects that removing the background bias adjustment and using more recent emissions would have on estimated concentrations in the area.

Jurisdictional Boundaries

Existing jurisdictional boundaries are considered for the purpose of informing our final unclassifiable area, specifically with respect to clearly defined legal boundaries. The EPA did not receive any comments regarding the intended boundaries for this area.

The EPA finds that our final unclassifiable area, consisting of all of Gallia County and the western half of Meigs County, which includes Bedford, Columbia, Rutland, Salem, Salisbury,

and Scipio Townships, are comprised of clearly defined legal boundaries, and we find these boundaries to be a suitably clear basis for defining our final unclassifiable area.

Conclusion

After careful evaluation of the state's recommendation, all timely comments and information received during the state and public comment period, and additional relevant information as discussed in this document, the EPA finds that the area around Gavin and Kyger Creek cannot be classified on the basis of available information as meeting or not meeting the 2010 SO₂ NAAQS, and therefore is designating the area as unclassifiable for the 2010 SO₂ NAAQS. Specifically, the area is comprised of all of Gallia County and the western half of Meigs County, which includes Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships.

The EPA has determined that the state's April 19, 2016, modeling analysis does not provide a reliable assessment of whether the area is attaining the NAAQS. Specifically, the EPA does not find the state's derivation of its final temporally varying background concentrations to be technically justifiable, and the available evidence does not conclusively indicate whether correction of the background concentrations, to remove the bias adjustment, as well as consideration of declines in emissions, would lead to identification of violations. The EPA has also determined that evidence of nonattainment demonstrated by Sierra Club is questionable due to its mischaracterized and overestimated emission input values, in addition to its generally overstated background inputs. Therefore, the EPA finds that a reliable basis does not exist after considering available information for designating the area either as attainment or nonattainment. Instead, after careful evaluation of available relevant information, the EPA designates Gallia County and Bedford, Columbia, Rutland, Salem, Salisbury, and Scipio Townships in Meigs County as unclassifiable for the 2010 SO₂ NAAQS.

At this time, our final designations for the state only apply to this area and the others contained in this final technical support document. Consistent with the court-ordered schedule, the EPA will evaluate and designate all remaining undesignated areas in Ohio by either December 31, 2017, or December 31, 2020.